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Le développement économique régional, la politique et les disparités régionales des grands territoires: le cas du Canada et de la Chine

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Résumé

Depuis le début des années 1990, la recherche sur le développement régional a pris une importance considérable dans les disciplines de l'économie et de la géographie dans la plupart des pays. De nombreuses études ont été consacrées à ce sujet et l'on constate une approche analytique de plus en plus sophistiquée.

Que les économies pauvres ont tendance à converger vers les pays riches, ou bien à diverger au fil du temps est une question qui a attiré l'attention des décideurs et des universitaires depuis quelques décennies. Convergence ou de divergence économique est un sujet d'intérêt et de débat, non seulement pour valider ou non les deux modèles principaux de croissance qui sont considérés comme concurrent (l'approche néo-classique et celle des approches de croissance endogène), mais aussi pour ses implications pour les publiques politiques.

En se basant sur une analyse des politiques de développement régional et des analyses statistiques de la convergence et des disparités régionales, les objectifs de cette thèse sont de tenter de fournir une explication des différents processus et des modèles de développement économique régional poursuivis dans le cas de territoires immenses en utilisant le Canada et la Chine comme études de cas, d'entreprendre une analyse des différents facteurs et des forces motrices qui sous-tendent le développement régional dans ces deux pays, et d'explorer à la fois les réussites et les échecs apparents dans les politiques de développement régional en comparant et contrastant les expériences de développement régional et les modèles de ces deux pays.

A fin d'atteindre cet objectif, la recherche utilise une approche multi-scalaire et des méthodes de mesure multidimensionnelle dans le cadre des analyses sur les disparités « régionales » entre les macro régions (sous-ensembles de provinces) des deux pays, des provinces et des régions urbaines sélectionnées, dans le but ultime d'identifier des problèmes existants en termes de développement régional et de pouvoir proposer des solutions.

Les étapes principales de la recherche sont :

1. La cueillette des données statistiques pour le Canada et la Chine (incluant les provinces de Québec et de Xinjiang) pour une gamme d'indicateurs (voir ci-dessous).
2. D'entreprendre une analyse de chaque dimension dans les deux juridictions: Population (p.ex. composition, structure, changement); Ressources (p. ex. utilisation, exploitation de l'énergie); Environnement (p.ex. la pollution); et le Développement socioéconomique (p.ex. le développement et la transformation des secteurs clé, et les modèles de développement rural et urbain), et les disparités changeantes par rapport à ces dimensions.
3. La définition d'une typologie de différents types de région en fonction de leurs trajectoires de développement, ce qui servira pour critiquer l'hypothèse centre-périphérie.
4. Le choix d'une région métropolitaine dans chaque juridiction (province).
5. D'entreprendre une analyse temporelle des événements clé (politiques, investissements) dans chaque région et les facteurs impliqués dans chaque événement, en utilisant l'information documentaire générale et des agences institutionnelles impliqués actuellement et dans un passée récent.

Cette étude a tenté d'expliquer les schémas et les processus des deux économies, ainsi que la présentation d'études de cas qui illustrent et examinent les différences dans les deux économies à partir de l'échelle nationale jusqu'au niveau régional et provincial et aussi pour certaines zones urbaines. Cette étude a essayé de répondre aux questions de recherche comme: Est-il vrai que les pays avec des plus grandes territoires sont associés avec des plus grandes disparités interrégionales? Quel est le résultat des comparaisons entre pays développés et pays en développement? Quels sont les facteurs les plus importants dans le développement économique de vastes territoires dans les pays développés et pays en développement? Quel est le mécanisme de convergence et de divergence dans les pays développés et, respectivement, les pays en développement?

Dans l'introduction à la thèse, le cadre général de l'étude est présenté, suivie dans le chapitre 1 d'une discussion sur les théories et les concepts utilisés dans la littérature théorique principale qui est pertinent à l'étude. Le chapitre 2 décrit la méthodologie de recherche. Le chapitre 3 présente une vue d'ensemble des politiques de développement économique régional et les programmes du Canada et de la Chine dans des périodes différentes à différentes échelles. Au chapitre 4, la convergence des deux pays à l'échelle nationale et la convergence provinciale pour chaque pays sont examinés en utilisant différentes méthodes de mesure telles que les méthodes traditionnelles, la convergence bêta et la convergence sigma. Dans le chapitre le plus complexe, le chapitre 5, les analyses comparatives sont présentées à l'aide de données statistiques, à partir des analyses des cas régionaux et provinciaux retenus des deux pays. Au chapitre 6, ces dispositions sont complétées par une analyse des régions urbaines choisies, qui permet également des aperçus sur les régions les plus périphériques. Dans la recherche proposée pour cette thèse, la politique, la population, le revenu, l'emploi, la composition industrielle, l'investissement, le commerce et le facteur de la migration sont également pris en compte comme facteurs importants de l'analyse régionale compte tenu de la superficie du territoire des deux pays et les différences de population entre eux.

Cette thèse a évalué dans quelle mesure les politiques gouvernementales ont réussi à induire la convergence régionale ou ont encore ont creusé davantage les disparités régionales, ce qui implique nécessairement une évaluation de la durabilité des patrons et des programmes de développement régional. Cette étude a également mis l'accent sur les disparités régionales et la politique de développement régional, les comparaisons entre pays, pour mesurer la convergence entre les pays et entre les régions, y compris l'analyse spatiale, d'identifier les facteurs les plus actifs tels que la population, les ressources, la politique, l'urbanisation, les migrations, l'ouverture économique et leurs différents rôles dans le développement économique de ces grands territoires (au Canada et Chine). Les résultats empiriques et les processus de convergence et de divergence offrent un cadre intéressant pour l'examen de la trajectoire de développement régionales et les disparités régionales dans les deux économies.

L'approche adoptée a révélé les différentes mosaïques complexes du développement régional dans les deux pays. Les résultats de cette étude ont démontré que la disparité en termes de revenu

régional est une réalité dans chaque zone géographique, et que les causes sont nombreuses et complexes. Les deux économies ont certains parallèles dans la mise en œuvre des politiques de développement économique régional, mais il existe des différences importantes aussi et elles se sont développées à différentes vitesses. Les deux économies se sont développées depuis la Seconde Guerre mondiale, mais la Chine a connu une croissance rapide que le Canada comme témoignent de nombreux indicateurs depuis 1980. Cependant, la Chine est maintenant confrontée à un certain nombre de problèmes économiques et sociaux, y compris les disparités régionales marquées, un fossé toujours croissant entre les revenus ruraux et urbains, une population vieillissante, le chômage, la pauvreté et la dégradation rapide de l'environnement avec toujours plus de demandes en énergie. Le développement économique régional en Chine est plus déséquilibré. Le Canada accuse un degré de disparités régionales et provinciales moins important que la Chine. Dans les cas provinciaux, il existe d'importantes différences et de disparités dans la structure économique et spatiale du Québec et du Xinjiang. Les disparités infra provinciales sont plus grandes que celles à l'échelle des provinces et des grandes régions (des sous-ensembles de provinces). Les mécanismes de convergence et de divergence dans les deux pays sont différents. Les résultats empiriques et les processus de convergence et de divergence offrent un cadre intéressant pour l'examen de la trajectoire de développement régionale et les disparités régionales dans les deux économies.

Cette étude démontre également que l'urbanisation (les métropoles et les villes) s'avère être le facteur le plus actif et contribue à l'économie régionale dans ces grands territoires. L'ouverture a joué un rôle important dans les économies des deux pays. La migration est un facteur majeur dans la stimulation de l'économie des deux pays mais de façons différentes. Les résultats empiriques démontrent que les disparités régionales ne peuvent pas être évitées et elles existent presque partout. Il n'y a pas une formule universelle et de politiques spécifiques sont de mise pour chaque région. Mais il semble possible pour les décideurs politiques nationaux et régionaux d'essayer de maintenir l'écart à une échelle raisonnable pour éviter l'instabilité sociale.

Mot clés : Territoire; développement régional; politique; disparité; convergence; évaluation

Abstract

Whether poor economies tend to converge towards rich ones or else to diverge over time is an issue that has attracted the attention of policy-makers and academics alike for some decades.

Economic convergence or divergence is a topic of considerable interest and debate, not only for validating or otherwise the two leading and competing growth models (the neoclassical and the endogenous growth approaches) but also for its policy-oriented implications. The conflicting predictions of the two alternative theoretical frameworks (endogenous versus exogenous development approaches) have given rise to an explosion of empirical studies especially since 2000. Significant progress has been made in dynamic modeling under the neoclassical model and endogenous growth models. The new economic geography approach, which emerged in the early 1990s, has gained much attraction for its arguments on centralizing and decentralizing forces in geographic economic space, which could lead to convergence or divergence of regional incomes. A similar set of issues and questions have been posed in relation to patterns of convergence or divergence between different regions of a given country.

Based on an analysis of regional development policies and statistical analyses of convergence and regional disparities, the research objectives of this thesis are to attempt to provide an explanation of the different processes and patterns of regional economic development in large territories (countries) using Canada and China as examples, to undertake an analysis of the different factors and driving forces underlying regional development in both countries, and to explore both the apparent successes and failures in regional development policy through comparing and contrasting the regional development experiences and models of these two countries. In order to achieve this objective, the research uses a multiscalar approach and multivariate measurement methods in the course of investigating regional disparities across both countries' macro regions (sub-sets of provinces), provinces and selected city regions.

The overall approach has involved:

1. Gathering statistical data for Canada and China (including provinces as well as the selected provinces of Xinjiang and Quebec) for a range of variables (see below).

2. Undertaking an analysis of each selected dimension in the two jurisdictions: Population (e.g. composition, structure, change); Resources (e.g. energy resources); Environment (e.g. pollution);

and Socio-Economic Development (e.g. development and change for key economic sectors, and rural and urban development patterns), and changing disparities on these dimensions.

3. Defining a typology of different types of region based on development trajectories that are used as the basis for questioning the core-periphery hypothesis.

4. Selecting a metropolitan region in each jurisdiction.

5. Undertaking a temporal analysis of major events (policies, investment,) and the factors involved in these events in each chosen region, using statistical and documentary evidence.

This study has tried to explain the patterns and processes of both economies as well as presenting case studies which illustrate and examine the differences in both economies from the national to regional and provincial scales and for some urban areas. This study has focused on trying to answer research questions such as: Is it true that large territorial countries have larger interregional disparities? What are the results of comparisons between developed and developing countries? What are the most influential indicators (in a statistical sense) in the economic development of large territories in developed and developing countries? What are the mechanisms of convergence and divergence in large territories in developed and developing countries?

This thesis has assessed whether government policies have succeeded in inducing regional convergence or have further widened regional disparities, thus necessarily involving an evaluation of the sustainability of patterns and programmes of regional development. This study also focused on regional disparity and regional development policy, and cross-country comparisons, for measuring convergence between countries and across regions including spatial analysis, and identified the most active factors such as population, resources, policy, urbanization, migration, openness and their different roles in the economic development of large territories (in Canada and China). The empirical results and the process of convergence and divergence offered an interesting framework for examining the regional development trajectory and regional disparities in both economies.

In the introduction to the thesis, the general framework of the study is presented, followed in Chapter 1 by a discussion of the theories and concepts used in the principal theoretical literature relevant to the study. Chapter 2 outlines the research methodology. Chapter 3 presents an overall perspective of the regional economic development policies and programmes of Canada and China in different periods at different scales. In Chapter 4, cross-country convergence between Canada and China at the national scale and within country provincial convergence for each country is examined using different measurement methods such as traditional methods, and beta convergence and sigma convergence analyses. In the most complex chapter, Chapter 5, comparative analyses are presented using statistical data, moving from analyses of the two countries to analyses of the broad regions and the provincial cases retained. In Chapter 6, this is complemented by an analysis of selected urban regions which also provides some insights on the more peripheral rural regions. In this thesis, policy, population, income, employment, industrial composition, investment, trade and migration factors are also considered important factors of regional analysis given the territorial size of the two countries and the population differences between them.

The approach adopted revealed the different complex mosaics of regional development in both countries. The results of this study demonstrated that disparity in regional income is a reality in every geographically large area, the causes of which are numerous and complex. Both economies have some parallels in the implementation of regional economic development policies, but there are important differences as well and they have been implemented at different speeds. Both economies have developed since the Second World War but China has grown faster than Canada on many indicators since 1980. However, China is now faced with a number of economic and social problems, including pronounced regional disparities, an increasing rural-urban income gap, an aging population, unemployment, poverty and rapid environmental degradation with ever-increasing energy demands.

Regional economic development in China is more unbalanced. Canada has a lesser degree of regional and provincial disparity than China. At the provincial level, there are significant differences and disparities in the economic and spatial structure of Quebec and Xinjiang. Sub-provincial disparity is larger than provincial and broad regional (sub-sets of provinces) disparities. The mechanisms of convergence and divergence in both countries are different. The empirical results and the process of convergence and divergence offered an interesting framework for examining the regional development trajectory and regional disparity in both economies. This study also shows that urbanization (metropolitan and cities) was found to be the most active factor contributing to the regional economy in large territories. Openness has played a significant role in the economies of both countries. Migration is a major factor in boosting the economy in both countries but in different ways. The empirical results show that regional

disparity cannot be avoided in either economy. There is not a specific universal formula and policy for every country and region. Regional disparities represent a development challenge in a large territory (or country). The persistence of large regional disparities may pose a threat to a country's territorial integrity and affect its political unity. But it appears possible for national and regional policy makers to try to keep the disparity at a reasonable scale to avoid social instability.

Key words: Territory, regional development, policy, disparities, convergence; evaluation.

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Introduction

The phenomena of regional development and regional disparities are of particular importance both to developing countries and developed countries. The trends of and the forces underlying regional disparities in economic development have been the subject of heated debate since 1950. Questions regarding whether regional disparities have been reduced or whether economic reforms have intensified regional disparities have generated considerable attention. The topic has attracted broad interest across several disciplines, notably from economics, geography, political science, sociology and history.

I.1 Purpose and Objectives of this Study

Living conditions, income, wealth and service levels vary among people, cities, regions and countries. Income and wealth distribution affects the allocation of scarce resources and economic growth, and economic growth leads to changes in the redistribution of important components of our societies such as investment, capital, human resources and technology.

Substantial regional disparities occur throughout the world in terms of the amount of goods and services produced per inhabitant and in the availability of natural resources per inhabitant. The contrasts between 'rich' and 'poor' regions have existed and been commented on for a very long time. The gap between rich and poor may also be viewed at the level either of single individuals or groups of people (Cole 1981).

Regional development is related to the capacity of a region to produce (and sell) goods and services, and thus the capacity of its inhabitants to earn income. Regional development disparities thus refer to differences among regions in their capacity to provide earned income opportunities to their inhabitants. Regional development policies seek to reduce such disparities, essentially by seeking to promote increased development in lagging region (Polèse 1999). Regional development from a holistic perspective is concerned simply and principally with getting poorer regions to converge with richer ones in terms of wealth and presumably quality of life. Regions, in this sense, may be within a country or they may lie across countries, and comparisons can be made among "developed" or "developing" regions, or between both of these types. Regional development presents itself in different forms and with different characteristics in different countries. The rate of economic growth and the development of regional economic disparity (or convergence) show different levels of performance among both “developed” and “developing” countries.

It is important to study how persistent disparities in aggregate growth rates across nations, regions, or groups of people have led to differences in welfare and “happiness” (quality of life). Does a more equal distribution of income and wealth encourage national economic growth[1]? Will income disparity among individuals or regions be reduced as an economy expands? Will globalization and technological progress enlarge or reduce inequalities among nations, regions, or individuals? What is the difference in terms of regional disparities between developed and developing countries? What forces have contributed to the changing patterns of regional development? ….

One of the universal characteristics of macroeconomic growth is the unequal participation and the unequal incidence of the benefits and the costs of production between regions and territories at all geographic scales of analysis. National economic growth has often been accompanied by intensified polarization among regions and an increase in the disparities between them. Only in a few countries has national economic growth been accompanied by a narrowing of regional disparities (Lipshitz 1995).

Regional income disparities have attracted a great deal of attention in the post-Second World War period in most countries as a popular subject for debate, research and public action. Since the early 1960s, regional development studies have assumed considerable importance in economic and geographic research in most countries. Many studies have been devoted to this topic with an increasing degree of

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[1] Economic Growth - A positive change in the level of production of goods and services by a country over a certain period of time.

analytical sophistication.

These studies have variously focused on regional disparity, cross-country comparisons, and convergence and divergence including Canada and China. For example, Coulombe (1995, 1996, 1997, 1999, 2007) has undertaken much research on economic growth and regional disparities in Canada and the Northern United States and convergence within Canada; Akbari (1996) focuses on provincial income disparities in Canada; Sakamoto (2006) on regional disparities in Indonesia; Ioannides and Petrakos (2000) on regional disparities in Greece; Barro (1991) on economic growth in a variety of countries; and Chechi and Peragine (2005) on regional disparities and inequality of opportunity in Italy.

The degree to which incomes have converged across countries over time has been the subject of extensive research. Initial studies tended to be descriptive - highlighting the key trends in inequality over time (Abramovitz 1986; Baumol 1986). However, in recent years this work has become more closely connected with research on economic growth theory. Two theories have come to dominate the literature on economic growth. The traditional Solow growth model (Solow 1956) predicts that countries that are furthest away from their steady states will grow more quickly than countries closer to their steady state[2]. For countries with the same steady state, this implies that incomes will converge along the transition path. In contrast, endogenous growth models (Romer 1986) can generate patterns of growth that do not exhibit any tendency towards convergence. Initially, it was suggested that the presence of convergence could form the basis of a test of the neo-classical growth model against the more recent endogenous growth models. As a result, several papers were written examining the nature of the convergence process (e.g. Barro and Sala-I-Martin 1992; Mankiw et al. 1992). As a consequence of this work, however, there has been much controversy, debate and confusion regarding how to measure and interpret income convergence.

The dominant approach in the early literature is characterized by the work of Barro and Sala-i-Martin (1992). This involved regressing income growth rates on

[2] A steady-state is defined as the situation where all variables grow at constant rates (Barro and Sala-i-Martin 1995: 19).

initial income to test whether poor countries grow faster than rich countries. However, several authors (e.g. Friedman 1992; Quah 1993) have argued that these regressions detect mobility within a distribution but tell us little about whether income dispersion across countries has fallen: it is possible to observe poor countries growing faster than rich countries and yet for incomes still to diverge. For this to happen, the initially poorer countries must overtake or leapfrog the richer countries, so that the rankings of countries change. To distinguish between these different forms of convergence Sala-i-Martin (1996a) coined the term β-convergence to capture situations where "poor economies tend to grow faster than rich ones." The term σ-convergence is defined as follows: "a group of economies are converging, in the sense of σ, if the dispersion of their real per capita GDP levels tends to decrease over time" (Sala-i-Martin 1996: 383). While Friedman (1992) has argued that the real test of convergence should focus on the consistent diminution of variance among countries (σ-convergence), Sala-i-Martin (1996a, b) argues that both concepts of convergence are interesting and should be analyzed empirically (O'Neill and Van Kerm 2004).

A considerable literature also exists focusing on regional inequality in China. For instance, Fan (1995) focussed on state policy and uneven regional development in post-Mao China; Tsui (1991) on regional inequality in China from 1952 to 1985; Lin and Chen (2004) on China's widening economic disparities and its 'Go West Program'; Pedroni et al. (2005) on regional income divergence in China; Duo Qin et al. (2006) on income disparity in relation to economic growth; and Lakshmanan and Chang-i Hua (1987) on regional disparities in China.

Public concern for regional economic development disparity in China has been increasing rapidly since the 1990s with the appearance of growing economic differences between the Western, Central and East Coastal Regions (see, for instance, Tsui, 1993; Thomas 1998; Tian 1999; Wangshaoguang and Anguanghu 1999; Wei yehua 2000; Sylvie 2001; Carsten 2000; Guang 2004; Xuhua 2004; and Xiaopei 2004). The question of regional inequality in China has been extensively studied in recent years both from a microeconomic (individual or household inequality) and a macroeconomic perspective (GDP per capita or consumption level differences between provinces). The most commonly highlighted feature in the studies on regional disparity in the post-1978 period is the growing gap in both income levels and income growth rates between the coastland provinces and the interior provinces of China.

There is also a wealth of studies that have focused on urban and rural development and urban-rural disparities in both countries (see Chapter 1).

Canadian scholars have mostly concentrated on micro studies and micro-level determinants such as worker participation rates, capital productivity by sectors which reflects the technology and capital intensity by sector and industrial structure in order to analyze regional disparity. Migration and immigration are major factors underlying or associated with transformations of the Canadian economy. Compared to other countries, Canada receives a large number of immigrants (about 250,000 each year) in proportion to its population. This is the complete opposite of China. There are also quite a few studies of Canada's immigrant population, their direction of destination, internal migration patterns and processes between Canadian provinces and major metropolitan regions (Simmons, 1980; Vanderkamp and Grant 1988; Field 1988; Termote 1988; Prescott and Wilton 2002). Some scholars put a special emphasis on smaller units of analysis (larger cities, smaller towns, rural areas) to help further our understanding of regional economies (Chalifoux et al. 2004). These factors can be appropriately analyzed with standard statistical techniques if comparable data over time and regions are available (Dholkia 2005).

In recent years, many studies have been devoted to cross-country studies, with an increasing degree of analytical sophistication. However, these studies are mostly focused on comparisons between developed countries, or between developing and undeveloped countries. For instance, Valletta (2005) discusses the ins and outs of poverty in advanced economies (Canada, Germany, Great Britain, and the United States); Venables (2003) analyses spatial disparities in developing countries; Heidenreich (2003), the regional inequalities in the enlarged Europe; Barro and Sala-i-Martin (1999), patterns of convergence across States and regions; Togo (2001), patterns of regional convergence in East Asian economies; and Gajwani et al. (2006), the patterns of spatial convergence and divergence in India and China.

Several researchers have focussed on large countries. Milanovic (2004), for instance, attempted to compare regional inequality in five large countries - China, India, the United States of America, Indonesia and Brazil in the period 1980-2000. However, there has also been some resurgence of interest in small countries and their economic performance (Alesina and Spolaore 2003; Armstrong and Read 1995, 2002; Bertram 2004; Easterly and Kraay 2000; Poot 2004; Felsenstein and Portnov 2005). Portnov (2005) in a very interesting study compared regional inequalities in 22 small countries (small in terms of size of territory) in Europe (Table 1), and rejected the hypothesis that small territorial countries have smaller interregional disparities[3]. The world economy had experienced more or less a steady boom since 1980. The current world-wide economic recession raises the question of how this will affect regional disparities both in developed and developing countries. Most countries have been affected by the economic recession since 2008. China avoided this recession successfully with a 9% real GDP growth rate in 2009. In contrast, in Canada labour productivity fell, and unemployment rose, real GDP growth rate declined from 2.5% in 2007 to 0.4% in 2008. The RBC Economics news report indicated that although the Canadian economy contracted by 2.5% in 2009, it is estimated to grow in 2010 with real GDP rising by 2.6% and that it will continue to expand in 2011, at 3.9%[4].

Measurement of regional economies in large territories is a complicated and delicate matter. Because it is difficult to choose "the best" index of regional disparity, the measure employed must reflect the purpose of the analysis.

There is considerable debate over which technique is the most suitable to measure regional disparities. The main problem in this debate is that the term disparity is a multifaceted concept encompassing dimensions such as convergence, inequality and polarization (Villaverde and Maza 2009).

When drawing up their overall judgments on progress or expressing their

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[3] Note: See more about regional disparity in small countries in "Regional Disparities in Small Countries" by Portnov and Felsenstein. Springer (2005).

[4] http://banknerd.ca/category/news/ RBC Economics: Canada on the Path for Recovery in 2010.

concerns about the future, many observers in developed societies still rely heavily – perhaps even more than they used to – on the main indicators of economic growth, which measures variations in GDP or its variants and remains the cornerstone of national accounting.

Of course in the arena of public debate and in the media, and different academic fields, other major indicators regularly attract attention, particularly unemployment rates, inflation rates, and more recently, the main stock exchange indices. However, the level of GDP and growth are still treated as the main symbols of success. Since the 1970s, however, the dominance of this criterion has attracted criticism. However, these criticisms have had little impact until now, at least as far as the institutionalization of alternative indicators are concerned (Gadrey 2006: 1).

Regional differences in economic performance are usually judged on the basis of per capita income, but income can be viewed in several ways. Indicators, both quantitative and qualitative, are obvious tools to employ to assess economic development (Cole 1981). While economic indicators such as GDP are useful, development is generally considered to be a much broader concept and must involve more than a focus on economic growth (Carlucci and Pisani 1995). There have been numerous calls for broadening the concept of development, going back certainly as far as the 1950s; inevitably, this has resulted in demands for a more diverse set of indicators.

Throughout the history of development, the concept of development has changed from time to time. Observers suggest it should include all the components expected to lead to a better and satisfactory life worldwide. Prefixes have been added to the term to reflect paradigm shifts so that, for instance, development became 'human', 'participatory' and 'sustainable' (Germond-Duret 2009). In the literature reviewed thus far, development has a range of different meanings but it is generally regarded as a desirable goal. Another consensus which emerges from the discussion thus far is that development is closely related to the broader definition of modernization, as a process of economic and social change (Schech and Haggis 2000). A desire to promote a broader vision of human development understandably helped to spawn the need for an alternative index to the GDP and its family of economic indicators for gauging progress in human development (Gadrey et al., 2006).

Alongside these calls for a broader perspective and associated matching indicators, there have also been moves to aggregate them into a single index of development, thereby keeping intact the power of a single number as exemplified, for example, by the GDP indicator (Bayless and Bayless 1982). There are many examples of composite development indices (synthetic indicators), and in each case the selection of indicators is used by the authors concerned (e.g. Morse 2004). Some examples are: the Human development Index (HDI) and its variants such as the Gender Related Development Index (GDI), the Gender Improvement Measure (GEM), and the Human Poverty Index (HPI), various Indicators of Sustainable Development, the Index of Social Health, the Personal Security Index (PSI) and the Genuine Progress Indicator (GPI) (Morse 2004). To some extent, in this thesis, a multivariate, multilevel approach will be used to analyze regional development data.

In this thesis, based on statistical data from Canada and China, the regional economic development trajectory of both countries since 1980 will be compared, in an attempt to examine systematically regional disparities and their changing patterns and rates of change. Comparing regional development performance between Canada and China poses a challenge because of differences in governmental systems and data collection processes. So, statistical indicators which capture both spatial and temporal dimensions are analyzed in this thesis at three scales – national (cross-country), provincial, urban (and to a lesser extent the rural peripheries) and for four dimensions (Natural, Economic, Social, Environment) with respect to the different socio-economic indicators available.

Based on an analysis of regional development policies and statistical analyses of convergence and regional disparities, the research objectives of this thesis are to attempt to provide an explanation of the different processes and patterns of regional economic development in large territories (countries) using Canada and China as examples, to undertake an analysis of the different factors and driving forces underlying regional development in both countries, and to explore both the apparent successes and failures in regional development policy through comparing and contrasting the regional development experiences and models of these two countries. The research uses a multiscalar approach and integrative multivariate measurement methods, in the course of investigating regional disparities across both country's macro regions, provinces and selected city regions. This approach is intended to show the complex mosaic of regional development in both countries.

I.2 Regional Scope and Time Period for the Study

The study is based upon selecting two countries for general comparative analysis, including provinces (as well as a metropolitan region within each province) for more detailed analysis, focusing on the role of different actors in shaping those processes and patterns, in order to identify existing problems in terms of regional development and to propose solutions. In this study, Canada is selected as a developed country and China is chosen as a developing country for this international comparative analysis; the provinces of Quebec in Canada and Xinjiang in China are selected as the provincial case studies; Montreal in Quebec and Urumqi in Xinjiang are also selected as the metropolitan cases for comparison, representing the 'core' regions of their respective provinces. Necessarily, some comments are made in relation to rural and resource peripheries in these two provinces.

One difficulty is that of securing adequate and reliable statistical data from 1949 to 1978 from China's statistical data sources. The other difficulty is the comparability of indicators between the two countries. Most of the statistics for China during the Great Cultural Revolution (as well as, particularly, those for the late 50s and early 60s) must be read with great care and caution. Statistical data are publicly available since 1980 in China. Furthermore, the question arises concerning the conformity of these statistical indicators with Canada's statistical indicators. Because of this, the analysis of the statistical data is mainly focused on the time period between 1980 and 2008. In this study, to explore income convergence between 1960 and 2007, the latest (published in 2009) version of the Penn-World Tables[5] is used. The Penn World Tables provide price adjusted income measures for 168 countries for the years 1950-2007 and have been used extensively in previous studies of convergence. For the other comparative analyses, statistical data for the 1980-2008 time period are selected. Statistics quoted or used for this study are taken directly from the official Chinese Statistical Yearbook and the Xinjiang Statistical Yearbook or related statistical sources. Statistics for Canada quoted or used for this study are taken directly from Statistics Canada, the Gouvernement du Québec (http://www.stat.gouv.qc.ca/), or related statistical sources such as World Bank Penn (Data http://web.worldbank.org/) and Databank of Official Statistics on Québec (http://www.bdso.gouv.qc.ca/).

Statistical data analysis software SPSS 16.0 for Windows, StatsDirect and GIS tools such as Arcgis 9.0 and Mapinfo8.2 are used for data processing and mapping to develop databases, perform statistical spatial analysis and produce maps.

I.3 Research Questions

1. Is it true that large territorial countries have larger interregional disparities? What is the result of comparisons between developed and developing countries?
2. What are the most influential indicators (in a statistical sense) in the economic development of large territories in developed and developing countries?
3. What are the mechanisms of convergence and divergence in large territories developed and developing countries respectively?

Much of the literature on regional inequality implicitly assumes that small and large territorial units should be treated uniformly. For example, the intense preoccupation with measuring national or regional convergence using Barro-type

[5] http://pwt.econ.upenn.edu/php_site/pwt_index.php

growth models does not make any distinction between large and small countries or regions (Barro and Salai-x-Martin 1991; Salai-x-Martin 1996; Armstrong 1995; Cuadraro-Roura et al. 1999; Tsionas 2002; Hofer and Worgotter 1997). This could just be due to a perception that small countries are simply scaled-down versions of large ones and therefore do not warrant special and separate treatment. It could stem thus from a view that regional or country size is something of a red herring in regional analysis (Beenstock 2005).

It is argued that the size of the region or country should be taken into account as an important factor in regional analysis. It is argued that a geographically large territory has more difficulty compared to small ones in achieving more balanced patterns of economic and social development. Small countries can be regionally more homogenous while large countries can be regionally more heterogeneous.

Regional disparity is certainly a phenomenon common to both developed and developing countries (Tables I.1 and I.2). Being large and diverse countries, Canada and China will always face the challenges of balanced regional development and national economic integration. In China, for instance, it will likely take a significant length of time before the less developed regions converge with the advanced and fast growing coastal region, if they ever will.

Substantial disparity in regional income is a reality in every geographically large area, the causes of which are numerous and complex. To start with, geographically vast countries such as Canada and China invariably face the problem of regional disparity because natural endowments and climate and physical conditions differ significantly across their regions. The regional problems are manifested through several symptoms such as significant differences among regions in levels of per capita incomes, levels of unemployment rates, physical quality of life, human development indices and so on. The regional problem has led people from relatively economically weak regions to migrate out to better off regions since there are likely to be few or no barriers to movement of people within a given country.

International migration has been a major factor during many periods of Canadian development. In 2006, international migration accounted for two-thirds of Canadian population growth. More than 225,000 immigrants have been admitted to Canada each year, on average, since the early 1990s[6].

Internally, migration tends to occur from poorer provinces to richer ones in both countries. For instance, Quebec lost almost 300,000 people to other provinces in the last 20 years. Younger migrants (under the age of 30) tend to go disproportionately to Alberta and British Columbia. As a result, interprovincial migration is making Alberta younger. The opposite is true for the Atlantic Provinces (Prescott and Wilton 2002).

Table I.1 Per Capita Average Income Difference of Some Territorially Small-sized Countries

Country	Year	Max/Min (Times)	CV[7]
Austria	2000	2.18	0.58
Belgium	2000	3.26	0.47
Bulgaria	2000	1.66	0.48
Czech	2000	2.80	0.15
Denmark	2000	1.40	0.26
Finland	2000	1.73	0.92
Greece	2000	1.63	1.20
Hungary	2000	2.37	0.49
Ireland	2000	1.66	0.80
Israel	2000	2.08	0.25
Italy	2000	2.21	0.86
Netherlands	2000	1.77	0.92
Norway	2000	2.10	0.76
Poland	2000	2.21	0.51
Portugal	2000	1.75	0.95
Romania	2000	3.00	0.22
Slovakia	2000	3.28	0.40
Spain	2000	2.16	0.99
Sweden	2000	1.61	0.50
Switzerland	2000	1.67	0.39
UK	2000	3.73	0.50

Source: Felsenttein and Portnov (2005)

The analysis of Fan (2005) shows that in China the relationship between migration and regional development has become stronger over time, with migration

[6] Statistic Canada, Catalogue no. 91-003-XIE, 2008.

[7] CV-Coefficient of Variation

flows from the central and western regions to the eastern region increasing dramatically from the beginning of new reform era. Cai Fang et al. (2009) analyzed migration and labour mobility of China since 1980 and found that the total number of migrants has kept growing and reached 136 million, migrant workers accounted for 46.5% of total urban employment, and concluded that migrant workers have had a substantial role in the urban labour market.

Regional economic development is a long-standing issue of public policy in Canada. Despite the attention it has received, however, and despite major government programs and expenditures aimed at stimulating regional development, the problem of regional disparities has not been significantly reduced (Coffey and Polèse 1987; Polèse 2010)

Table I.2 Per Capita Average Income Difference of Some Countries

Country	Year	Max/Min (times)	CV
China[1]	1978	14.27	0.73
China[2]	1978	3.87	0.34
China[1]	1994	18.34	0.87
China[2]	1994	5.34	0.39
Greece	1988	1.69	0.10
Spain	1988	2.23	0.17
Germany	1988	1.93	0.13
France	1988	2.15	0.26
Canada	1988	2.30	0.28
Japan	1988	1.47	0.12
Italy	1988	2.34	0.26
Portugal	1988	1.66	0.23
Belgium	1988	1.61	0.15
England	1988	1.63	0.15
Holland	1988	2.69	0.19
America	1983	1.43	0.11
Australia	1978	1.13	0.05
Korea	1985	1.53	0.15
India	1980	3.26	0.36

Source: Dengxiang (2002). In the table, China[1] indicates the three cities of Shanghai, Beijing and Tianjin are excluded in the calculation. China[2] shows all regions are included in the calculation.

In Canada, regional development, including in recent decades attempts to reduce regional disparities, has been a top priority objective of both federal and provincial governments, no matter what political party has been in power. Equity in Canada has been thought of much more in terms of regions and provinces (Higgins and Savoie 1994). Provincial disparities in per capita gross domestic product (GDP), per capita income, and productivity have lessened since World War II in Canada, but they are still substantially larger than those among US states. The persistence of regional disparity in Canada is the result of the country's diversity and its particular model of fiscal federalism (Coulumbe 1999).

China, also a large country, has severe regional disparities between the eastern coastal regions which are highly prosperous, urban and growth-oriented while the western hinterland of China is poor, rural and underdeveloped. Yet migration within China from west to east is not fully allowed due to the household registration (Hukou) system (which still has some restriction in relation to basic social benefits such as education and health care, as well as jobs,). The case of Canada is very different in this regard. Population in Canada is more mobile both within and outside the country.

Table I.3 HDI Trend of Canada and China

Country	HDI rank	1980	1985	1990	1995	2000	2003	2004	2005	2006	Average Growth Rate 1980-2006
Canada	3rd	0.892	0.915	0.935	0.941	0.95	0.956	0.963	0.965	0.967	0.075
China	94th	0.529	0.552	0.607	0.655	0.718	0.738	0.744	0.754	0.762	0.233

Source: Human Development Report Various Annual Issues (1980-2007)

There are few studies on the comparisons between Canada and China due to the difficulty of comparisons such as differences in income level and status, population size, statistic system, government system and its composition and public policy. They do share the characteristic of similar territory size, however. Canada is among the least densely populated and one of the world's wealthiest nations, with a high per capita income, while China is the most populous country in the world but with a per capita income classified as low by world standards, at about \$3259 (Nominal, 104th of

178 countries/economies), and \$5970 (PPP, 97nd of 179 countries/economies) in 2008, even though it accounts for 11.35% of world total GDP based on purchasing-power-parity (PPP) in 2008, according to the IMF[8]. There are therefore sharp contrasts that exist between these two countries. Canada is the less populated but a high ranked country in economic development and HDI (Human Development Index) while China is fast developing and the most populated country in the world with a medium ranked HDI (Tables I.2 and I.3). Despite these great contrasts, both countries share the same basic problem of regional disparity.

Canada and China also present some parallels and contrasts in terms of the implementation of regional economic development policy. Both economies are characterized by “unidirectional” growth, Canada towards the south while China’s development has been towards the coast. In the late 1960s, Canada began to implement a development policy based on growth pole ‘theory’ and later, more of a decentralization policy to address the problem of regional disparity, while China pursued a high growth rate, and only later on implemented policies to try to reduce regional disparity, notably through its Western Development Policy. Though there have been some successes over the years, more often regional development policies have not reduced disparities in either country. The ratio of the lowest to the highest provincial per capita incomes in China is 4.77 in 2008 if the three cities of Shanghai, Beijing and Tianjin are excluded (if these three cities are included in the calculation, the ratio of the lowest to the highest provincial per capita incomes reaches 8.25), while Canada has a ratio of 1.76 between the lowest to the highest provincial per capita incomes in 2008 if northwest territory is excluded (when the Northwest territory is included the disparity ratio reaches 3.04). As another example, we can note that the ratio of per capita income of the richest region over the poorest region was 2.2 in the US (1990)[9], 2.02 in the US (2000), 5.59 in Brazil (2000), 4.81 in India (2000) and 9.07 in China (2000) [10].

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8 http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/weoselgr.aspx

9 The data is taken from Barro and Sala-i-Martin (1995).

10 The data is taken from Mario Polèse (2010), The Wealth and Poverty of Regions: 5.

In the context of a strong demand for direct government intervention to reduce regional disparities in various spheres because of the substantial lagging regions in a large nation, it is important to identify those factors and determinants of regional disparity that can be directly influenced by government policies.

This study aims to evaluate regional economic development in the broad context of public policy in both countries and to determine whether there has been progress in narrowing regional disparities by using long term statistical analysis of economic indicators. This involves developing an appropriate methodology and measures or indicators to monitor achievements in reducing regional disparities (to identify divergence or convergence or persistence). Then, the thesis attempts to assess whether government policies have succeeded in inducing regional convergence or have further widened regional disparities, thus necessarily involving an evaluation of the sustainability of regional development.

I.4 Organization of this Research

The thesis is divided into six inter-related chapters and as follows:

In the Introduction, the general framework of the study, including its objectives, questions, regional scope and organization have been presented.

In Chapter 1, the major theoretical literature that is relevant to the study is reviewed. An overview of the major theoretical schools which either explicitly or indirectly contribute to the explanation of the phenomenon of regional growth differences, and hence regional income differences, are provided. This is followed by Chapter 2 in which the research methodology is presented.

Chapter 3 contains an overall perspective of the regional economic development policies and programmes of Canada and China in different periods at different scales.

In Chapter 4, the data analysis of cross-country convergence between Canada and China at the national scale and within country provincial convergence for each country is presented using different measuring techniques such as traditional methods, beta convergence and sigma convergence. In order to overcome the heterogeneity bias associated with the traditional convergence analysis, spatial analysis is taken into consideration in the beta convergence analysis in this Chapter.

In Chapter 5 and Chapter 6, comparative analyses are presented using statistical data, moving from analyses of the two countries to analyses of the regional, provincial cases retained in Chapter 5 and then to the selected urban regions and more peripheral regions in Chapter 6.

Finally, the research findings are summarised and the conclusions of the research are presented.

Chapter 1
Literature Review

1.1 Development Theories and Concepts: An Overview

The dominant paradigm for dealing with the issue of regional disparities has changed considerably in recent years. Analysis of development, underdevelopment, and lagged development between countries and between regions of the same country is today approached via growth models, whereas in the 1970s it was based more on the neoclassical general equilibrium model, international trade theory, the hypothesis of constant returns to scale and the theory of comparative advantage (Coulombe 1999). The resurgence of economic growth analysis in the late 1980s stemmed from the development of endogenous growth models. The key feature of these models is that accumulation of physical and human capital, ideas and knowledge is the ultimate source of long-run growth in per capita economic indicators. In the neoclassical growth model — the benchmark model since the 1950s — long-run growth was thought to rely on exogenous technical progress since the accumulation of the stock of variable productive factors was considered to face decreasing returns (since some factors, such as land, are fixed). The conflicting predictions of the two alternative theoretical frameworks have given rise to an explosion of empirical studies since 2000. At the core of the research agenda has been the notion of convergence across national and regional economies.

The emergence of a regional development policy in Canada, the US, France, Italy and other countries since the Second World War heralded a major advance in national government strategies for development by recognizing that a country's economy has a spatial dimension. However, although it is necessary to develop (ideally at least) a comprehensive regional development policy for all regions within a country (or province, which can also be seen as a 'central state'), the objectives of regional policy for each region should be different, because the characteristics and problems of the regions are different. An overall national regional policy objective designed to reduce interregional economic and social imbalance necessarily involves different objectives and strategies for each region.

"… It should be admitted that no such thing (regional development theory) exists. So far, economists, geographers, physical planners and sociologists have recognized the specific character of regional development as well as the need to explain the phenomenon, but neither (sic) of these scientists has been successful in presenting a doctrine. Nevertheless, the necessity for such a doctrine is being experienced by more and more now that many governments in the developed and underdeveloped parts of the world have decided to embark upon or to continue with regional planning efforts." (Hilhorst 1969: 21)

Because of the comparative neglect of the subject – unlike some other branches of economics – the factors which govern the spatial dispersion of economic activity, and the causes of regional growth and decline, are still not clearly understood, although some important conceptual frameworks have been developed. If the dimensions of regional socio-economic development problems and their interrelationships were clearly distinguishable and quantifiable, and if a generally accepted "theory of regional development" was available, then the task of designing a comprehensive development strategy would be, presumably, a relatively easy one. This, however, is not the case (Francis et al. 1974: 16).

What are some of the major theoretical tools now available and what has been their contribution toward resolving the practical problems of policy-making in regional development?

Industrial location theory is the oldest and one of the more important elements in the conceptual tool-kit. The main concern of much of the theoretical work in this area has been with the factors affecting the firm's location. Work of this nature tended to assume a predefined spatial distribution of economic activity and ignored both the factors which determine how economic activity comes to spread over space, as well as those which account for regional growth and decline overtime.

Before focussing on the industrial sector, it is worth making some brief comments on the location framework for agricultural activity. Although the theoretical framework for this has gone through major modifications and refinements since its first formulation by Von Thunen (Von Thunen 1826), its main focus is still largely on micro-economic considerations (so therefore also at the individual firm or farm level). Von Thunen, for example, assumed the sites of towns as given, and postulated that the choice of agricultural activity location would depend on the cost of transporting the product to the market (the sites of towns). This theory has been helpful in explaining the phenomenon of economic rent and, by the nature of its assumptions it may also have applications in analyzing the effect of new urban development on the surrounding agricultural area. However, it is weak in that it is not concerned with the broader questions of spatial dispersion of economic activity, or with the dynamics of economic growth and change.

Alfred Weber's Theory (Weber 1909) was about industrial location. But the emphasis on the firm's locational choice based on the lowest combination of production and transportation costs, the assumption of proportionality of transportations costs to distance, and the neglect of the role of market demand in industrial location decisions, makes Weber's theory also quite inadequate in explaining the factors that influence the overall spatial pattern of economic activity. This weakness of the theory remains even after Losch's modification of it (Losch 1954) that focussed on 'profit maximization' as the key objective in locational choice and his recognition of the importance of agglomeration economies.

Other refinements of industrial location theory by Hoover (1948), Isard (1956), and others, suggest that the extent to which a firm can benefit from external economies in a particular location might be a more important consideration than transportation costs in locational choice. However, even after account is taken of all the relevant external economies and diseconomies, the emphasis in the theory is primarily on the location of the firm, and it does not provide an adequate explanation of such phenomena as the changing patterns of spatial distribution of economic activity and the differences in the economic structure and performance of regions.

Central place theory was developed to deal with a larger spatial scale, and attempts to tackle the question of the distribution of an activity in geographic space (a specific type of activity, namely the service sectors). In Christaller's (1933) pioneering work, the concern was with the tertiary sector of the economy; he postulated that central places (i.e. towns and villages providing services to a surrounding area) which provide an equivalent range of goods and services will be located equidistant from each other since this assures that the population will be served with a minimum of transportation costs. Since different goods and services have different market thresholds, the relative importance of the centres will vary; however, they will be located in such a way that the total central place system will take the form of a hierarchy of centres nesting within a system of hexagonal market areas. This is the framework based on the marketing principle (Christaller also developed frameworks based on a transportation principle and on an administrative principle). While this framework is useful for looking at service activities, it does not hold for centres with a concentration of manufacturing activity since, in such cases, centres of the same size could have vastly different economic structures and market areas.

Losch's developments in relation to manufacturing activity location are also restrictive since he assumed an even spatial distribution of agricultural population and natural resources. Furthermore, although the theory suggests that the growth of a central place will be sustained by its hinterland (Richardson 1978), it is not concerned with the dynamics of regional growth and change.

There have also been efforts to apply the theory of international trade to explain interregional economic dependence and change. Here again, a complete answer to the question has been elusive. In contrast with the conditions which make international trade profitable for participating nations, the regions of a country have neither the advantage of factor immobility (which enables nations to trade on the basis of comparative advantage) nor of complete factor mobility (which would tend to make persistent unemployment impossible). This seems to question the validity of the principle of comparative advantage as the sole basis for interregional trade. Furthermore, if the prevailing costs and prices in the regions do not reflect real differences in productivity, the prospects of interregional balance of payments equilibrium are even more remote. Under such conditions, a region which is less efficient than others in all sectors of economic activity, due either to inferior resources or to an inability to realize economies of scale, or both, will be at a general disadvantage, and this process could result in the cumulative decline of the region (McCrone 1969). The final outcome of this process depends on the relative strength of what Myrdal calls the "spread effects" arising either out of deliberate public action to stimulate regional economic activity or from the pressure on resources in the prosperous region (Myrdal 1954).

Over the period of the 1950s through to the 1980s, three exogenous development theories or set of concepts gained prominence. They are growth pole theory, cumulative causation theory and the core-periphery model (Hansen 1981).

Growth centre strategies received their original impetus from an article on polarized development by Perroux (1955), where he coined the term 'growth pole'. The growth pole was identified as a 'point' in the economy, but not a geographic point. As a growth pole (sector) experienced growth it would pull along other sectors and sub-sectors in the economy and with it, regions because of the positive interactions between the growth pole and these other sectors and sub-sectors. This notion was eventually transformed into a growth centre theory (see below), in which it was argued that because of limited resources, especially in peripheral rural regions, development efforts and resources should be concentrated in a few well-situated places, the development of which would then spill over into surrounding regions and possibly other regions.

Perroux argued that analyses of economic development should concentrate on the process by which various economic activities appear, grow in importance and in some cases, decline or disappear. Similar to Schumpeter (1934), Perroux maintained that entrepreneurial innovation is primarily responsible for the development process which involves a succession of dynamic sectors, or poles, over time. Although Perroux's article did discuss the advantages to be obtained from the geographic clustering of economic activity, he was mainly concerned with relations among industrial branches. The spatial aspects of polarized development were elaborated for

France primarily by Boudeville (1972) and, more generally, by Hirschman (1958). Hirschman uses the term polarization to refer to the negative impact of a growth pole on surrounding regions. 'Trickling down' is the term he uses for the positive impact of a growth centre on adjacent regions. Myrdal (1957), a Swedish economist, uses the terms backwash and spread effects for the same concepts as Hirschman's polarization and trickling down concepts respectively, and also uses the powerful concepts of cumulative processes of change (growth and decline) as well as the reinforcing effects of the spatial flows of capital, labour and goods. The American economist, Friedmann (1956), developed a concept that is related but distinct from the ideas of growth poles and growth centres, and involves two key concepts, the centre (core) versus the periphery of an economic region. Friedmann builds a broad theoretical framework, composed chiefly of four factors: population migration, flow of capital investment, spatial diffusion of technological innovation and spatial organization of political power. Their simultaneous influences cause instability in the spatial system that increases the inequality between the core and the periphery. The cumulative causation theory was constructed to explain regional development processes and to explain regional differences. Both Mydral (1957) and Hirshman (1958) argued that development efforts should not be widely spread but should instead be concentrated in a relatively few selected areas. Mydral's (1957) cumulative causation theory suggested that the gap between core and periphery depends on the relative rates of backwash and spread effects. If backwash effects dominate there is an increasing gap; if spread effects dominate, there is a decreasing gap. Friedman's core-periphery model was built on the basis of an understanding of the historical processes of spatial development. His growth model argued that the spatial change of regional development processes (core-versus periphery) moved through four different stages, i.e. the preindustrial economy, the transitional economy, the industrial economy and the post-industrial economy.

Writers like Perroux, Myrdal, Hirschman, Rostow and many other advocates of the exogenous development approach have argued that growth does not take place evenly, but rather occurs in a few growth points that usually prosper at the expense of the rest of the country. They also add that market forces, if left alone, tend to reinforce the concentration of development in the growth centres by attracting capital and labour from the backward regions in a search for high returns on investment, employment opportunities, better living standards and public services. These writers have convincingly argued that government intervention, through a process of regional development, is not only predictable but also necessary in order to facilitate the spread and trickling down of growth from core regions to the hinterland. Such theories and concepts influenced many governments in their development policies and programs for rural regions during the 1950s and especially the 1960s (Alhowaish 2006)

There have also been disputes over the nature of the policies that might be required to break a country out of a low-level development trap. For instance, Rosenstein-Rodan (1943) argued for planned large-scale investment programs in the industrialization of countries with a large surplus workforce in agriculture, in order to take advantage of network effects, i,e. economies of scale and scope in order to escape the low level equilibrium "trap". He argued that balanced growth appeared to imply that a coordinated, broadly based investment program, or the “Big Push Model”[1] would be required. Hirschman (1958) disagreed, arguing that a policy of promoting a few key sectors with strong linkages, then moving on to other sectors to correct the disequilibrium generated by these investments, and so on, was actually the more appropriate approach (Krugman 1994).

Richardson (1973), like Friedmann, attributed great importance to spatial distribution in the creation of technological innovation and in the absorption of such innovations in order to explain the increase in interregional inequality. Richardson

[1] The major contributions of the concept of the Big Push were made by Paul Rosenstein-Rodan in 1943 and later on by Murphy et al. in 1989. In addition, the works of Matsuyama (1992), Krugman (1991) and Romer (1986) proved to be seminal for the later literature on the Big Push. The Big Push Model is a concept in development economics or welfare economics that emphasizes the fact that a firm's decision whether to modernize or not depends on the expectation of what other firms will do. It assumes economies of scale and an oligopolistic market structure (http://www.viswiki.com/en/Big_Push_Model).

maintains that a wise spatial policy undertaken by government or its authorities may influence the rate at which inequality is reduced (Lipshitz 1995).

Growth poles (à la Perroux as noted above) refers to a 'point' in the economy, not necessarily a geographic point, characterized by a leading sector which influences a whole set of other interrelated sectors. The growth centre is a specifically geographical concept. It is true that in some of the literature the distinction was not made clearly and the two terms have been sometimes used interchangeably.

The problem has been compounded by the use of other terms: growth point, growth area, development pole, development centre … Certain authors, notably Darwent (1969) and Higgins (1971), suggested particular conventions by which these terms might be distinguished. Unfortunately, their suggestions appear to have gained little general acceptance. Preston (1987) explained the logical relationship between the central place theories and growth centres and concluded that the role of development poles – primary growth centres – and of secondary growth centres should be integrated into the system context of the central place hierarchy and exploited in that context in regional development theories and programs.

Overall, the concept of growth poles has been of only marginal importance in analyzing regional economic problems. Nevertheless the idea of growth poles and more specifically its geographic cousin the development centre has had a major role in formulating regional policy (Darwent 1969). During the 1960s and 1970s, the growth centre concept experienced a cycle of boom and slump (Richardson 1978; Parr 1979). Initially, growth centres were considered to offer a solution for numerous regional development problems in advanced and developing countries alike, and policies involving channeling economic growth into specific locations were either advocated or practiced in a number of nations (Kuklinski 1972; Moseley 1974; Higgins 1978). Subsequently, however, resistance to development strategies employing growth centres intensified, especially in developing countries (Richardson 1978; Higgins 1978; Friedman and Weaver 1979). Not only is the concept no longer regarded as a panacea for understanding the regional development process in both developing (Corraggio 1981) and developed (Hansen 1981) countries, it has also been questioned on both theoretical and ideological grounds. However, Richardson (1978) and Parr (1979) rejected the popular critical view and made a more nuanced argument. They concluded that growth centres do not offer a universal remedy for regional problems, but that growth centres can still be a valuable component of national economic development programs and they are particularly well suited for use in rural development schemes (Preston 1984).

Growth centre strategies were eventually adopted**,** at least nominally, in a host of newly developing countries such as China (after 1990) as well as in such industrial nations as France, Canada and the US early on, where two major regional development programs both specified that relevant investments should be concentrated in places with significant growth potential. It was held that beneficial “spread effects” from the growth centres would eventually induce development in remaining peripheral areas, and that growth centres would have a significant relay function in the process of innovation diffusion through the urban hierarchy. However, during the 1970s, growth centre strategies came to be almost universally regarded as failures. It should be acknowledged that the concepts of positive spread effects to areas surrounding growth centres and of hierarchical innovation diffusion were both rather naïve given the more complex spatial interdependencies that characterize actual economic activity. However, with hindsight it is clear that growth centre strategies were rarely if ever implemented in accordance with their theoretical rationale, and some never actually got beyond the planning stage. The principal difficulty was that implementation would necessarily leave out more places and people than would be included, which meant that majority political support could not be obtained. Although interest in the growth centre strategy faltered because of these difficulties, its central insight concerning agglomeration economies and increasing returns was independently rediscovered with much enthusiasm in the 1990s (Hansen 1996).

Regional policies also lost favour in the 1970s because of widespread economic and demographic revival – unrelated to the regional policies of many North American and European non-metropolitan areas. Widespread decline in regional disparities during the 1970s, usually a continuation of longer term trends, suggested to some observers that market forces would reduce interregional per capita income differences without the need to resort to regional policies. However, developments during the 1980s, when governments tended to have a relatively favourable view of market resource allocation, indicated that reduction in regional disparities was not necessarily an automatic phenomenon. For example, regional disparities increased in the United States (Amos 1989) and Australia (Maxwell and Hite 1992), and they stabilized within the EC, with a slight increase between 1983 and 1987 (Suarez-Villa and Cuadrado Roura 1993; Hansen 1996). Thus, there was been increased interest in the role that regional policies might have in addressing regional disparity issues; however, if they are to be effective, regional policies must take account of the forces that impinge on the economic destinies of the regions concerned. Neoclassical economic theory suggests that increasing economic integration would tackle interregional income differences through the relatively free movements of labour and capital.

Polèse (1999) argued that the term "growth pole" has fallen into disuse. For instance, in Canada, the Department of Regional Economic Expansion was closed down in the mid-1980s. In many other Western states, notably the U.K., central government departments devoted to regional development have either been entirely abolished or, at best, greatly reduced in importance. Polèse (2010) argued that regional development is in general no longer seen as a burning national policy issue for some countries, even though it is still a major issue in many European countries and the EU in particular, and also in China.

On the other hand, the recent economics literature on endogenous growth theory indicates that growth tends to be more rapid in countries and regions that have a relatively large stock of capital, a highly educated population and an economic environment favourable to the accumulation of knowledge (Romer 1986; Gould and Ruffin 1993).

The endogenous growth literature has also recently rediscovered this cumulative process, though there are differences in emphasis on whether regional specialization

(Krugman 1991) or knowledge spillovers among industries (Glaeser et al. 1992) are the main sources of growth. If there are elements of truth in both the neoclassical theory and in the increasing returns argument, then one would expect that economic geography at a large scale would be characterized by a complex mosaic of patterns and processes that cannot be sufficiently explained by any single model. Evidence from Europe and the US suggests that this is the case (Hansen 1996).

The endogenous development approach is, theoretically, the direct opposite of the exogenous development approach. It contends that development planning, policies and decisions should be taken and implemented at the grassroots level by local people affected directly by the development decisions rather than at the central or national level (Friedman 1978; Stohr 1985). The notion of endogenous development was conceived (in the research filed) in the 1980s as academics and practitioners began to question the effectiveness of exogenous economic development models and to identify serious short-comings with the existing approach. In fact, since the early 1980s, there have been a number of major revisions in development theories and concepts leading to a new perspective on development that favours a more area-based or endogenenous-led development (Coffey and Polèse 1984; Bryant and Preston 1987; Stolar 1990; Putnam 1993; Douglas 1997; Morgan 1997; Ray 1999; Annis 2002; and Shucksmith 2004).

In countries at an early stage of economic development, where the economic structure is quite simple, where primary activities such as agriculture or resource industries dominate hinterlands and where modern activities are few and concentrated in a limited number of metropolitan areas the region-centred perspective appears to be reasonable. The notion of distinctive, weakly linked regions is descriptively accurate and is analytically useful in helping to explain the problems such as spatial dualism that Hisrchman and Myrdal demonstrated.

As economic development advances, this region-centred model becomes increasingly tenuous. This is because the structural changes inherent in economic growth in reality have more complex spatial impacts. Development historically features the increasing dominance of industrial and tertiary activities over primary activities. These activities involve much greater differentiation and interdependence than primary activities. The spatial patterning of structural changes entails the nodalization of activity, and greater interdependence between the nodes, or urban centres. This patterning is attributable to the dominance of locational factors such as market size, scale economies, externalities in production and consumption, and declining relative costs of transportation (recent increases in energy costs may well require this statement to be revised!). The dominant activities within a given region will tend to be those that are functionally linked to activities in other regions – a spatial extension of increasing specialization and exchange. And as regional interdependencies intensify, the internal structure of regions becomes increasingly heterogeneous. These sorts of development patterns are clearly in strong contrast to the rather neat and simple assumptions of the region-centred or core-periphery model.

The results of a long period of poor economic performances are similar everywhere. It is the identification of their real causes and effective remedies which presents one of the greatest challenges to modern society. There are indeed 'more questions than answers' in the regional development domain once we start exploring the real causes and appropriate remedies.

Regional policy, which constitutes the economic policy line of regional economics, pursues a different focus than regional growth theory. Scholars in regional policy have a desire to propose policy strategies which should lead to regional development, e.g. the export-led growth strategy or the endogenous development policy. Regional development policy strategies partly borrow from economic theories of other fields, such as growth theories and theories of economic development. However, regional policies embody also additional micro-economic and spatial aspects which are original to the regional economics discipline. Reflecting the common macro-economic views, regional economics has in principle offered two competing paradigms to explain regional inequalities, a neo-classical approach, which stresses the supply side, and other approaches which emphasize demand factors (Tondle 2000).

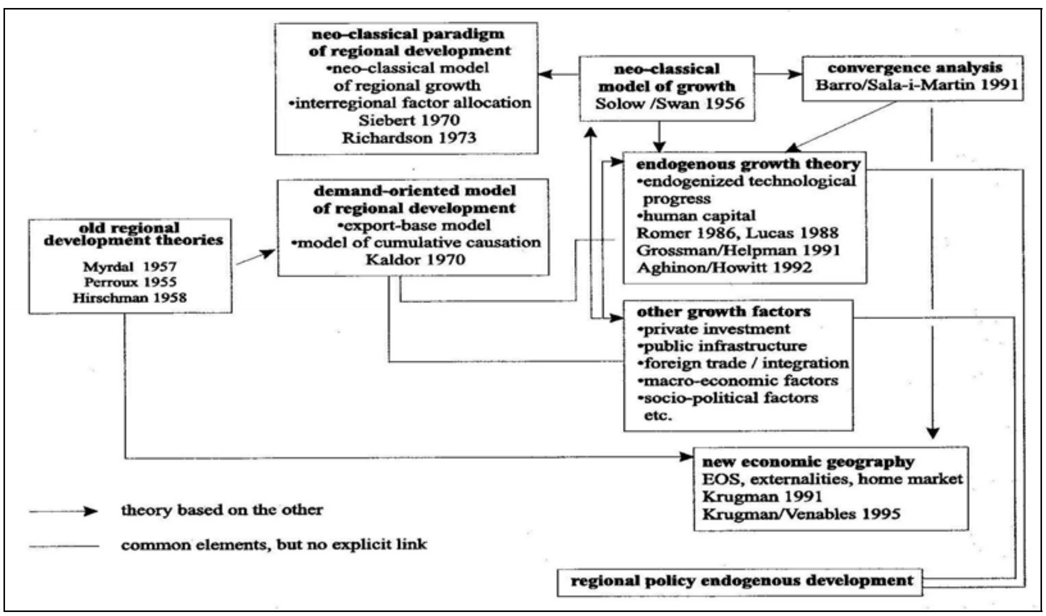
Regional policies in less-developed regions have typically provided infrastructure investments, grants, loans, and other subsidies to support and encourage private business initiatives. Although basic education is usually a more local (e.g. provincial in the case of Canada) responsibility, national standards for educational attainment, when they exist, can also indirectly promote the human capital base that is essential for sustained development. Such polices in effect attempt to provide a (more) level playing field on which local, regional and provincial authorities and leaders can further develop an innovative milieu.

Regional policy may also be considered in more of a development context. National governments have typically addressed national competitiveness issues in sectoral terms, yet it has become increasingly apparent that the conditions that underlie national competitiveness are often localized. This means that if one wants to understand differences in national growth rates, one should also start by examining differences in regional growth (Porter 1990; Krugman 1991; Hansen 1996). The sum of the parts is greater than the whole!

The objectives of regional policies have varied. But generally, they have been oriented to such equity considerations as reducing unemployment, increasing incomes, promoting structural adjustments, and/or realizing development potential. Neoclassical economists have tended to view such efforts as distortions of efficient resource allocation from a national perspective because resources are shifted from more 'efficient' places to 'less efficient' places, but this really depends upon the perspective one adopts. They have also typically argued that labour migration from lagging regions and capital flows to such areas will eventually reduce regional disparities (Hansen 1996).

Tondle (2000) summarized major theories which were proposed in regional economics and that have followed closely the current paradigm of general economic theory (Figure 1.1) and explained that the phenomenon of regional income inequalities, synonymous with differences in regional growth performance and regional development gaps, constitutes the core interest of regional economics. Thus, the neo-classical approach, and in particular the neo-classical model of growth, had a strong influence on regional growth theory. This led to the neo-classical model of regional growth in the 1960s and 1970s, proposed by Borts and Stein (1964), Siebert (1970) and Richardson (1973). Very much in contrast to this school of thought are demand-oriented models of regional growth, e.g. the model of cumulative causation proposed first by Myrdal in 1957 and then by Kaldor in 1970. Since then, however, regional economics has participated less in the formulation of theories of regional growth and has shifted its own focus more towards regional development policies. Nevertheless, regional policy often used the input of general growth theory as a starting point. Similarly the new economic geography approach, which attempts to explain regional growth differences, was initiated in general economics and not within the regional economics discipline — although reviving old models from regional economics.

Figure 1.1 Major Theories in the Explanation of Regional Growth (Tondl 2000)



The new economic geography approach, which emerged in the early 1990s, has gained much attraction for its arguments on centralizing and decentralizing forces in geographic economic space, which could lead to convergence or divergence of regional incomes. A key issue in economic development is whether economies which start out behind tend to grow faster in per capita terms and thereby converge toward those that began ahead (Barro 1994).

Beyond the traditional paradigms of regional growth, regional economics did not further engage in theoretical questions of regional growth. Instead, regional economics shifted its focus to regional policy issues in the 1980s, with a stronger focus on policy measures and an emphasis on the micro-economic level. Regional policy has employed new general economic models, which were suggested by new growth theory, and later by the new economic geography, merely as the theoretical explanation of regional growth differences and as a justification for policy intervention.

The neo-classical paradigm rests on the neo-classical theory of growth and allocation mechanisms as suggested in international trade theory. In a period when the belief in a neo-classical world led to the neo-classical model of growth on the macro-economic level by Solow and Swan in 1956, Cass (1965) and Koopmans (1965), regional economists followed these ideas to formulate a neo-classical model of regional growth with very much the same spirit. For example, Borts and Stein (1964), Siebert (1970) and Richardson (1973) established the neo-classical model of regional growth to explain regional income differences (McCombie 1988; Amstrong and Taylor 1985).

In short, faced with imperfect concepts and theories on the one hand and the reality of the problems of regional disparity and the need for a more cohesive national economy on the other hand, regional policy-making in modern industrialized societies has almost taken on an experimental character! The approach to the problem of regional development in advanced societies thus generally reflects a blend of the practical capability of the analytical tools and the institutional constraints within which developmental action has to be designed, i.e. a very pragmatic approach.

1.2 Convergence Studies: A Literature Review

Whether poor economies tend to converge towards rich ones or else to diverge over time is an issue that has attracted the attention of policy-makers and academics alike for some decades. Economic convergence or divergence is a topic of considerable interest and debate, not only for validating or otherwise the two leading and competing growth models (the neoclassical and the endogenous growth approaches) but also for its policy-oriented implications. Generally speaking, the presence of convergence is considered as a valid test in favour of the neoclassical growth model as opposed to the endogenous models that predict divergence in most cases.

The convergence issue has been revived in the past two decades thanks to the seminal works of authors such as Abramovitz (1986), Baumol (1986) and Barro and Sala-i-Martin (1991, 1992). Convergence analysis has even gained momentum by the development of endogenous growth models that allow a major role for economic policy. Unfortunately, the available empirical evidence does not provide unambiguous support for either of the two aforementioned growth frameworks, although it does point to the existence of conditional convergence.

At the regional level, the issue of economic convergence is also much debated. A look at the growth performances of member countries of integration schemes in Europe, Asia and Latin America over a relatively long period of time does not show unambiguous empirical support for the convergence hypothesis either (De Lombaerde 2002). This is in sharp contrast with the fact that, as for the EU, for the majority of commentators, economists and politicians economic convergence is an expected (if not necessary) outcome of regional economic integration processes (Meeusen and Villaverde 2002b). The empirical assessments of the effects of the elimination of barriers to flows of goods, services and production factors on growth (and its spatial distribution) and the debate on cohesion policies in the EU have considerably contributed to the development of the conceptual framework and the methodological toolbox for studying economic convergence (Villaverde Castro, 2004).

Since the early 1990s, in the suite of cross-country convergence analyses, many researchers have investigated the question of income convergence across and within countries. There is an argument about the existence of convergence among countries or between regions within a country over time that has been ongoing since Solow (1956) and Swan (1956) developed the neoclassical growth model. One of the important findings of the neoclassical growth model is its prediction of convergence — poor nations or regions tend to grow faster than rich ones in terms of the level of per capita product or income.

Barro and Sala-i-Martin who analyzed the data of US states since 1880, the prefectures of Japan since 1930, and the regions of eight European countries since 1950 found that absolute beta-convergence is the norm for these regional economies, i.e. poor regions of those countries tend to grow faster on a per capita basis than rich ones. The authors found the similarity of β-convergence rate which exhibit at a rate of close to 2-3% a year. However, they found that regional income convergence is weaker in Europe than in the US. The authors also analyzed another 122 countries from 1965 to 1985, dividing these countries between fast growers and low growers on the basis of real per capita GDP, and they found that the average gap between these two groups declined during this period[2]. Sala-i-Martin (2006) estimated the world distribution of income by integrating individual income distributions for 138 countries between 1970 and 2000 and found that all of them show reductions in global inequality during the 1980s and 1990s.

Many researchers have examined the existence of β-convergence for a variety of regions from the macro level to the single country level, from cross-country analysis to single country analysis. The existence of a convergence process can therefore reveal the real chances of reaching the aim of better cohesion among different territories and regions; this is the main reason why the measures of economic convergence are so popular in regional studies, particularly in the field of European Regional studies (Neven and Gouyette 1994; Fagerberg and Verspagen 1996; Fingleton et al. 1996; Tondi 1997a; Button and Pentecost 1994, 1999; Leonardi

[2] Barro and Sala-i-Martin (1995: 413-415.

1995; Marques and Soukiazis 1998; Nachtigal and Votavova 2002; Veiga 2004; López-Bazo et al. 2004; Rodriguez–Pose and Fratesi 2004; Ertur et al. 2006; Busetti et al. 2006; Paas and Schlitte 2007; Dall'Erba and Le Gallo 2007; Piras and Arbia 2007; Krüger 2007; Ramajo et al. 2008; Albu 2008**;** Karras 2008; Brasili et al. 2008; Becker and Hall 2009).

Mathur (2005) measured the speed of absolute and conditional convergence for selected European countries – the EU16, South Asian countries (5) and some East Asian (8) countries – from 1961 to 2001. Some researchers have assessed the convergence rates of countries in North America (Coulombe (1999) for Canada-USA; Gerber (2003) for USA-Mexico); Latin America (Wiggins and Pfitzner 2005), and Asia (Togo 2001; Ghosh 2007) by using different data sources in relation to various periods in time.

While empirical findings from cross-country studies remain controversial, there is ample evidence for convergence across regions within countries. Different regions have been studied by different researchers : Keller (1994) for Austria and Germany; Cashin (1995) for Australia; Coulombe and Lee (1993) for regions in Canada; Kim (1998), Jhonson, (2003) and Young et al. (2007) for US states; Kangasharju (1999) for Finland; Solanko (2003) for Russian regions; Carlos et al. (2000) for Brazilian states; Duncan et al. for Chili (2006); Adabar (2004) for Indian states; and Young (2005) for China.

Coulombe and his co-authors have similarly demonstrated in a variety of publications that convergence has taken place in Canada, with poorer regions growing more rapidly than richer regions (Coulombe and Lee 1995; Coulombe and Day 1999; Coulombe 1999, 2000; Coulombe and Tremblay 2001). Not all studies provide such a striking confirmation of convergence theory however. Hofer and Wörgötter find only weak confirmation of convergence theory in the Austrian context (1997). Moreover, Chatterji and Dewhurst (1996) and Siriopoulos and Asteriou (1998) have rejected the convergence hypothesis in Great Britain and Greece, respectively. In short, the convergence hypothesis is a central component of mainstream neoclassical growth theory. Moreover, it has been verified to a varying extent in most countries.

The evidence seems to be unequivocal: different regions in different countries are converging. However, the same cannot be said about the whole world. Furthermore, Boldrin and Canova (2001) using a similar methodology severely criticized previous results. Using a different data set, which includes 185 EU regions during the period 1980 - 1986, they concluded that the results are mixed and not supportive of convergence of regional per capita income. Both Delong (1988) and Barro (1991) used world-wide country data to test the convergence hypothesis which resulted in rejecting the null hypothesis due to the differences of economic structures among countries that are too large to converge to a long run equilibrium. Canova and Marcet (1995) also, basing their analysis on per capita incomes for 144 EU regions, found only limited signals of convergence during the period 1980 - 1982.

Mankiw et al. (1992) and Barro and Sala -I-Martin (1992) suggested that when using advanced economies such as OECD countries, states in the US, or regions in Western Europe, it is easy to attain a convergent equilibrium because their economic structures are similar. But while using data from both developed and developing economies simultaneously, it is not possible to find the same result because their economic structures are different. Galor (1996) and Quah (1996) proposed the club convergence hypothesis and suggested hypothesis testing frameworks indicating that an initial capital abundant rich country will accumulate more capital, while the initial capital poor country may even de-accumulate the capital. Consequently, the rich are getting richer and the poor are getting poorer (Durlauf and Johnson 1995; Quah 1996). Canova (2004), searching for clubs using per capita income from European regions and OECD countries, found that there are heterogeneities of per capita income and a tendency for the steady-state distribution to cluster around four poles of attractions. In both cases, a rich–poor, north–south dimension in the clubs emerge. Hansen (2000) applies the threshold model which allows the individual observations to be classified into different classes based on the value of an observed threshold variable. He finds that there are threshold effects in the initial per capita GDP as well as the literacy rate. Funke and Niebuhr (2005) tested for the existence and the significance of thresholds and multiple equilibriums across Western Germany. They found that the 71 West

German regions cluster towards three distinctive income clubs. The above convergence models have used a set of explanatory variables such as the initial income per capita, the investment rate, the initial secondary-school enrollment rate and the average annual rate of population growth to examine their impact on income growth. Chou (1997) followed this line and examined the exogeneity of the determinants of per capita growth, and built a simultaneous equation system to find the mechanism by which trade activities affect economic growth (Chou 2007).

The standard beta–convergence concept and test have also been more profoundly criticized by Friedman (1992) and Quah (1993b). Moreover, Quah (1993a, 1996a, 1996b, 1997) argued that convergence should be studied by taking into account the shape of the entire distribution of per capita GDP and its intra-distribution dynamics overtime and not by estimating the cross section correlation between growth rates and per capita GDP levels or by computing first or higher moments. Using an alternative empirical methodology based on Markov chains and probability transition matrices, Quah (1993a, 1996a, 1996b, 1997) found evidence on the formation of convergence clubs, the international income distribution polarizing into “twin-peaks” of rich and poor. Quite surprisingly, Quah (1996c) does not find evidence supporting “twinpeakedness” in the European regional income distribution for a sample of 82 regions (excluding southern poor Portuguese and Greek regions) over the 1980-1989 periods. Quah (1996c) raises another criticism concerning the neglected spatial dimension of the convergence process: countries or regions are actually treated as “isolated islands” in standard approaches while spatial interactions due to geographical spillovers should be taken into account. Arbia et al. (2005) described the law of motion of cross-sectional distributions of per-capita income and its components in Europe. These results are also in line with the most recent literature available on the distribution dynamic approach to regional convergence (Pittau and Zelli 2006).

An important part of the empirical literature uses a cross-section notion of convergence in order to verify the existence of a negative relationship between initial per capita income and its growth rate. However, if economies show multiple long run equilibria, cross-sectional tests tend to spuriously reject the null hypothesis of no convergence (Bernard and Durlauf 1996). Tests of the Convergence Hypothesis or the tendency for per capita income levels to narrow over time have generally utilized cross-sectional data and have usually found conflicting evidence.

Hall et al. (1997) consider possible definitions of convergence for time series. Thus, in these cases, a different notion of convergence might be used, such as applying a time series approach. Kosfeld and Lauridsen (2004) introduced a dynamic spatial modeling approach which is suitable for tracing regional adjustment processes in space instead of time and measured conditional income and productivity convergence across labour market regions in unified Germany. Wan and Zhou (2005), Li (2003), discusses Chinese regional economic inequality among 30 provinces. Lall and Yilmaz (2000) show that the speed of convergence is influenced by region specific characteristics and the availability of trained labour in neighboring regions. Islam (1995) raises alternative techniques like panel data to measure convergence. After that, Antunes and Soukiazis (2006) apply a panel data approach to test the convergence in per capita income among regions in Portugal. Llussá (2007) reviews the econometric methodology on panel data estimation and testing as applied to the study of convergence in empirical growth analyses and discusses and compares the different econometric methodologies used in cross-section and panel data studies of conditional convergence. Amplatz (2003) critically examines theories and empirical studies for three types of convergence, namely beta, sigma and club convergence from 1996 to 2000, uses population-weighted and non-weighted data.

Most studies do confirm some convergence in incomes across regions within a country. Even when the results are not statistically significant, there is almost always some tendency towards convergence. Sala-I-Martin, for instance, does not explicitly test convergence theory in each country, but he emphasizes that across all prominent Western European countries – Germany, France, Britain, Italy and Spain – regional divergences in income have consistently narrowed across the decades from 1950 to 2000. There are clearly countries which registered a high rate of regional convergence, such as the Britain and Spain with 2% and more (Sala-i-Martin 1996; de la Fuente

1996), and countries with low to medium rates of regional convergence with only 1% rates, such as Germany and France (Sala-i-Martin 1996) and Italy and Austria (Fabiani and Pellegrini 1997; Hofer and Wörgötter 1997).

In contrast to those cross-section analyses, the panel data analyses of Canova and Marcet (1995) and Tondl (1997b) come to the conclusion that European regions are converging at an average rate of about 2% to their own steady state incomes, which are much different. Both studies derive their results from annual growth rates rather than from growth averaged over a period as in the cross-section analysis. Gaulier et al. (1999) presents new empirical tests of the convergence hypothesis based on panel data by testing three samples (Europe, OECD and World). Some authors have addressed the issue of convergence with a distinctly different econometric methodology, applying Markov chain analysis to study intra-distribution dynamics of income and its long-term distribution. Quah (1996a), Fingleton (1997, 1999) and Magrini (1999) applied this concept to investigate convergence of European regions. Gallo (2004) studied space-time analysis of GDP disparities among European regions by applying the Markov chain approach. Quah (1996a) who investigated regional income distribution dynamics of NUTS II[3] level regions in the 1980s shows that in contrast to the first half of the 1980s the income distribution became more concentrated around the mean income in the second half. In addition, a peak in the upper income classes, which had existed in the first half of the 1980s, disappeared afterwards. In that period, the spread of cross-sectional income declined as well. The standard deviation of income fell from 0.27 in 1980 to 0.25 in 1989.

Some recent research in this area has tried to reconcile these findings with sensible theoretical models by exploring the role of alternative convergence

[3] NUTS: The database is based on the Nomenclature of Statistical Territorial Units: a coherent system created to provide a geographical subdivision of the EU's territory. The NUTS system is a hierarchical classification. Each Member State of the EU is divided into a number of regions at the NTJTS- 1 level. Each of these is further divided into sub-regions at the NUTS-2 level and these, in turn, into smaller areas at the NUTS-3 level (Eurostat 2002). There are 78 European Union regions at the NUTS-1 level, 211 basic administrative units at the NUTS-2 level, and 1093 subdivisions of basic administrative units at the finer NUTS-3 level of spatial disaggregation (Arbia 2006).

mechanisms and the possible shortcomings of panel data techniques for convergence analysis.

In a standard convergence analysis, the existence of both beta-convergence (which refers to the narrowing of income disparities) and σ-convergence (which tells whether poor economies are growing faster than rich ones) has been studied. If conditioning variables are used, it can be determined whether the poor economies are approaching their own steady states at a faster rate than the rich economies are approaching theirs (Sari Pekkala 1999).

Despite the recent criticism directed at neoclassical growth theory and cross-section regressions, it can be argued that they provide at least a good starting point for the analysis of regional disparities, as they are straightforward to use and continue to be commonly employed in empirical studies of convergence.

Until a few years ago, spatial statistics was a topic outside the range of interest of applied economists. In recent years, however, there has been a flourishing of economic studies that, by developing theoretical models that involve relationships between variables observed across countries or regions have greatly stimulated interest in the measurement and statistical modeling of spatial variables. Most of these models are linked to the developments in the so-called new economic geography (Krugman 1991; Fujita et al. 1999; Krugman and Venables 1995; Ottaviano and Puga 1998; Puga and Venables 1997, 1999; Durlauf and Quah 1999) and to economists' renewed interest in problems related to economic growth and the conditions under which the per-capita income levels of various regions tend to converge over time (Arbia 2005).

The importance of taking spatial effects into account was reviewed extensively by Anselin (1988) and since then, a growing literature attests to the importance of the problem of errors and misspecifications that can occur if spatial issues are ignored in cross-sectional data analyses involving geographic units. Among such economic problems is the question of per-capita income convergence; the current methodology would suggest that the econometric analysis of regional convergence should consider the possibility of spatial dependency among the regions (Magalhaes et al. 2005).

In recent years, the regional per-capita income convergence studies have been integrated with spatial econometrics in many regional convergence studies. Paas et al. (2007) deal with the development of disparities in regional per capita GDP and convergence processes in the enlarged EU from the regional spatial dependence perspective. Brasili et al. (2008) assessed European Union Cohesion Policy by estimating a conditional β-convergence model for a sample of 196 EU regions over the period 1980-2006, using a spatial econometric perspective and a distance-based weight matrix; Kamarianakis and Gallo (2004) compared regional productivity of European Union from 1975 to 2000 by applying Exploratory Spatial Data Analysis and a Spatial Econometric Model; Magalhaes and Hewings (2005) introduced some spatial econometric techniques to the convergence issues among Brazilian states. There are also some studies for single countries. For example: Rey and Montouri (1998) reconsidered the question of US regional economic income convergence from a spatial econometric perspective; Henley (2005) measured regional growth convergence in Great Britain; and Buccellato (2007) tested convergence across Russian regions using spatial econometrics approaches.

The analysis of convergence has so far been mainly focused on studies of regional or personal income distribution. However, there have been few studies that develop linkages between other related fields and the broader literature on economic convergence. Starting with studies by Barro and Sala-I-Martin (1991, 1992, 1995) and Mankiw et al. (1992), the question of convergence - that is, the catching up of poor economies with rich economies, whether at the regional or international level - has received considerable attention from researchers. Significant progress has been made in dynamic modeling under the neoclassical model and endogenous growth models. Recent analyses stress features such as the dynamics of the adjustment of physical and human capital, migration, economic and political integration, the stability and effectiveness of public institutions, economic policy and the spread of technology. Recently, some other researchers have extended the framework to other related fields such as market force, productivity, labour, spatial problems, education and information.

1.3 Studies on Regional Disparity and Convergence in Canada and China

The study of regional income convergence is gaining even more attention as scholars explore the impacts of globalization on income disparity among countries. The issue has been stressed within countries because of accumulating evidence which suggests that increased economic growth has generated increasing regional income inequalities, especially in many developing economies (Mossi et al. 2003; Aroca et al. 2006).

The recent literature on territorial disparities has been dominated by an econometric approach aimed at testing the convergence hypothesis. This approach is elegant and concise, but at the same time it provides a narrow understanding of territorial structures and processes of regional change (Quah 1996b, 1993; Rey and Montouri 1999; Lopez-Bazo et al. 1999).

In the case of Canada, there exists an abundant literature on regional disparity, on provincial disparities and convergence. Only some of them are listed on Table 1.1.

Table 1.1 Summary of the Related Literature on Regional Disparity and Provincial Disparities and Convergence

Topic	Author
Convergence	Coulombe and Day (1997, 1998); Coulombe and Lee (1993, 1995, 1998); Helliwell and Chung (1991); Helliwell (1994); Lee and Coulombe (1995); Lee (1997); and Lefebvre (1994), Day (2006), Akbari (1996); James and Krieckhaus (2008), Afxentiou and Serletis (1998); Ralhan and Dayanandan (2005).
Provincial Disparity	Regional Disparity - Coulombe (1997, 1999, 2004); Provincial Standards of Living - Coulombe and Jean-François (2006); GDP per Capita, Measures of Territorial Disparity - Alasia (2002); Taxes, Transfers and Regional dDisparities - Alter and Greenberg (1990). Income Earning Differences- Shearmur, Polèce (2005)
Micro analysis	Labour Productivity and Work Intensity – Baldwin et al. (2001, 2004, 2005); Provincial Earnings - Sharan (2000); Trade, Equalization and Regional Disparities - Hobson, Paul A.R and Donald J. Savoie (1992, 2002); Federal Income Tax Cuts - Fougère and Ruggeri (2001).
Urban-rural Income Disparity	Rural Income Disparities – Singh (2002); Urban-Rural - Beckstead and Brown (2005); Wages and Labour Productivity- Campbell (2002); Rural / Urban Divide- Alasia and Rothwell (2003).
Canada-USA Comparison	Standard of Living - Létourneau and Lajoie (2000); Ndayisenga and Downs (2005); Coulombe and Day (1999)

Regional disparities in per capita incomes have long been a feature of the Canadian economy. One of the first to quantify this fact was McInnis (1968), who used historical data on nominal personal income per capita for the Canadian regions to examine the evolution of relative regional disparities from 1926 to 1962. He concluded that "the trend of regional income differentials in Canada appears to have been roughly a constant; there has been neither convergence nor divergence" (McInnis 1968: 441). The findings of the research conducted to date show that, at the provincial level, the dispersion indices of various income and output measures record a substantial convergence among Canadian provinces from the 1950s to the mid-1980s. Since the mid-1980s, the catch-up convergence process appears to have come to an end. The dispersion indices converge slowly suggesting that the system is approaching a steady state (Coulombe 1999).

Gunderson (1996) discussed the factors that foster regional convergence such as migration, spatial convergence, inter-jurisdictional competition for jobs and investment and equalization in the context of a theoretical framework, while other researchers have tried to estimate this from the empirical analysis of convergence.

Lefebvre (1994) examined whether the hypothesis of economic convergence holds for Canadian provinces by using data on real gross domestic product per capita and on factor productivity from 1966 to 1992. His results support the findings of other authors who have studied convergence among Canadian provinces. Afxentiou and Serletis (1998) in their study used data extracted from Statistics Canada, Provincial Accounts publications for the period 1966 to 1991 and from publications of the Conference Board of Canada for 1961 to 1965; they found some results that conflicted with the work of Coulombe and Lee (1995), who had found that different per capita concepts converge at different speeds toward the national average. They also concluded that the various regional developmental policies and transfers introduced after 1960 had neither sped up nor slowed down the overall convergence process. Ralhan and Dayanandan (2005) measured unconditional and conditional income convergence among provinces in Canada during the period 1981-2001 by applying the first-differenced GMM (Generalized Method of Moments) estimation technique to the dynamic Solow growth model and compared the results with the other panel data approaches such as fixed and random effects. They found higher convergence rate of around 6% to 6.5% p.a. whereas the previous studies using OLS and other techniques reported a convergence rate of around 1.05% for per capita GDP and 2.89% for personal disposable income among Canadian provinces.

According to Coulombe (1999), the level of regional (i.e. provincial) disparities in Canada is close to a condition of disparity equilibrium, which reflects the industrial structure, and the institutional and political context. On the other hand, Sheamur and Polése (2001) observe a steady process of concentration of economic activities between 1971 and 1996. Keddie and Joseph (1991), Joseph and Keddie (1988) and Coffey and Polése (1988), after assessing population and employment trends, suggest that most of the alleged process of decentralization supposed to have occurred over the 1970s and the 1980s is in fact decongestion, due to urban spillovers into adjacent rural areas.

However, the large majority of empirical work concerned with regional disparities in Canada has used provincial level data (see Coulombe (1999) and references therein; Afxentiou and Apostolos 1998; Moazzami 1997; Lefebvre 1994; Maxwell 1994). A limited number of studies have used small geographic area data such as Census Division data, mainly from the Census of Population (Sheamur and Polése 2001; Keddie and Joseph 1991; Joseph and Keddie 1988). Alasia (2002) has assessed territorial income disparity trends in Canada using annual time series data for small geographic units and with a national coverage. James and Krieckhaus (2008) emphasized the importance of initial income in explaining growth variation across individual units and they found that Canadian provinces do show convergence over time in terms of overall economic performance. They suggested that national economic performance and convergence effects largely determine growth in the provinces and concluded that from an economic policy perspective it is important to recognize that provincial inequality is largely a self-correcting problem.

In the case of China, the widening regional disparities and income convergence have generated a great deal of attention both within and beyond China, because it would appear that regional income disparities have increased at the same time as the country has been growing rapidly after the period of economic reform. Several hypotheses have been proposed to explain the widening disparities. Yingqi Wei (2003) and Wei et al. (2008) emphasized the effects of foreign direct investment (FDI) on regional disparities. Other studies (Wang and O'Brien 2003; Wan, Guanghua and Zhou 2004; Fleisher et al. 2008; Kanbur et al. 2001; Ajit et al. 2003; Démurger et al. 2001,2002) have attributed the widening of regional disparities to the biased regional policy of the central government or to location factors. These studies argue that the central government's investment priority favouring the eastern region was the root cause for the lagging behind of the central and western regions and, at the same time, the unfavourable geographic conditions limited the development the central and western regions. Tsui also found that physical capital is the dominant factor that affected the interprovincial differences. Also, articles indicate "club convergence" exists in China (Shen and Ma 2002), which means it is of great importance to decrease the disparity among the three regions in China. Wei (2000) points out the asymmetric distribution of fixed-capital investment among regions and industry is one of the reasons of inequality in China's development. Cai et al. (2001) studied the effect of labour and Hu and Xiong (2000) studied the role of knowledge for disparity among regions. Wei et al (2001) investigated the international trade can reduce the disparity between urban and rural regions; Wei (2000) and An (2007) also found the distribution of FDI can result in disparity. There is also a considerable literature about the effect of regional development policies (e.g. Yang 2002; Raiser and Martin 1998; Ma and Yu 2003). Local factors include the natural, historical and infrastructure condition (Yao and Zhang 2001b; Demurger et al. 2002; Demurger (2001) and Demurger et al. (2002) showed geographical location, transportation and communication facilities can explain a certain degree of inter-provincial disparity in China. Furthermore, some scholars have provided explanations based on other factors. Lin (2002, 2003) believed the strategy of "heavy industries must develop in advance" is the main reason for disparity, because it breached the regional relative advantage, while Cai (2002) et al. believed the distortion of the labour market was an important factor.

Recently, a great deal of research has been undertaken to measure regional income convergence and income inequality from different factors. Wan et al. (2008) tackled the inequality-growth relationship, Wang (2008) discussed the influencing factors of income inequality, Zhang et al. (2006) introduced the impacts of growth and inequality on rural poverty, Lin and Liu (2008) focused on China's development strategies on regional inequality, Tsui (2007) proposed forces shaping China's Interprovincial Inequality, Liang (2006) analysed the impact of financial development of regional inequality and Aroca et al. (2008) using the non-parametric methods of kernel density function and Marcov chain analysis analyzed regional convergence from spatial interactions. Fan and Wan (2008) and Lee (2008) analyzed regional inequality from the perspectives of innovation capability and education opportunity respectively. While previous literature recognizes the importance of space and geography in China's growth process, Aroca et al. (2008) used techniques which have been tailored specifically to take spatial effects into account.

For example, based on the Solow growth model, Weeks and Yao (2003) find conditional convergence in both the pre-reform (1953-1978) and reform (1978-97) periods with the convergence speed in the reform era being much faster than during the pre-reform time. Applying two methods for detecting convergence (sigma convergence and beta convergence), Jian et al. (1996), on the other hand, found that China's real income convergence developed strongly since 1978 reform, a period strongly associated with the adoption of market economy and openness to external trade. However, they noted a divergence in regional income between the coastal and non-coastal regions since 1990.

Using an augmented Solow growth model, Chen and Fleisher (1996) measured regional inequality and projected that overall regional inequality in the near term is likely to decline modestly but the coast/non-coast income difference is likely to increase somewhat. Fujita and Hu (2001) analyzed the problem by relating it to the processes of globalization and economic agglomeration in China. They argued that income disparity between the coastal area and the interior is increasing, while there was a trend towards convergence within the coastal area. Zhang et al. (2001) and Wang and Ge (2004) suggested that China's regions, especially the eastern and western regions, have converged to their own specific steady states over the past 40 years, while the differences between the east and west regions have widened.

Yao and Zhang (2001) proposed a production model to explain regional divergence based on the hypothesis that in developing countries where the technology and capital are scare, initial economic growth depends on the economic spillover from growth centres. Furthermore, they provide alternative tests to demonstrate that regional divergence can be associated with studies of different geo-economic clubs. In contrast to some previous studies, they found that regions in China did not converge in the reform period.

1.4 Conclusion

Over the period from the 1950s to the 1980s, exogenous development theories or concepts gained prominence in explaining regional development. The conflicting predictions of the two alternative theoretical frameworks (endogenous versus exogenous development approaches) have given rise to an explosion of empirical studies especially since 2000. Significant progress has been made in dynamic modeling under the neoclassical model and endogenous growth models. The new economic geography approach, which emerged in the early 1990s, has gained much attraction for its arguments on centralizing and decentralizing forces in geographic economic space, which could lead to convergence or divergence of regional incomes.

There are many empirical and theoretical studies on Canadian and China's regional disparities and regional convergence mainly based on the single indicator of GDP as well as some other indicators. While the previous literature recognizes the importance of measuring regional disparity in Canada and China independently, none has used multiple indicators in convergence analysis which has been tailored specifically to take some additional indicators and other related spatial effects into account. This would constitute a significant advance in the cross-country analysis of two countries with different income levels and status. In this study, we expect to fill this gap and to report new information derived from the application of new methods in the analysis of regional income disparities between Canada and China.

In Chapter 2 that follows, the methodology of the analysis used in this thesis is presented and discussed.

Chapter 2

Methodological Framework

This chapter outlines the methodological framework for the cross-country analysis of Canada and China. First, the traditional methods of measuring regional economies are briefly introduced. Then, economic convergence in the new classical models is explained in greater detail theoretically and methodically to construct a methodology to accomplish the objectives of this study. This includes the types of convergence, approaches and methodologies for measuring convergence and spatial analyses (within each country). Finally, the econometric methods applied in this study are presented.

2.1. Introduction

Regional disparities continue to be a major concern of regional policy and regional development throughout the world. A prominent theme in the recent macroeconomic has been that economic convergence.

Whether poor economies tend to converge towards rich ones or else diverge over time is an issue that has attracted the attention of policy-makers and academics alike for some decades. Economic convergence or divergence is a topic of considerable interest and debate, not only for validating or otherwise the two leading and competing growth models (the neoclassical and the endogenous growth approaches) but also for its policy-oriented implications. Generally speaking, the presence of convergence is considered as a valid indicator that supports the neoclassical growth model as opposed to the endogenous models that predict divergence in most cases (Castro 2004).

In recent years, the issue of regional economic convergence has increasingly drawn the interest of economists to the empirical analysis of regional and spatial data. Regional disparities exist in both developing countries and developed countries. Hence, regional policy makers are interested in whether to expect convergence or divergence of regional incomes and what are the major determinants of regional growth. The neo-classical convergence hypothesis has given rise to a considerable amount of empirical research since the early 1990s. Meanwhile quite different methodological approaches for convergence analyses have been suggested.

Until a few years ago, spatial statistical analysis[1] was a topic outside the range of interest of applied economists. In recent years, however, there has been a burgeoning of economic studies that, by developing theoretical models that involve relationships between variables observed across countries or regions have greatly stimulated interest in the measurement and statistical modeling of spatial variables. Most of these models are linked to developments in the so-called new economic geography (Krugman 1991; Fujita et al. 1999; Krugman and Venables 1995; Ottaviano and Puga 1998; Puga and Venables 1997, 1999; Durlauf and Quah 1999) and to economists' renewed interest in problems related to economic growth and the conditions under which per capita income levels of various regions tend to converge over time. One important aspect of such a goal concerns reduction of disparities between growth rates of per capita income levels, based on the assumption that this would, in the long run, lead to a reduction in welfare disparities. The analysis of the dispersion of regional incomes is often considered as a proxy for the inequality in personal incomes distribution and is used as an indicator in economic policy debates. As a consequence, substantial empirical research efforts have been devoted to this topic by researchers.

Part of the contrasting results that are often encountered in comparing empirical studies, however, can be explained by the variety of research methods, technical definitions and caveats applied by different studies. In particular, three questions must be kept in mind when comparing research results. First, what type of disparity exactly is being measured? This implies a clear definition of the income concept used.

[1] Complex issues arise in spatial analysis, many of which are neither clearly defined nor completely resolved, but form the basis for current research generally. The most fundamental of these issues is related to the problem of defining and selecting the spatial entities being studied. In this study, however, spatial statistical analysis is associated with the national case (provinces in a given country) only.

Second, disparity between whom? This refers in particular to the level of geographic aggregation. Third, disparity over what time horizon? The time frame may considerably alter the outcomes of any assessment (Alasia 2002). A fourth question arises in that some temporal patterns of convergence may be related to particular patterns of periodic or cyclical commodity price fluctuations.

2.2. Measuring the Regional Economy

Measurement of regional economies in large territories is a complicated and delicate matter. As it is difficult to choose "the best" index of regional disparity, the measure employed must reflect the purpose of the analysis. There are many difficulties in trying to compare the regional economic development performance between Canada and China. One is developed and less populous; the other is developing at a high speed and has a huge population. One of the difficulties is the absence of a broadly acceptable measure of economic convergence. Though individual studies of regional disparity may deal with separate development measures – such as population growth, wages, welfare and regional productivity - the use of multiple indicators appears essential, particularly if a comparative (cross-country) analysis is required. In order to measure the extent of disparities, various indices of inequality are commonly used.

2.2.1 Classical Methods

There are many approaches that have been used over a long period of time in studies of regional income inequality.

The computational problems associated with multi-group comparison of income inequality were noticed relatively early on by the American economist Max Lorenz. In 1905, Lorenz highlighted several drawbacks associated with the comparison of wealth concentration between fixed groups of individuals. In particular, he found that while an increase in the percentage of the middle class is supposed to show the diffusion of wealth, a simple comparison of percentage shares of persons in each income group may often lead to the opposite conclusion. His suggestion was to represent the actual inter-group income distribution as a line, plotting "along one axis cumulated percents of the population from poorest to richest, and along the other the percent of the total wealth held by these percents of the populations" (ibid.: 217; see also Portnov (2005)).

The Italian statistician Corrado Gini moved Lorenz's ideas a step further in 1912, suggesting a simple and easily comprehensible measure of inequality known as the Gini coefficient. This coefficient is calculated as the arithmetic average of the absolute value of differences between all pairs of incomes, divided by the average income. Subsequently, Dalton (1920) carried out the first systematic attempt to compare the performance of different inequality measures and found that the standard deviation is sensitive to transfers among the rich, while the standard deviation of logarithms is less sensitive to transfers among the rich than to transfers among the poor but still changes when a transfer among the rich takes place. Dalton's calculations showed that the 'simplest' measures, such as absolute mean deviation, absolute standard deviations and absolute mean difference, fail to indicate any change, when proportional additions to the numbers of persons in individual income groups are applied (ibid.: 355-357; see also Champernowne and Cowell (1998: 87-112)).

Kuznets (1955) introduced the famous 'inverted-U' shape relationship between inequality and income which states that the distribution of income first becomes more unequal as income increases before inequality decreases with income increases. This relationship received much attention in the development debate in the 1970s and was adopted by the World Bank in order to predict trends in inequality (Cappelen 2006).

Yitzhaki and Lerman (1991) noted another deficiency inherent to most inequality measures, i.e. their insensitivity to the position which a specific population subgroup occupies within an overall distribution. Their Gini decomposition technique takes group-specific positions into account. In particular, they suggested weighting subgroups by the average rank of their members in the distribution. This is in contrast to the weighting system used more conventionally in which between-group inequality is weighted by the rank of the average (Pyatt 1976; Silber 1989).

It is common to use a variety of statistics for the measurement of regional disparities. By far the most frequently employed summary statistics for measuring dispersion are the variance and the standard deviation. However, these two indicators are unsatisfactory descriptive measures of dispersion in that their value is related to the units of measurement. In contrast, the coefficient of variation is independent of the units of measurement; this is why it is used here as an indicator of σ-convergence. The simplest concept of economic convergence refers to the reduction of per capita income inequality across a sample of economies (countries, regions, states, provinces …). In order to measure it, a whole array of inequality indicators has been proposed, the three most popular being some summary measure of dispersion, such as the CV, the Gini index and the Theil index. In this study, descriptive analysis, the coefficient of variation (CV), the weighted coefficient of variation (WCV), the Gini coefficient (Gini) and Theil's inequality statistic (Theil) are used. The main classical methods for looking at regional inequality indicators can thus be summarized three types such as descriptive analysis, absolute difference indices and relative difference indexes as follows:

A. **Descriptive Analysis** - A fundamental and basic distinction can be drawn using regional descriptive analysis.

B. **Absolute Difference Indices** - The common measures of central tendency of a distribution are Arithemetic Mean and Standard Deviation. The mean (arithmetic mean) is the average (sum of observations / number of observations) in a distribution, sample or population. The standard deviation of the mean (SD) is the most commonly used measure of the spread of values in a distribution. SD is calculated as the square root of the variance (the average squared deviation from the mean).

$$\sigma^2 = \frac{\sum (x-\mu)^2}{n} \quad (2.1)$$

[x is a value from the population, μ is the mean of all x, n is the number of x in the population, Σ is the summation]

C. Relative Difference Index

1. Variance of logarithms, weighted (VL_W) and unweighted (VL)

The Calculation Formula for the calculation of weighted (VLW) and unweighted (VL) Variance of logarithms is given as:

$$VL_w = \sum_{i=1}^{N} \frac{Pop_i}{Pop^*} \cdot \left(\log \frac{y_i}{y^*} \right)^2 \qquad (2.2)$$

$$VL = \sum_{i=1}^{N} \frac{1}{N} \cdot \left(\log \frac{y_i}{y^*} \right)^2 \qquad (2.3)$$

Note: For the above equation *y* the average per capita income, *Y* indicates the aggregate income, *Pop* is the population, *i* is the subscript for the *i*th territorial unit, and the superscript '*' indicates national values.

2. Coefficient of Variation (comparing the variability of two data sets) (CV) (adjusted or unadjusted)

A frequently used indicator for the convergence measurement is the variation coefficient of the GDP per capita denoted by σ and calculated as follows:

$$\sigma = \sqrt{(1/n).\sum (x_i - \bar{x})^2} \Big/ \bar{x} \qquad (2.4)$$

where x_i, is the value of the variable of interest for the *i*th region, there are *n* regions, and $\bar{x}$ is the sample mean for x. This indicator is also known as σ- convergence, first used by Sala-i-Martin, along with β-convergence (Iancu 2007).

Williamson (1965) introduced CV weighted by the proportion of population, known as σ_w. If the population factor is taken into consideration, then σ can be transformed into a new weighted one, σ_w by simply employing a population weighted variance $\frac{Pop_i}{Pop^*}$ given by the expression below:

$$\sigma_w = \frac{\sqrt{\sum_{i=1}^{N} \frac{Pop_i}{Pop^*} (x_i - \bar{x})^2}}{\bar{x}} \qquad (2.5)$$

where x_i, is the value of the variable of interest for the ith region, there are n regions,

$\bar{x}$ is the sample mean for x , p_i is population of the ith region, and pop^* is the national population.

3. Gini Coefficient (an aggregate numerical indicator of inequality ranging from 0 (absolute equality) to 1 (absolute inequality).

A very popular inequality indicator is the Gini coefficient. This is derived from the Lorenz curve (see Appendix A2 and A3), a cumulative frequency curve which plots the cumulative share of population of the economies in the sample on the X-axis and the cumulative share of total income of these same economies on the Y-axis. In both cases, the economies are ranked according to their per capita income from bottom to top. The Gini index (G) corresponds to twice the area between the Lorenz curve and the *45°* line.

The classical definition of G appears in the notation of the theory of relative mean difference:

$$G = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\left|x_i - x_j\right|}{2n^2\bar{x}} \qquad (2.6)$$

where x is an observed value, n is the number of values observed and $\bar{x}$ is the mean value.

If the x values are first placed in ascending order, such that each x has rank i, some of the comparisons above can be avoided and computation is quicker:

$$G = \frac{2}{n^2\bar{x}}\sum_{i=1}^{n} i(x_i - \bar{x}) \qquad (2.7)$$

$$G = \frac{\sum_{i=1}^{n}(2i - n - 1)x_i}{n\sum_{i=1}^{n}x_i} \qquad (2.8)$$

where x is an observed value, n is the number of values observed and i is the rank of values in ascending order[2].

[2] http://www.statsdirect.com.

4. Theil Index (used to measure in group, or intra group inequality)

There are three types of Theil index of inequality – Theil, Theil1 and Theil0.The Theil indexes of inequality are calculated as below:

$$Theil = \sum x_i \log\left({x_i}/{\bar{x}} \right) \Big/ n\,\bar{x} \quad (2.9)$$

$$Theil1 = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{x_i}{\bar{x}} . \ln\left(\frac{x_i}{\bar{x}} \right) \right) \quad (2.10)$$

$$Theil0 = \frac{1}{N}\sum_{i=1}^{n}\ln\left(\frac{x_i}{\bar{x}} \right) \quad (2.11)$$

Note: where x_i, is the value of the variable of interest for the *i*th region, if there are *n* regions, $\bar{x}$ is the sample mean for x $\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i$

2.2.2 Convergence Approaches

2.2.2.1. The Neo-Classical Model of Growth and Convergence

The convergence postulate of this growth model has been extensively tested in empirical growth studies. The automatic reduction of income disparities, in other words the convergence of regional incomes, is postulated by the neo-classical model of growth. The idea of a transitional growth path to a steady state income, on which growth rates decline, is the fundamental theoretical ingredient of convergence analyses.

The concept of convergence has its roots in the neo-classical model of growth. The original model, generally referred to as the Solow model of growth, rests on the work of Robert Solow (1956) and Trevor Swan (1956).

The neo-classical model of growth postulates that an economy starting from a low level of capital and low per capita income, accumulates capital and runs through a growth process, where growth rates are initially high, then decrease, and finally approach zero when the steady state per capita income position is reached. The transition growth path of the single economy can be transposed to the situation of a set of economies, which start from different income levels. If economies have the same steady state, the same transition dynamics will apply for the whole cross-section. Therefore, the dynamics of the neo-classical growth model are the key to the convergence hypothesis.

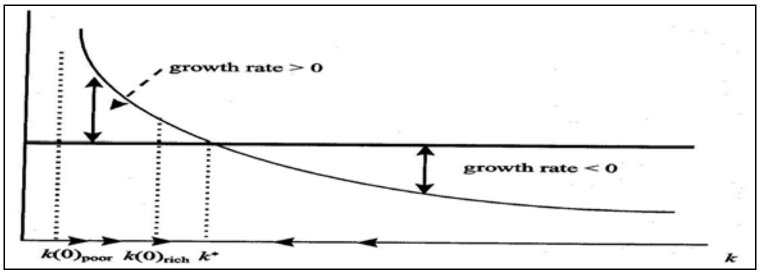
In conclusion, we can state the fundamental prediction which is made by the Solow growth model: The growth rate of per capita income declines when the economy moves from a low per capita income level, with a low capital stock per person, to a higher income and a higher capital stock, to reach its steady state income.

2.2.2.2 The Definition of Convergence

The neo-classical model of growth postulates the convergence of regional incomes. Given the dynamics of this model of growth discussed in the previous chapter for the single economy, one may expect that in a set of economies, which have the same steady state per capita income, and which differ only in their initial capital endowment per person and per capita income, initially poor economies will grow faster than rich economies to converge finally on the same per capita income. In the literature, the phenomenon that poor economies grow faster than richer ones is known as β-convergence. β-convergence is a necessary (although not sufficient) condition for the decline in income disparities or σ-convergence, as the latter is called.

This basic kind of convergence to a common income level is referred to as absolute convergence (Barro and Sala-i-Martin 1991, 1995; Sala-i-Martin 1996; de la Fuente 1995; Galor 1996). The assumption of a unique steady state will only be satisfied if all economies have the same fundamental parameters with respect to the saving rate s, population growth n, capital depreciation σ and above all the same level of technology A, i.e. if they all have the same production function. The only difference is in the endowment of capital. Only a homogenous group of economies with similar technological level and similar institutional environment, such as for example the OECD countries or the federal states of the US, fulfils the condition of similar fundamentals to assure a convergence mechanism towards the same steady state income, i.e. absolute convergence (Figure 2.1).

Figure 2.1 Dynamics in the Neo-classical Model[3]



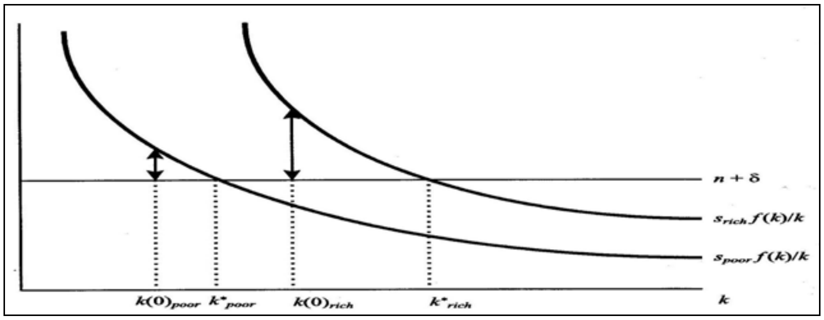
Source: Barro and Sa1a-i-Martin (1995: 23)

Otherwise, if economies differ in their fundamentals, one will find in a set of economies several subgroups which differ in their steady state income. The group will show multiple steady states. If one regards a large set of non homogenous economies, e.g. a world-wide sample of economies including both industrialized and developing countries, it is obvious that their fundamentals are not the same. Differences in a variety of factors, e.g. in the technology level, in the level of education and in government policies, imply that economies, or groups of economies have different steady states. For example, those countries with a high level of education in the labour force will have a higher steady state income than those with a low educational level. Similarly, countries with a higher saving ratio have a higher steady state than those with a low one. Also, in the case of different steady states, one may find the dynamics of the neoclassical growth model, so that economies grow faster the further they are away from their steady state position. However, they will not reach the same steady state position and it may happen that a rich economy shows a higher growth rate than a poor one, because it is further away from its particular steady state. With different

[3] Note: In this figure, K indicates capital and growth rate indicates per capita income growth rate. This figure shows the fundamental prediction which is made by the Solow growth model: the growth rate of per capita income declines when the economy moves from a low per capita income level, with a low capital stock per person (poor economy), to a higher income and a higher capital stock (rich economy) to reach its steady state income. The vertical distance between the curve and the line equals the growth rate of capital per person and the crossing point corresponds to the steady state.

steady states, the neo-classical growth model invokes the concept of conditional convergence rather than absolute convergence.

Figure 2.2 Conditional Convergence[4]



Source: Barro and Sala-i-Martin (1995: 29).

Barro and Sala-i-Martin (1995: 29) state that if a rich economy has a higher saving rate than a poor economy, then the rich economy may be proportionately further from its steady state position. In this case, the rich economy would be predicted to grow faster per capita than the poor economy: that is, absolute Beta convergence would not hold. The neoclassical model does predict that each economy converges to its own steady state and that the speed of convergence relates inversely to the distance from the steady state (Figure 2.2).

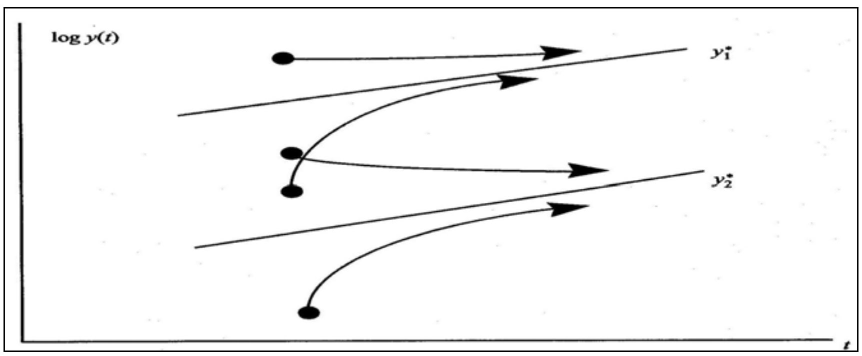
The concept of conditional convergence, which encompasses the existence of multiple steady states, can also explain the phenomenon of club convergence (Galor 1996). This refers to the situation where richer economies converge towards a high level of income, whereas poor economies converge towards a lower income level (Ben-David 1994). If the difference in steady state of the two is caused, e.g. by different endowments of human capital, poorer economies will remain inside the low-income club unless a substantial rise in their human capital leads to a rise in their

[4] Note: In this figure, $k(0)_{poor}$ and $k(0)_{rich}$ indicate the different initial stocks of capital per person of poor and rich economies, s_{poor} and s_{rich} indicate the different saving rates of poor and rich economies. The steady state values are determined by the intersection of $s_i.f(k)/k$ curves with the common line of $n+\delta$ parameters.

steady state income (Figure 2.3).

The major focus of recent work on the empirical analysis of economic growth has been the issue of convergence. Empirical studies on the convergence hypothesis have mushroomed since the mid-1980s. The concept of convergence in its most general form refers to equalizing or at least decreasing disparities and originated from the discussion that was centred on whether a steady state existed in economic dynamics. However, far from narrowing, the gap between the incomes of rich and poor countries has grown markedly and is likely to widen further (Chett 1996).

Figure 2.3 Club Convergence[5]



Source: Durlauf and Quah 1998; Tondle 2002: 43.

In practice, what people are interested in is the question of whether income disparities across economies decline over time.

The dispersion of income over time is referred to as σ-convergence. This concept was often used in the earlier empirical growth literature (Easterlin 1960; Streissler 1979; Dowrick and Nguyen 1989). It typically is measured by a measure of dispersion such as the standard deviation of income, the coefficient of variation, or the Gini coefficient.

β-convergence is a necessary, although not sufficient, condition for σ-convergence. Only if poor economies grow faster than richer ones will a reduction of income disparities take place. However, as Chatterji (1992) pointed out, a negative

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[5] Note: y^*_1 and y^*_2 indicate the steady state per capita income of two different economies.

value of β does not guarantee that the dispersion of incomes is smaller at the end of a period than at the beginning, nor does it guarantee that regions converge to a common steady state. He showed that for both to happen a value of $-2 < \beta < 0$ is required.

A similar important argument against the conclusion of a tightening income distribution from conditional β-convergence was raised by Quah (1993a) when he pointed to the analogy to Galton's fallacy: The general observation in a population that the heights of the single family's members tend to converge toward their mean does not mean that the dispersion of heights across the total population will have diminished. Similarly, conditional convergence would not necessarily indicate a reduced dispersion of incomes.

Convergence and divergence processes have been widely discussed over the last several years. Convergence refers to the process by which relatively poorer regions or countries grow faster than their rich counterparts. If in a region poorer economies are growing faster than richer ones, regional income inequality will decrease over time. In this situation, the region's economies are said to be converging toward one another. Conversely, if the poorer economies are growing more slowly than the richer ones, then income inequality will become increasingly exacerbated over time and such economies are said to be diverging from one another.

Empirical analysis on the existence of convergence is the debating point of conventional and endogenous growth theories. Conventional growth models imply that there should be a convergence of growth rates as wealthier and more capital intensive economies should grow more slowly, and poorer less capital intensive economies should grow more rapidly. However, the more recent endogenous growth literature emphasizes that the very process of growth may generate externalities or positive spillover effects that generate further growth (Gunderson 1996).

Since the rather informal contribution of Baumol (1986), and the more formal contributions of Barro and Sala-I-Martin (1991, 1992, 1995) and Mankiw et al. (1992) among others, the controversial convergence issue has been extensively debated in the macroeconomic growth and regional science literature and heavily criticized on both theoretical and methodological grounds. Alternative concepts such as club convergence (Durlauf and Johnson 1995; Quah 1993a, 1993b, 1996a, 1996b) or stochastic convergence (Bernard and Durlauf 1995, 1996; Evans and Karras 1996) have also been developed (Ertur et al, 2006).

The hypothesis of convergence of GDP per capita among countries or regions has been intensively tested in recent years. The most popular approaches for the quantitative measurement of convergence are those based on the concepts of σ- and beta-convergence (Durlauf and Quah 1999). Recent empirical studies have proposed and used a variety of additional measures for inter-group inequality. Quah discusses alternative methods, namely the intra-distribution dynamics approach (Quah 1997; Rey 2001). In relation to the convergence concepts used, econometric problems, such as heterogeneity, omitted variables, model uncertainty, outliers, endogeneity and measurement errors, are often raised and alternative techniques like panel data (Islam 1995; Caselli et al. 1996), time series (Bernard and Durlauf 1995, 1996; Carlino and Mills 1993, 1996a, 1996b; Evans and Karras 1996) and probability transition matrices (Quah 1993a, 1996a, 1996b) have been proposed (Beaumont et al. 2002).

Empirical convergence studies have attracted much attention as a research area since the seminal study of Barro and Sala-i-Martin (1991), "Convergence across states and regions". Convergence studies can be placed in three broad categories: cross-section studies for absolute or conditional convergence, panel data analyses, and time-series approach. According to the convergence methodology used, three types of approaches to convergence can be identified:

1. **The Barro regression approach**

Sigma convergence: variability of per capita income, as measured by the coefficient of variation, reduces over time.

Beta convergence: this can be absolute or conditional convergence. Baumol (1986) rejected absolute beta convergence using a set of world countries, but Barro and Sala-i-Martin (1992) accepted conditional beta convergence on a set of world countries.

The interest in regional convergence has been growing substantially in the last decade or so. The most widely-accepted method of testing the convergence hypothesis is the regression approach developed by Barro and Sala–I-Martin (1995), known as the *β*-convergence approach. This method has been discussed from different points of view (see Durlauf and Quah (1999) for a review of the literature on economic convergence; and Magrini (2004) for a survey focusing on regional convergence studies). One of the critical points is that this approach tends to concentrate on the behaviour of the representative economy. In particular, it sheds light on the transition of this economy towards its own steady state, but provides no insight on the dynamics of the whole cross-sectional distribution of regional per capita incomes. Generally speaking, in fact a negative association between the growth rates and the initial conditions can be associated with a rising, declining and stationary cross-section income dispersion. Quah criticized that a method that cannot differentiate between convergence, divergence and stationarity (steady state behaviour) is of limited or no use).

To overcome this problem, the combination of the β-convergence approach with the analysis of the evolution of the un-weighted cross-sectional standard deviation of the logarithm of per capita income has been proposed. A reduction over time of this measure of dispersion is referred to as σ-convergence. However, concentrating on the concept of σ-convergence does not represent an effective solution: analyzing the change of cross-sectional dispersion in per-capita income levels does not provide any information on the intra-distribution dynamics. Moreover, a constant standard deviation is consistent with very different dynamics ranging from criss-crossing and leap-fogging to persistent inequality. Distinguishing between these dynamics is, however, of essential importance.

Quah criticised this approach saying that parametric tests generally refer to the behaviour of a representative unit, and they are then unsuitable to catch the more real situations of polarization and club convergence. Sigma and beta convergence approaches are shown to be uninformative about convergence in some cases, and the beta convergence approach does not properly consider the dynamics of change over time.

2. Panel data approach

More recently, new testing procedures for the convergence hypothesis using panel data have been developed. These procedures bring together cross-sectional and time series analysis. Panel data estimates of the neoclassical model, which accommodated level effects for individual countries through heterogeneous intercepts, deal with some of the econometric difficulties arising in some of the earlier cross-sectional studies. Islam (1995) presented panel estimates of the neo-classical model which provide fixed effects for individual countries through heterogeneous intercepts (i.e. the 'fixed effects'). Islam (1995) found that each steady state is better proxied by employing a fixed effects panel estimator, otherwise the convergence effect would be underestimated; he found evidence to support the convergence hypothesis for a set of world countries. Ismail (2008) tested for growth and convergence in Asean countries using a dynamic panel data approach.

There are several advantages of using panel data over time series and cross section data. These include: (1) panel data usually provide a large number of observations, which increases degrees of freedom, reduces uncertainty among explanatory variables, and increases the probability of producing more reliable parameter estimates; (2) it is possible to specify and test sophisticated models that incorporate less restrictive behavioural assumptions. As there are large differences in the growth performance of states, which are due to regional factors such as differences in institutions, leadership and technological adoption, the use of panel data provides methods to examine the heterogeneity across statistical units; and (3) these data sets enable the identification and measurement of effects that are not observable in pure cross-section or time series analysis. For example, it has been argued that cross-sectional data reflect long run behaviour and time series data show short run effects, and so the combination of these two in a panel data set enable the formulation of a comprehensive dynamic structure (Hsiao 1986; Balestra 1996).

3. Time series approach

Bernard and Durlauf (1995) test the presence of common long-run trends between per capita GDP series. Hobjin and Franses (2000) propose an algorithm to detect clubs of converging countries and rejected the convergence hypothesis, while Evans and Karras (1996) performed a unit root test on panel data and confirmed the convergence hypothesis.

Mikael (2000) suggested a non-parametric time series testing to analyze the convergence of international output per capita gaps. Non-parametric tests are based on signs and ranks of time series properties of output differences. The methods are applied to logs of USA per capita income differences for 16 OECD countries from 1900-1997. Oxley and Greasley (1995) utilized time-series data on Australia, UK and USA for the period 1870-1992, and time-series tests, to consider both catching-up, and long-run convergence. Wolff et al (2001) tried to use Markov chain Monte Carlo (MCMC) methods to assess convergence using a time series and dynamic systems approach.

Francisco (2003) used time series analysis to study how the gap between a number of countries and the USA evolves through time, and found that time series analysis provides a better insight into the concept of convergence than the cross-sectional one. In general, he found European countries catching up, convergence for East and South Asian countries, and neither for Latin American countries.

2.2.2.3 Alternative Approaches

Recently, some authors have developed alternative methods to the standard convergence analysis. These are based on a Markov chain approach, and in particular on empirical transition probability matrices. Examples of this approach are the studies by Quah (1993, 1996a), Lopez-Bazo et al. (1999) and Rey (2001). These methods provide a set of measures and indicators that can describe the persistence or change in disparity conditions. A transition probability matrix is an analytical tool in a matrix format; each cell of the matrix shows the probabilities of a region making the transition from income category i to income category j over a certain period of time. When the income class boundaries that define the matrix are kept fixed, the analysis also provides insights into the evolution of the distribution of territorial units across income class boundaries over time. Territorial income convergence would be reflected by the distribution concentrating in the middle income classes, while the opposite would indicate territorial divergence. Furthermore, a number of indices that summarize the mobility in the distribution can be calculated from the transition matrix. Mobility indices, and extension of them that include measures of mixing as defined in the previous section, are presented by Rey (2001). Also, Lopez-Bazo et al. (1999) present a measure of ranking changes. These indices are referred to here for completeness of the review. Their application is not fully developed in the empirical part of the analysis, and further consideration should be given to these indicators in future research (Alasia 2002).

More recently, a new approach to the analysis of convergence has been suggested in order to overcome such problems. This method, known as the intra-distribution dynamics approach (Quah 1996), examines directly how the whole income distribution changes over time and thus appears to be more informative than the convergence empirical analysis developed within the regression paradigm.

The intra-distribution dynamics has been generally analyzed through the application of Markov chain methodologies (Quah 1996; López-Bazo et al. 1999; Fingleton 1997, 1999) or, more recently, through the estimation of conditional densities using stochastic kernel estimators (Quah 1997; Magrini 2004; Cheshire and Magrini 2005). All of the studies that make use of non-parametric stochastic kernel estimators[6] provide contour plots of the conditional density to describe the law of motion of cross-sectional distributions[7]. In this way, they treat the conditional density

[6] **Definition of Kernel Estimation:** Kernel estimation means the estimation of a regression function or probability density function. Such estimators are consistent and asymptotically normal if as the number of observations n goes to infinity, the bandwidth (window width) h goes to zero, and the product nh goes to infinity. http://economics.about.com/library/glossary/bldef-kernel-estimation.htm

[7] **Cross-sectional distribution** means a scientific method for the analysis of data distribution gathered from two or more samples at one point in time. **Cross-sectional data** or cross section (of a study population) in statistics and econometrics is a type of one-dimensional data set. Cross-sectional data refers to data collected by observing many subjects (such as individuals, firms or

function as a bivariate density function. However, it is important to note that the conditional density function is a "sequence of univariate functions" (Hyndman et al. 1996).

The above Barro regressions and the Markov transition matrix approach to the convergence hypothesis are relatively new. The Barro regression has the advantage of differentiating the effects of government policies and those of market mechanisms. By introducing explanatory variables such as the amount of public investments and dummies for regional policies into the right-hand side of the Barro regression, it is possible to distinguish the effect of market mechanisms from superficial phenomenon. However, the Markov transition matrix and classical indexes can provide basic information about regional income inequality, but they cannot differentiate between the effects of market mechanisms and those of policies.

2.3 On the Methodologies of Measuring Convergence

In the early 1990s, Barro and Sala-i-Martin initiated the branch of convergence research by proposing what has now become the classical theoretical concept of convergence analysis in two prominent papers: "Convergence across states and regions" (Barro and Sala-i-Martin 1991) and "Convergence" (Barro and Sala-i-Martin 1992). In the following, the major points of this concept are introduced based on the convergence theories of Barro and Sala-i-Martin (1995), Romer (1996) and Durlauf and Quah (1998).

2.3.1 The Central Model for Convergence Studies

Given the convergence hypothesis of neo-classical growth theory, one requires a specification for its empirical testing. The question is whether the economy reveals

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countries/regions) at the same point of time, or without regard to differences in time. Analysis of cross-sectional data usually consists of comparing the differences among the subjects.

β-convergence, i.e. whether growth rates are negatively related to the income gap, and how fast the economy converges to its steady state. This answer is given by the rate of convergence β. Equation (2.12)[8] implies that the average growth rate of per capita output *y* over a period of time of length *T* is given by:

$(1/T).\log[y_T /y_0]= x +(1- e^{-\beta t})/T \bullet \mathrm{Log}[y^*/y_0]$ (2.12)

(remember that x is the growth rate of technology and the steady state growth rate of output p.c.). Let x be constant, then Eq. (2.12) models the dynamics in the Solow model and states that in a given interval *T* and for a specific rate of convergence β, the average growth rate of income depends negatively on the ratio of y_0 to y*. Hence, the equation shows that the average growth rate must be higher the further away the economy is from the steady state.

Note that for a given β, the coefficient $(1- e^{-\beta t}) /T$ establishing the relationship declines with the length of the time period. Its construction has the effect that for a longer time interval more of future lower growth rates are combined with present higher growth rates. In contrast, if one considers a fixed time interval *T,* then the coefficient becomes larger for higher β (Barro and Sala-i-Martin 1995: 81).

2.3.2 Convergence Time

To derive the corresponding convergence time for a given convergence rate one has to consider that Eq. (2. 13) is a differential equation in log[y(t)] with the solution:

$$\log[y(t)] = (1 - e^{-\beta t}) .\log(y^*) + e^{-\beta t} \log[y(0)] \qquad (2.13)$$

where y(0) denotes per capita output at the beginning of a time period, y* is the steady state income and *y(t)* is an observation in between at time *(t).*

The time *t* where *y(t)* is halfway between y(0) and y* satisfies the condition:

$$e^{-\beta t} =1/2 \, . \qquad (2.14)$$

Taking logs and solving with respect to *t,* the half-life *H* is:

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[8] Note: For the derivation of 2.13 see Barro and Sala-i-Martin (1995: 53).

$$H = \log(2)/\beta = 0.69/\beta. \qquad (2.15)$$

For example, if β is 0.02, the half life is *35* years (Barro and Sala-i-Martin 1995: 37; Romer 1996: 23).

2.3.3 Estimating Absolute Convergence

Barro and Sala-i-Martin consider a cross section of economies *i* in period *T* with two observations of per capita output Y_{i0} and y_{iT}. The steady state income per capita of an economy is y_i*, and x_i* is the steady state growth rate of output, corresponding to the labour augmenting technological progress.

The starting point is the convergence model of Eq. (2.16):

$$(1/T).\log[y_{iT} / y_{i0}] = x + (1 - e^{-\beta t})/T \bullet \log[y_i^*/y_{i0}] + u_{i0,T} \qquad (2.16)$$

In practice, estimation is effected with a reduced form (Barro and Sala-i-Martin 1995: 387):

$$(1/T).\log[y_{iT} / y_{i0}] = \alpha - [(1 - e^{-\beta t})/T] \bullet \log[y_{i0}] + u_{i0,T} \qquad (2.17a)$$

In this specification, one does not find the steady state y* or the steady state growth rate x. Both are contained in the intercept *a:*

$$a = x + [(1 - e^{-\beta t})/T]\,[\log(y_i^*)]\,. \qquad (2.17b)$$

It is convenient to work with this reduced form as in practice neither the steady state of an economy nor its steady state growth rate are known.

This specification states absolute convergence as it considers a common intercept *a* for the set of economies that represents the steady state according to Eq. (2.17b). We consider the case in which all economies converge to the same steady state income position.

An empirical test for absolute convergence is provided by the growth process of US states. Barro and Sala-i-Martin (1991, 1992) investigate income convergence among 48 US States for the period 1980-1988. The most striking result from their study is that the authors find an absolute convergence process in all sub-periods, except for the Great Depression period and the 1980s. However, the speed of convergence changes somewhat. It reaches 2% in the beginning of the century, 1%

between 1930 and 1940, soars to 4% in the post-war time, and stays at 2% during the 3 decades after 1950 (Barro and Sala-i-Martin 1991: 118). Consequently the dispersion of personal income across US States dropped from 0.55 in 1880 to 0.15 in 1980.

2.3.4 Estimating Conditional Convergence

If we consider a large group of countries from around the world, then we should not expect that they have a common steady state income.

The Solow model shows that differences in the savings ratio and in technology *A* affect the steady state income position — besides differences in population growth *n* and capital depreciation σ.

One can consider that the level of technology represents a number of persistent, positive or negative factors which determine the level of the output curve and steady state values of k* and y*, for example good or bad government policies, institutional efficiency and educational level. Such differences in fundamental factors would lead to steady state differences. Such differences can be captured by various variables contained in the vector X, which can proxy for the steady state:

$(1/T).\log[y_{iT} / y_{i0}]= \alpha-[(1- e^{-\beta t})/T] \bullet \log[y_{i0}] + X_i + u_{i0,T}$. (2.18)

It is important to note that conditional convergence analysis tests for convergence to different steady states and not to a common one. Any estimation for convergence, which includes other variables, even if they are only dummy variables for each economy, investigates convergence to different steady state incomes.

Conditional convergence has a less clear effect on the development of the dispersion of incomes. Only if steady state differences show a small deviation can one expect a decline of income disparities from convergence. On the other hand, if steady state differences are large, σ-convergence may not happen.

There is widespread empirical evidence now for conditional convergence. However, absolute convergence was the most interesting finding of the original convergence studies. Employing the concept of conditional convergence, Barro (1991) initiated research in the field of global income convergence. As mentioned before, one cannot assume the appropriateness of the absolute convergence hypothesis in the case of a large set of heterogeneous countries, which will have quite important steady state differences. Therefore, the investigation should rather be for conditional convergence. Barro (1991) introduced the methodology to include structural variables, variables on human capital and socio-political features to approximate for differences in steady state income. He showed that the convergence hypothesis in the sense of conditional convergence can be verified also for a worldwide group of 98 countries. The convergence coefficient is slightly smaller and reaches 1.8% for the large set of countries in the period from 1960-1985. Growth rates and hence the catching-up of poor regions are positively determined by the availability of human capital, and negatively by political instability. On the other hand, if steady state differences are not accounted for one cannot find convergence in the large country set (β is negative in that case, Barro and Sala-i-Martin 1992: 242). The inclusion of proxy variables for steady state differences also raises the convergence rate of the OECD countries to the benchmark value of 2 % (Barro and Sala-i-Martin 1992: 242).

2.4 Spatial Analysis

In recent years the so-called new economic geography and the issue of regional economic convergence have increasingly drawn the interest of economists to the empirical analysis of regional and spatial data. In all the aforementioned notions of convergence, the spatial dimension of the data under consideration is completely neglected. Because these spatial effects are largely ignored, problems of model mis-specification in the previous convergence analysis may arise; in particular, ordinary least squares (OLS) estimates ignoring spatial effects — as in the standard β-convergence approach — will be inefficient and/or biased (Anselin 1988).

Spatial effects refer to spatial dependence (autocorrelation) and/or spatial heterogeneity - it is not an easy task to differentiate between them practically. Spatial autocorrelation implies that the observations (economies) in cross-sectional data are not independent. Following Anselin (1988: 11), it means "the existence of a functional relationship between what happens at one point in space and what happens elsewhere". Spatial dependence can originate either as a result of a true spatial interaction among the economies (substantive spatial dependence) or as a measurement error problem (nuisance spatial dependence).

Spatial heterogeneity comes from the lack of homogeneity of the economies under consideration. From the perspective of regional economics, regional convergence studies should consider the possibility of spatial dependencies and the distance to consumer markets as an influential factor for the income development of a region.

In relation to the first point, since regions are small and highly open economic systems, it is fairly self-evident that their income development would be highly linked to those of their neighbouring regions. The dependence on other regions' income decreases with distance. A regression of regional income, that neglects the distance factor, may have spatially auto-correlated residuals. Hence regional income y, is modeled in a spatially auto-correlated errors model (see Fingleton 1995: 7-9; Anselin 1988):

$$\log(y_{t+1,i}) = b_0 + b_1 \log(y_{i,t}) + e_i, \quad (2.19)$$

$$e_i = p \sum_j W_{ij} e_j + u_{i,}\ u_i = N(0,\sigma^2), \quad (2.20)$$

where W_{ij} *is* a matrix which considers the auto-correlation between a region ***i*** and all other regions j as a function of the distance d_{ij} between them. It is defined as:

$W_{ij}^* = 1/d_{ij}^2$, e.g. if $d_{ij} < 250$km, i,j=1,….n

$W_{ij}^* = 0$ if $d_{ij} > 250$km

$W_{ij} = W_{ij}^* / \sum_j W_{ij}^*$. (2.21)

Another simple 'way of taking spatial dependence into account is to normalize a region's income on the average of all surrounding regions' income, as performed by' Quah (1996).

In relation to the second important spatial factor determining regional income, the closeness to large consumer markets — as emphasized, for example, in demand-oriented models of regional growth (Kaldor 1970) and the agglomeration effect of the new economic geography models — can be captured by a term that is familiar in gravity models:

$$MP_i = \Sigma_j Y_j f(d_{ij}). \quad (2.22)$$

The potential consumer market of a region *i, MP_i,* is given by the income of other regions' Y_j, ,j=1,………N, weighted by the distance d_{ij} between both regions. Regional income then can be written:

$$\log y_{i,t+1} = b_0 + b_1 \log(y_{i,t}) + MPi + u_i \qquad (2.23)$$

While spatial dependency was found to be an important explanatory for regional income (e.g. Fingleton 1995), the closeness to important consumer markets has lost its significance in determining a region's income over the 1980s (Maurseth 1999: 39). Thus, dynamic income regions have also emerged in the periphery, and need not necessarily be close to rich regions.

The statistical device usually employed to test for the presence of spatial dependence (spatial correlation) is the Global Moran's I statistic. The spatial dependence measure for each period t is provided by a global statistic such as Moran's I statistic, which can be represented by equation 2.24.

$$I = \frac{n\sum_i^n \sum_j^n w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{(\sum_i^n \sum_j^n w_{ij})\sum_i^n (y_i - \bar{y})^2} \qquad (2.24)$$

where y_i is the variable under consideration in spatial unit i in year t; $\bar{y}$ is the average of the variable over all regions in year t; n is the number of spatial units (in this case the number of provinces in country); w_{ij} is an element on the ith row and jth column of the matrix of $n \times n$ weights. w_{ij} is a non-stochastic square matrix of which the elements represent the intensity of the interdependence between each pair of economies; in the simplest case w_{ij}=1 if the economies i and j are neighbors and 0 otherwise. Global Moran's I statistic provides only a limited set of spatial association measurements. So in order to get a better result of spatial dependency, it is necessary to carry out Local Moran's I_i Statistic. Local Moran's I is a local spatial autocorrelation statistic based on the Moran's I statistic. According to Anselin (1995), a local Moran statistic for a point i is defined as

$$I_i = \frac{x_i - \bar{x}}{S^2} \sum_{j=1}^{N} w_{ij} (x_j - \bar{x}) \qquad (2.25)$$

where

$$S^2 = \frac{\sum_{j=1, j \neq i}^{N} x_j^{2}}{N-1} - \bar{x}^{2} \qquad (2.26)$$

Another dimension of the convergence analysis is that regional economic growth may follow a spatial pattern. Spatial dependence can be handled in beta convergence in alternative ways: The first approach, through the spatial error model, assumes that the spatial dependence operates through the error process, where any random shock follows a spatial pattern, so that shocks are correlated across adjacent regional economies, such that the error term in equation (2.28) may reveal a significant degree of spatial covariance, which can be represented as follows:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + u_i \quad (2.27)$$

$$u_i = \rho W u_i + \varepsilon_i \qquad (2.28)$$

So substituting (2.28) into model (2.27) results in a spatial error regression given by (2.29) as below:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + \rho W u_i + \varepsilon \quad (2.29)$$

where ρ is the spatial error coefficient, ε_i is a white noise error component and *W* is a spatial weighting matrix. *W* may be constructed using information on physical distance between pair wise combinations of economies in the sample or may be defined such that element $w_{ij} = 1$ if *i* and *j* are physically adjacent and 0 otherwise. Here, the latter approach is preferred.

Alternatively, the spatial lag model examines the extent to which regional growth rates depend on the growth rates of adjacent regions, conditioning on the level of initial income:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + \rho W \log(y_{it}/y_{i0}) + u_i \qquad (2.30)$$

where ρ denotes the spatial autoregressive parameter.

Moreover, the spatial cross-regressive model allows any spatial spillovers to be reflected in the initial levels of income as follows:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + \tau W \log y_{i0} + u_i \qquad (2.31)$$

where τ represents the spatial spillovers.

Despite the convincing argument of spatial dependency in regional convergence analysis, there does not seem to be a way to combine it with panel data estimation techniques. Therefore one has to choose whether to consider spatial dependency more important or region-specific steady state effects as more important.

2.5 The Econometric Methods Applied in this Study

There are different concepts of convergence and each one requires its own type of measurement technique. However, the concepts of σ-convergence and β-convergence continue to be the most popular methods of measurement. The former method evaluates convergence through the time evolution of a summary measure of dispersion and the latter method through the estimate of cross-section regression.

As has been shown, there are other ways to evaluate the convergence processes that are also revealing. Among these are the Gini and Theil inequality measures. These indices permit the disaggregation of the convergence process (or divergence~ into different components.

This study employs the following econometric methods with cross-national convergence estimation and provincial convergence estimation for each country, according to the comparability and availability of statistical data and indicators.

2.5.1 Integrative Approaches

It can be seen from the above experimental studies, critiques and methods that all debates centred on convergence or divergence have focussed on the measurement of the trend in income inequality and economic growth in regional development. These convergence concepts and tests have been substantially criticized in the recent literature both on theoretical and methodological grounds and several econometric problems are often raised (such as being unrealistic in empirical cases (Arbia 2005). Still, some researchers have argued for convergence while some others disagree. In relation to the convergence concepts used, econometric problems, such as heterogeneity, omitted variables, model uncertainty, outliers[9], endogeneity[10] and measurement errors, are often raised and alternative techniques like panel data, time series and probability transition matrices proposed. Divergence and convergence will remain a 'hot' topic not only in regional economic and econometric science, but also in social and political science. Looking for evidence of income convergence among the world's nations has become a fashionable pursuit. The tendency for poorer countries to grow faster than richer ones and, hence, for their levels of income to converge — has recently again received a great deal of attention in the economics literature. Through the convergence comparisons of Canada and China, we will explore in this thesis the possibility of existing convergence or divergence using the Barro regression methods in different time series.

One notable limitation of the research described earlier in this chapter is that there has been a general tendency to focus on a single economic variable while ignoring other relevant ones. Economic performance by itself is an insufficient indicator for understanding regional development. One can argue that the analysis has to include the whole range of dimensions (from physical to social and political

[9] In statistics, an outlier is an observation that is numerically distant from the rest of the data.

[10] In econometrics the problem of endogeneity occurs when the independent variable is correlated with the error term in a regression model. This implies that the regression coefficient in an OLS regression is biased.

conditions) that determine a region's sustainable development potential.

The notion of territorial disparity has a complex connotation even when attention is focused on one indicator only, such as per capita income. It has been acknowledged that, in order to generate a better understanding of territorial trends, it is necessary to rely on a comprehensive set of indicators that capture the multiplicity and complexity of the underling spatial processes (Alasia, 2003).

Regional development is a dynamic process. Convergence (or divergence) is not static. All the factors related to the regional manifestation of the economy are in the process of changing temporally and spatially. Neither the steady-state equilibrium nor the speed of convergence is unique and constant across countries and time. So the econometric analysis of convergence (or divergence) processes across countries or regions which analyzes trends in convergence (or divergence) should be capable of showing the characteristics of these dynamic processes.

This research attempts to answer the question of whether the convergence would be better described as dynamic or as static. It will have different results when it is applied to countries of a different state (developed or developing), and a lengthy period of time (with sub-periods) is required to combine theoretical development with empirical research methods. But it should be clear that convergence methods should be adapted to the specific conditions prevailing in Canada and China in the different time periods. For Canada and China given that they are large and diverse countries, integrative approaches will be used to compare cross-national and national analysis. One interesting line of research that is proposed is to extend the analysis to include convergence not only in economic indicators, but also in social, and environmental indicators including policy factors.

Initially, convergence studies started by using a single variable, GDP. Many researchers dealt with regional GDP per capita to measure convergence (e.g. Easterlin 1958; Mera 1975; Colen 1978; Richardson 1978; Fields and Schultz 1980; Israeli and Lin 1984; Fisch 1984). However, convergence does not involve only GDP per capita, and other researchers have used a number of variables such as education, migration, employment, public services and consumption (e.g. Andrews 1974; Schneider 1975;

Kuz 1978; Smith 1979; Wasserman and Chua 1980; Lipshits 1993).

Theoretically, it is relatively straightforward to compare personal income among individuals, but it is more difficult to measure disparities in, for example, per capita income between Canada and China. To deal with this, there are at least three possible measures of territorial disparity. The first considers the differences in GDP per capita among regions, *i.e.*, each region (national or provincial scale) is considered as an "individual". This implies giving the same importance to all regions. In practice, however, policy makers may be more concerned by low GDP per capita in a region with a greater population than in a region with few inhabitants.

The second possibility is, therefore, to weight regions by population. This method, however, does not take into account the "geography" of regions. In particular, since rural areas are less populated than urban areas, an index weighted by population would systematically underrate disparities between rural and urban regions.

A third option is, therefore, to weight regions by their area (ideally, only inhabitable area, i.e., excluding for example, deserts and glaciers, but this information is not available for all regions).

Based on the data of a weighted coefficient by territorial size and population, this study uses some other alternative variables for measuring income disparity including both economic and social indicators. Using only one variable cannot explain the total picture of convergence. For example, Canada which has a very high GDP per capita has had a lower level of productivity than several developing countries in some industrial sectors. China has a very high growth rate but lower GDP per capita.

Thus, in this research an integrated overall convergence method is applied to obtain a clearer picture of convergence of the two countries, and the two provinces. The general methodology proposed is now presented.

Based on Barro and Sala-i-Martin's classic model which involves analyses using each variable separately, the approach combines univariate analysis of each variable as well as multivariate statistical analysis. For purposes of presentation, the following discussion focuses on the use of GDP per capita for the two countries.

Absolute β convergence analyses use each variable separately. The simplest version of the classic model obtains a single β coefficient for the single time period under consideration.

For example, Barro and Sala-I-Martin (Sala-I-Martin 1996a) examined the growth and dispersion of personal income in several regions and countries by conducting regressions using the following equation:

$\ln(y_{i0+T}/y_{io})/T=\alpha_0+\alpha_1\ln(y_{io})+\varepsilon_i$ (2.32)

where

y_{i0} – initial GDP per capita in region *i*

T – number of years in observation period

α_0,α_1 – parameters to be estimated

ε_i- normally and independently distributed error term.

and where ln (*yi*,*t*) is the natural logarithm of economy *i*'s real GDP per capita at time *t*, *T* is a positive interval of time and $\ln(y_{i0+T}/y_{io})/T$ is economy *i*'s log annualized growth rate of real GDP between *t-T* and *t*. Here a negative value of β implies convergence, whereas a positive β implies divergence.

We consider multiple sub-periods within the overall time period, and estimate a first-stage β coefficient for each one of the *t* sub-periods for each variable which was used in this study. The β coefficient is weighted by territorial size and population of each country. This convergence methodological approach follows two different dimensions, i.e. cross-country analysis and cross-region analysis in Canada and China separately at the national scale.

For the estimation results of β-convergence at the national level the following model is used. Based on Model 1, the provincial beta convergence of each country can be calculated:

by regressing the average growth rate of per capita GDP between time t_{beg} = 1981 and time t_{end} = 2007 on initial income at time t_{beg} = 1981 where:

$$(\ln Y_{it(end)} - \ln Y_{it(beg)})/ T = \alpha + \beta \ln Y_{it(beg)} + \mu_i \quad (2.33)$$

Here, i is the index for each region where i = 1 to 10 in Canada while i = 1 to 31 in China. Time is indexed by t where t(beg) = 1981 and t(end) = 2007. The sample period is indexed by T where T = 27 years for the whole period.

lnY = natural log of real per capital income.

α = constant term and μ_i = random error term.

A statistically significant and negative β suggests absolute income convergence. Absolute convergence hypothesis is not supported by any empirical proof, though, particularly when studying the economies of different States or regional economies of different States. Conditional convergence, in turn, occurs when the relation between the growth rate of per capita output and its initial level is negative once we have controlled for factors that condition the steady state. In other words, the economies converge only when we take into account the factors that are specific to the steady state toward which they are moving. To test for conditional β-convergence, we extend equation 2.35 below by using a set of dummy variables to control for country-specific effects that differ between individual countries and affect the growth of per capita growth rate. By accounting for these unobserved differences of both countries, it can be determined whether or not country-specific effects influence the test of convergence:

$(1/T).\log[y_{iT} / y_{i0}]= \alpha-[(1- e^{-\beta t})/T] \bullet \log[y_{i0}] + X_i + u_{i0,T}$. (2.34)

Then, this traditional regression model can be changed into the following form:

$(\ln y_{it(end)} - \ln y_{it(beg)})/ T = \beta_0 + \beta_1 \ln y_{it(beg)} + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_n X_n + \mu_{it}$ (2.35)

where y_{i0} – initial GDP per capita in region i,

T – number of years in observation period,

$\beta_0, \beta_{1\ldots}\ \beta_n$ - parameters to be estimated,

εi– normally and independently distributed error term.

When the estimated coefficient β_1 is negative, poor economies tend to grow faster than rich ones. The annual rate of convergence β_1 can be obtained from the equation $\beta=-\ln(1-\beta_1)/T$, where *T* denotes the number of years between the initial and the final year of observation.

In addition, the spatial analysis method is also taken into consideration in convergence analysis. Since this was already stated in section 2.4, it is not repeated here.

Relative Difference Indexes (WCV, Gini or Theil according to data availability), convergence analysis and spatial analysis are used to compare the province of Quebec with the province of Xinjiang at the regional scale, by focusing on the metropolitan areas of Montreal and Urumqi using sectoral analysis to identify the key factors in the regional economies of those regions.

For the provinces of Quebec and Xinjiang, a similar analysis of the evolution of regional disparities is undertaken at the level of the major urban regions and metropolitan regions (statistical reporting units) and the remainder of the two provinces using the most similar statistical units for which comparable data are available (Regional Administrative units in Quebec from the ISQ, and similar units from the Statistical Bureau of Xinjiang).

At both scales of analysis (country, province and infra-provincial), additional variables are incorporated as the study progresses (including additional economic variables as well as social and environmental variables such as the Human Development Index) and/or alternative measurements into the model for a potentially more comprehensive assessment of the convergence picture. An integrated approach in which multiple key economic variables are simultaneously considered can be expected to yield an enhanced understanding of convergence.

The final component in the research methodology deals with the search for different explanations of the results of convergence-divergence at the different scales. At the level of the two countries and their provinces, this will involve confronting the results from this research with those of other researchers, identifying the different policies and regional development programs such as centralization and decentralization including growth pole oriented policy over the study period and the principal ministerial and other governmental actors involved. The analysis in this thesis on this subject here centres on an analysis of policy documents, including evaluations undertaken by the respective governments. At the level of the two provinces and their intra-provincial convergence-divergence patterns, a similar analysis is undertaken, taking into account of course that federal and central state programs are also operative in each province. This thesis presents an original analysis of the patterns of regional convergence-divergence at two different scales of analysis, and confronts the patterns observed and the researcher's explanations with the perspectives of key players and knowledgeable resource people (e.g. other researchers such as Mario Polèse, Richard Shearmur and Serge Coulombe).

The final stage of this research involves synthesizing all of the results and constructing a number of scenarios based on postulates regarding the efficacy of public intervention, on-going regional development processes, and selecting the most reasonable scenarios upon which to base proposals.

Chapter 3
Regional Policy, Disparity and Convergence

This chapter lays out the national contexts for the thesis research. The primary intention is to present their regional policies, analyze regional disparity in each country initially, and then measure the regional convergence process between Canada and China over the past five decades, to provide a critical analysis of the way in which national policy makers have dealt with regional issues.

Although the focus of this chapter is the analysis of cross-country disparities between Canada and China, three preliminary matters are identified which need to be addressed before presenting the empirical results. In the first few sections of this chapter, an overview of regional growth and regional development policies of both countries and their economic place in the world by growth level and rate of change are provided from 1950 to the present. Then, an attempt is made to answer the question whether China has succeeded in achieving convergence with Canada in relation to GDP per capita as well as in relation to other indicators. The main purpose of presenting this material is to provide a background for the interpretation of the empirical convergence analysis presented in the following chapter which focuses on the more recent periods.

3.1 Introduction

Since China's economic reform in 1978, China has witnessed rapid economic transformation and growth with an average annual GDP growth rate of 10%. This has subsequently triggered a boom in comparative studies of different countries with China. Since World War II, Canada has enjoyed solid economic growth except for a few slowdowns in its economy (Figure 3.2). The impressive growth of the manufacturing, mining, and service sectors has transformed Canada from a largely rural economy into one that is primarily industrial and urban.

Since it is a territorially large and fast developing country, China has faced pronounced problems of regional disparities across its provinces and at the intra-provincial scale. Not only is China a vast country with the largest population in the world, but it is hard to imagine a country more regionally diverse than China. Canada is a territorially large, developed country, and since its early days has been a collection of diverse provinces in terms of economy, natural resources wealth, population size and culture. Canada is a Federal country; Federal-provincial relations reflect the complex and multifaceted networks of influence which have developed between Canada's federal and provincial governments. These relationships have become a central element of Canadian government and policymaking, and a fundamental characteristic of Canadian federalism. This fact is perhaps more important than physiographic and other differences (Simeon 1985). It should not therefore come as a surprise that regional considerations have always been a core ingredient of national economic policy in both countries. For much of the last 50 years, Canada has been viewed as having one of the highest standards of living in the world due in large part to the high incomes generated by her economy, its resource base and its relationships with the US.

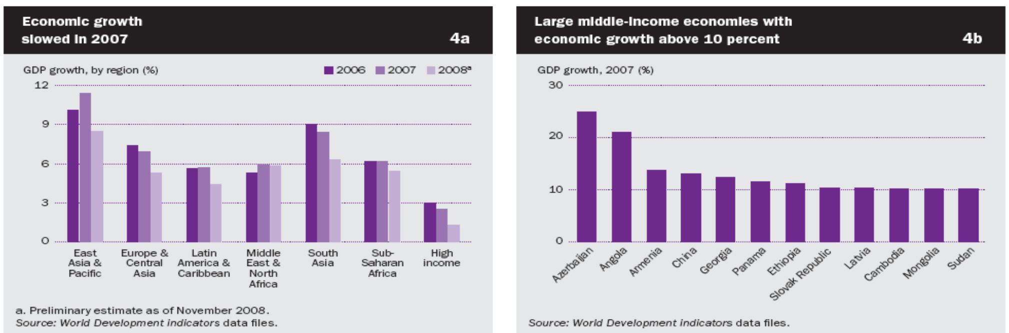
Before analyzing for the convergence of regional incomes, it is appropriate to recall the pattern of economic growth, the behaviour of regional development policy and the evolution of income disparities at the national scale for each country.

3.2 Economic Growth

In 2008, Global output rose by 3.8%, down from the 5.2% rate of 2007. Among major economies, growth was led by China (9.8%), Russia (7.4%) and India (7.3%). Worldwide, nations varied widely in their growth results, with Macau (15%), Azerbaijan (13.2%) and Angola (11.6%) registering the highest rates of growth (WDR 2008; Figure 3.1).

Growth rates slowed in all the major industrial countries (Canada 0.5%) and most developing countries, because of uncertainties in financial markets and a drop in consumer confidence. The world economy was beginning to show signs of recovery by mid-2009. Canada's GDP grew 2.5% in 2007 and edged up 0.5%in 2008. Although the IMF in July 2009 predicted the 2009 GDP would contract 2.3%, this was still the best anticipated performance of any G8 nation. The forecast was for 1.6% growth in 2010, double that of the US and better than any other G8 country except Japan.[1]

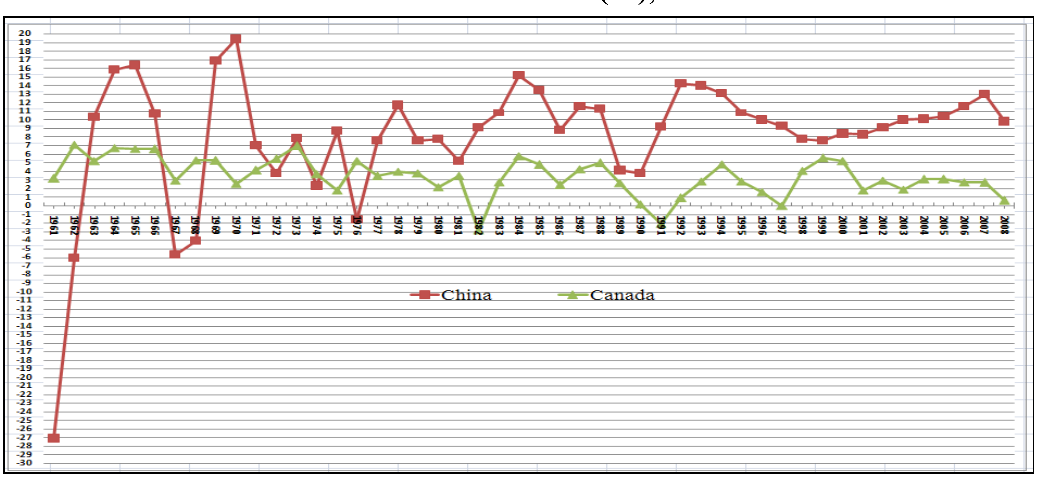
Figure 3.1 Economic Growth of the World



Source: WDR (2008)

It is estimated that China’s economy will recover quickly and return to its ‘normal’ annual speed of 8%. It is expected that the Canadian economy will recover slowly while the real GDP will fall by 2.9% in 2009 according to the Economist Intelligence Unit’s Country Forecast (Economist Intelligence Unit 2009).

Figure 3.2 Annual Average Growth Rate of GDP per Capita: Comparison between Canada and China (%), 1961 – 2008



Source: Based on the data of the World Bank Group, 2008

[1] http://www.economywatch.com/world_economy/canada/

3.2.1 Canada's Place in the World by Growth Level

From the per capita GDP growth rate in Figure 3.2, it can be seen that the Canadian economy appeared to be more steady compared to the fluctuating Chinese economy between 1961 and 2008. Even so, there have been several highs and lows in Canada's economic history. As an affluent, high-tech (relatively speaking) industrial country, Canada resembles the US in its market-oriented economic system, pattern of production and affluent living standards. Canada occupies a major northern portion of North America, sharing land borders with the contiguous US to the south and with the US state of Alaska to the northwest, stretching from the Atlantic Ocean in the east to the Pacific Ocean in the west; to the north lies the Arctic Ocean. In terms of total area (including its waters), Canada is the second largest country in the world after Russia and the largest on the continent. By total GDP (PPP- Purchasing Power Parity) it ranks 13^{th} in the world, and by per capita GDP (PPP) and by HDI, it ranked 14^{th} and 4^{th} respectively in 2007. By land area it ranks fourth, after Russia, China and the United States.

The Canadian economy is the eighth largest in the world according to the IMF. The Canadian economy is diversified and highly developed. The foundation of the Canadian economy is foreign trade and the US is by far the nation's largest trade partner. Foreign trade is responsible for about 45% of the nation's gross domestic product (GDP). Canada is one of the few developed nations that is a net exporter of energy[2]. As of 2007, its nominal GDP was $1.274 trillion, with a growth of 2.7%. It is part of the G8 and other 'rich clubs' such as the OECD. Since World War II, the impressive growth of the manufacturing, mining and service sectors has transformed the nation from a largely rural economy into one that is primarily industrial and urban. The service sector which now accounts for nearly 67.9% of GDP is very diverse and includes the retail sector, financial services, real estate, education, health, high-tech (IT or information technology), entertainment and tourism. All these sectors are developing at a rapid rate with retail and health leading growth. The service industry

[2] http://www.tradingeconomics.com/Economics/GDP-Growth.aspx?Symbol=CAD#ixzz0iO0IhsAY

employs 75% of the 17.9 million working Canadians. Although manufacturing has never been a dominant sector of the economy, it has been important and produces for instance a significant number of cars and light aircraft, mainly in central Canada[3].

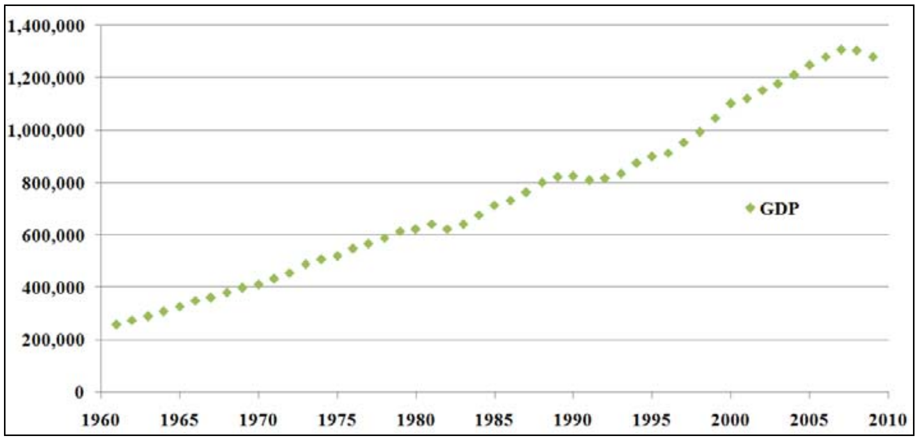
Natural resources contribute significantly to Canada's total wealth. Fuelled by rising resource prices, Canada's natural resource wealth grew, on average, 10% per year during the last decade. This growth rate would have been higher if extraction costs had not risen significantly during this period. In 2006, natural resource wealth - the dollar value of selected natural resource reserves - stood above $1 trillion or more than $30,000 per capita. In 2006, energy resources accounted for 57% of total resource wealth, followed by timber (24%) and mineral resources (19%). For much of the decade, natural resource wealth increased rapidly, with resource prices playing a substantial role in the expansion of this wealth[4]. Oil and lumber - including pulp and paper - are two major industries and exports. According to the U.S. Geological Survey (USGS)[5], Canada has the second-largest oil reserves in the world, with its large oil and gas reserves in Alberta, British Columbia and Saskatchewan and the Athabasca Tar Sands. Canadian mines are leading producers of nickel, gold, diamonds, uranium and lead. Canada is also one of the largest exporters of soft commodities including grains and wheat in particular.

The Canadian economy has enjoyed substantial development and GDP has not stopped increasing since the Second World War except for a few periods of recession and economic stagnation (Figure 3.2). The period from the end of the war in 1945 to the early 1970s ranks as one of the most prosperous in Canada's economic history. The standard of living, as measured by real per capita income, more than doubled in a single generation. The liberalization of trade opened markets for Canadian goods and services and provided lower-cost imports. The economy in the first decade of the 21st century is larger, richer and much transformed compared to that of 1945. In 2002

[3] http://www.economywatch.com/world_economy/canada/
[4] http://www.statcan.ca. EnviroStats, Winter 2007, Vol. 1, no.3, Catalogue no. 16-002-X
[5] http://www.usgs.gov/

constant prices, GDP increased from $257 billion in 1961 to $1279 billion in 2009, a factor of nearly 5 times (Figure 3.3).

Figure 3.3 Gross Domestic Product (GDP) Increase of Canada (in 2002 constant prices, $ Million)



Source: Statistics Canada. Table 380-0017 . Gross domestic product (GDP), expenditure-based, annual. Prices=2002 constant prices.

Norrie et al. (2002) provide a detailed discussion of the economic development history and regional development policy of Canada for the period from 1945 until 2000 in their book “A History of the Canadian Economy”. In it, they argued that the constancy in the relative position of the Canadian economy in the postwar period is surprising, given the type and magnitude of economic change that has taken place. The resource boom of the early 1950s, the stubborn recession that followed toward the end of 1956 and the boom of the 1960s altered the trend lines only slightly, and then only temporarily. Aggregate growth rates did, however, differ markedly among provinces. But interregional trade and capital and labour flows were sufficient to offset these differences in economic opportunity. Ontario, Alberta and British Colombia grew faster in these years, but they did not noticeably become much richer relatively speaking. Atlantic Canada grew more slowly, but managed to retain its relative living standards.

Wallace (2002) also offers a detailed account of the evolution of Canadian economy and economic forces after the Second World War in his book “A Geography of Canadian Economy". Wallace (2002: 5) stated that Canada's rapid economic development growth in the 1950s and 1960s rested on large firms of leading industries that contributed to the well-being of the wider society through a taxation system that provided the basis for expanded government investment in public health, education and other benefits (such as pensions) of the welfare state, with the added contribution of steady immigration from Europe and the growing demand of US industries for Canadian natural resources.

The Canadian economy experienced an extended boom for the period 1962 to 1973. Several factors such as the spread of prosperity of European countries to Canada, sustained development of the US, and natural resources development and export to the US, contributed to the strength and duration of this economic expansion. The most notable development in the manufacturing sector in this period undoubtedly was the Autopact[6]. The agreement brought about duty-free trade in the auto industry between Canada and the US, and boosted the Canadian auto-industry.

Norrie et al. (2002) also pointed out that foreign capital entered Canada to take advantage of the earnings opportunities available and that entry was facilitated by a relatively liberal policy. The great surge in investment came in the 1950s; by 1960, the basic patterns were set with 80% of the capital being held by Americans and 60% of Canadian manufacturing being foreign controlled, including 75% of oil and gas activity and 60% of mining. Investment continued after 1960, but it was more or less in line with the growth of the economy. Canada was growing rapidly during these years, creating both high and rising wages and employment opportunities, and was thus an attractive destination. Its political stability and generally high quality of life merely added to its attractivity. The supply of labour to the economy grew over time in separate ways - in domestic population, in immigration and increases in participation rates. The decade after 1970 was one of the most challenging in Canada's political and economic history. Many of Canada's difficulties during this period stemmed from the international economy being affected by the oil crisis of

[6] See more about Canada-US Automotive Products Agreement at http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0001245

1973. Macroeconomic performance deteriorated markedly and in ways that seemed to contradict current theory about the operation of a modern industrial economy. Growth slowed, leading some to look beyond cyclical factors to fundamental weaknesses in the economy. Policies once sought to promote growth or equity started to be seen as doing just the opposite. The federal-provincial consensus which had seemed (to some observers at least) to facilitate innovative policy formation, disintegrated into regional strife.

Norrie's et al. (2002: 415) analyzed these changes and showed that as a trading nation, Canada could not avoid dealing with the growth slowdown and stagflation that were gripping the industrial world during the 1970s. The macroeconomic record during this period illustrates the extent of the difficulties. GDP growth fell to 4.4% in 1974, from 7.7% a year earlier, and to 2.6% in 1975. It rose to 6.2% in 1976. After the economic disaster year of 1981, GDP grew at quite respectable rates for the next six years. By mid 1989, the Canadian dollar appreciated due to the tight monetary policy of Canada related to a resurgence in inflation. As a result, real GDP rose by only 2.9% in 1989 compared with 5% in 1988, then declined in both 1990 and 1991 for only the third and fourth time in the postwar period, and rose by less than 1% in 1992. The Canadian economy entered into its second recession in a decade, this one the worst at the time since the great depression. Economic growth strengthened after 1993. Real rates of growth have averaged nearly 3.0% since 1993 until quite recently.

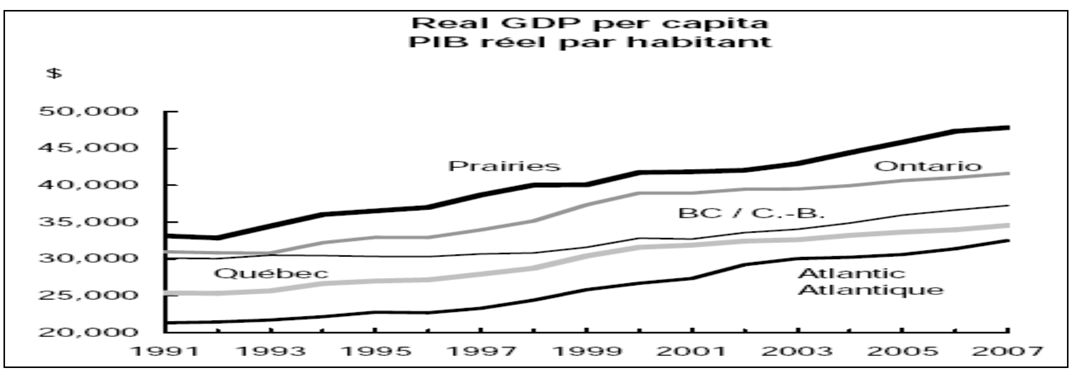
International and inter-provincial trade affects the regional incomes of a geographically large country due to the different trade links and volume of trade emanating from each region. It is one of the major factors contributing to regional disparity. Canada has long enjoyed strong economic ties with the US. The 1989 US-Canada Free Trade Agreement (FTA) and 1994 North American Free Trade Agreement (NAFTA) (which included Mexico) touched off a dramatic increase in trade and economic integration with the US.

The rise of the US as Canada's chief trading partner and source of foreign investment since WWII has benefited some regions more than others. Southern

Ontario has benefitted not only from its access to the Great Lakes but also because of its proximity to the major industrial zones of the American Midwest. The integration of Canada into the North American economy has contributed to the isolation of Atlantic Canada, whose economy traditionally had strong links with the UK. In more recent years, the growth of the PACIFIC RIM economies (Japan, China, California) has benefited BC and, to some extent, Alberta (Polèse 1987).

Canada enjoys a substantial trade surplus with the US, which absorbs nearly 80% of Canadian exports each year. Canada is the US's largest foreign supplier of energy, including oil, gas, uranium and electric power. Given its great natural resources, skilled labour force, and modern capital plant, Canada has enjoyed solid economic growth, and prudent fiscal management produced consecutive balanced budgets from 1997 to 2007[7]. Real GDP grew at an annual average rate of 3.7% between 1994 and 2000, compared to 2.7% between 1983 and 1993. Much of this growth was the result of an extraordinary economic expansion in the US after 1995. The US economy slowed appreciably in the winter of 2001 and, predictably, the Canadian economy followed suit (Wallace 2002).

Figure 3.4 Real GDP per Capita from 1991-2007



Source: Canadian Economic Observer**,** Statistics Canada – Catalogue no. 11-210-X : 105 (2008).

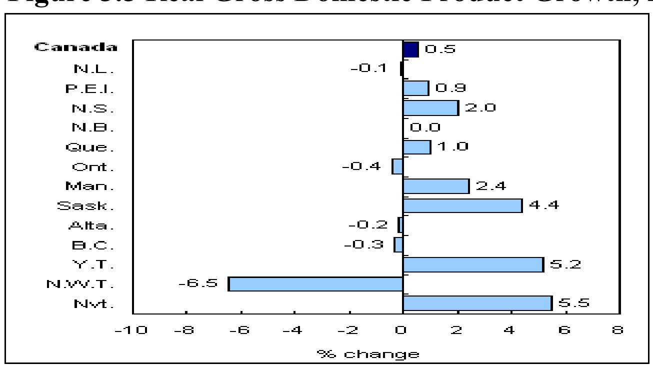
The slow growth in real GDP per capita in the 1990-1997 period reflects the sharp recession of the early 1990s. In the early 1990s, the effects of the recession were compounded by restructuring associated with the implementation of the Canada-US Free Trade Agreements. The 1997-2003 period was characterized by a

7 Https://www.cia.gov/library/publications/the-world-factbook/geos/ca.html

major turnaround in almost all key indicators of economic activity: unemployment fell, inflation remained in check and there was a surge in economic growth (Figure 3.3).

From 1991 to 2006, Canada's gross domestic product (GDP), which reflects the total value of all goods and services produced by a nation, experienced continuous growth (Figure 3.4). The services sector dominates the economy—it accounted for more than two-thirds of GDP in 2006. Services have also been the driving force of Canada's economic growth, expanding nearly 17% over the last five years—or almost twice as fast as the goods-producing sector, which grew just over 9%. The continuing resources boom has shifted economic growth from east to west. Since 2003, Alberta and British Columbia have outpaced the nation. Ontario and Quebec, the traditional manufacturing centres, have fallen short of the national average from 2003 to 2006[8] (Economic Accounts, 2007).

Figure 3.5 Real Gross Domestic Product Growth, 2008



Source: Statistic Canada. Provincial and Territorial Economic Accounts Review Catalogue no. 13-016-XIE, Vol. 5, no. 1, 2009.. http://www.statcan.gc.ca/pub/13-016-x/13-016-x2009001-eng.htm

In 2008, economic growth slowed sharply as a result of the global economic downturn, the US housing slump, plunging auto sector demand and a drop in world commodity prices. Public finances, too, deteriorated for the first time in a decade. Based on the statistics report of Provincial and Territorial Economic Accounts Review, 2009, Statistic Canada, output in most goods producing industries was down in 2008 with manufacturing and forestry strongly affected. Growth in services

[8] Statistics Canada Catalogue no. 11-402-XIE.

industries generally slowed. GDP growth in five provinces and two territories surpassed that of the national economy. These regions tended to have strong growth in their construction industry or enough personal or government expenditures to overcome a general weakness in the export market. Provincial real GDP has also been affected by the economic slowdown. Ontario, British Colombia, Alberta and Newfoundland experienced hardships and their economic growth declined. The Northwest Territories showed the worst slump of 6.5% in its real GDP growth compared to 2007 (Figure 3.5). Real gross domestic product (GDP) increased 0.5% nationally in 2008, a deceleration in growth from the 2.7% gain in 2007. The year 2008 was marked by a downturn in exports, the first decline since 2003. Trade in manufactured goods, particularly related to forestry and automotive products, was hard hit. Domestic demand grew at a slower pace than 2007, as growth of personal spending decelerated and housing construction declined. Since 2003, the services-producing sector which accounts for over two-thirds of Canada's GDP had been particularly strong. Services grew 14% from 2003 to 2007, driven mainly by wholesale trade, with 23% GDP growth, retail trade, 20%, and finance, insurance and real estate, 16%.

Canada's economy shrunk for the sixth consecutive (quarterly decline) time in January 2009 according to Canada Economic Statistics reports. It has been further confirmed by Canada Economic Statistics that manufacturing has decreased at a rate of 3.1% with a marked decline in automobile production. Construction in Canada has decreased at a rate of 3% as well. Production in construction industry has been falling. However, Canada's economy stood up to the mild economic crisis in 2009 and it is now set for a nationwide recovery in 2010 according to a new report in the RBC Economics Report[9]. The new report indicated that although the Canadian economy contracted 2.5% in 2009, we will be seeing a return to positive growth in 2010. According to the report, the Canadian economy is set to grow in 2010 with real GDP rising by 2.6% and it will continue to expand in 2011, at 3.9%.

[9] http://banknerd.ca/category/news/

As Canada's population has grown and its economy has expanded, and as the goods-producing sector has increased its efficiency and productivity, there has been a steady growth in the share of the working population employed in the service sector. But while the resource industries still account for a significant share of overall economic activity, two-thirds was from the service industries, especially community, business and personal services (which include much of the "para-public" sector, education and health care, mainly), and public administration and defence[10].

Canada has been one of the most resilient and steady economies amongst the developed nations despite several slumps since World War II. Furthermore, a number of economic problems have emerged with significant geographic implications over the years, e.g. the collapse of the cod fishery in the 1960s, the economic slowdown with the oil crisis in 1973, the economic recession in 1981-82 (GDP in Canada fell 4.9% and employment by 5%) and the 1991-92 economic slump (causing a 3.4% fall in GDP and a 3.2% decline in employment) and the mild economic recession in 2008-2009.

Canada's services sector is an economic strength of the country. However, having a larger service sector (the very sizable nature of the “non-market” goods and service component, e.g., hospitals, schools, public administration, clinics, social welfare services, community colleges and universities) and a smaller manufacturing sector is unusual for an advanced economy. Harmonizing Federal-provincial relationships and reducing the persistence of provincial disparities have been a major concern of Canada’s regional economy. Canada and the US are currently the world's largest trading partners. Access to US markets, investment and technology have benefited Canadians, but it has also created a high level of dependency on and vulnerability in relation to the US economy and its policies.

[10] http://www.thecanadianencyclopedia.com

3.2.2 China's Place in the World by Growth Level

The People's Republic of China, or China, is the largest country in East Asia and the third largest country in the world. Beijing, a major world city, is the capital. With a population of over 1.3 billion, China is the most populous country in the world. It also has the second largest economy in the world after the US with a GDP of nearly $7 trillion (2007) when measured on the purchasing power parity (PPP) basis. In November 2007, it became the third largest in the world after the US and Japan on the basis of a nominal GDP of US$3.42 trillion (2007) when measured in exchange-rate terms. China has been the fastest-growing major nation for the past quarter of a century with an average annual GDP growth rate above 10%. Nonetheless, the country's per capita income is still classified as low by world standards, at about $2,000 (nominal, 107th out of 179 countries/economies), and $7,800 (PPP, 82nd out of 179 countries/economies) in 2006, according to the IMF (International Money Fund). China is the world's fastest growing major economy and it is predicted that it could become the world's largest economy by 2025 if it can sustain the high growth rate (IMF 2008) (see Table 3.1).

During the last three decades, China's economy has changed from a centrally planned system that was largely closed to international trade to a more market-oriented economy that has a rapidly growing private sector. It has also become a major player in the global economy (Table 3.1). Reforms started in the late 1970s with the abolition of collectivized agriculture, and expanded to include the gradual liberalization of prices, fiscal decentralization, increased autonomy for state enterprises, the foundation of a diversified banking system, the development of stock markets, the rapid growth of the non-state sector, and opening up to foreign trade and investment. Annual inflows of foreign direct investment rose to nearly $84 billion in 2007. Measured on a purchasing power parity (PPP) basis which is adjusted for price differences, China in 2008 stood as the second-largest economy in the world after the US, although in per capita terms the country is still a 'lower middle-income' country. In late 2008, the global economic downturn began to slow foreign demand for

Chinese exports for the first time in many years. From Table 3.1 it can be observed that China has a high ranking position for major indicators in the world. However, if population size is taken into account, while the country is fast developing, it is still a lower middle-income country on the world scene.

Table 3.1 The Changing Ranked Position of China for Major Indicators in the World

Indicator	1978	1980	1990	2000	2004	2005	2006
Area	4	4	4	4	4	4	4
Population	1	1	1	1	1	1	1
Life Expectancy① [11]	75(169)	77(173)	83(186)	88(190)	87(213)	86(216)	
GDP (USD)	10	11	11	6	6	4	4
GNI per capita①	175(188)	177(188)	178(200)	141(207)	132(208)	128(208)	129(209)
Foreign Trade	27	25	16	8	3	3	3
Exports	28	28	14	7	3	3	3
Imports	27	22	17	9	3	3	3
FDI		60	12	9	2	3	5
Foreign Exchange Reserves(USD)	40	37	7	2	2	2	1
HDI①			79(160)	96(173)	81(177)	81(177)	

Data sources: FAO Database; UNSD Database; World Bank Database; IMF Database;UNDP Human Development Report 2007[12]. Note: The data indicates ranks. The number in the parentheses indicates the number of countries or territories the order based on.

China has experienced a sharp increase in GDP since the economic reforms in the late 1970s. The share of primary industry in its GDP decreased from 28% in 1978, at the beginning of the reform period, to 15% in 2004. This drop occurred because agricultural output grew more slowly than output of other economic sectors. At the same time, the share of tertiary industry grew from 24% to 32% as the various service sectors proliferated and expanded. Manufacturing grew slightly faster than GDP over

[11] http://www.indexmundi.com/china/life_expectancy_at_birth.html
[12] Website: http://www.stats.gov.cn/tjsj/qtsj/gjsj/2008/t20090608_402563712.htm

the period as a whole - though in recent years it has tended to grow more rapidly. The construction sub-sector of China only accounted for 5.7% in 2008, an increase from 3.8% of GDP in 1978.

It can be seen from Figure 3.1 that China's economy has experienced substantial changes during the past few decades, which includes a steady growth in the First FYP (1953-1957), a short leap (GDP up 15.6% in real terms) forward followed by a sudden economic disaster between 1958 and 1962, a rapid growth period (1963-1965), a chaotic period stemming from the Cultural Revolution movement (1966-1976) which undermined the economy (GDP actually fell during this decade), and then a fast growth and recovery period (1977-1989) during the post-reform era with a few exceptions (notably 1981 and 1989-1990). From 1983-1985, double-digit real GDP growth accompanied the first wave of foreign investment into China, and non-state enterprises started to develop. From 1989 to 1991, growth slowed after the government put the brakes on an overheating economy following an aborted effort at wholesale price reform in 1988. Growth rates subsided gradually in subsequent years. During the 1990s and 2000s, living standards and GDP continued to rise first in the coastal provinces and then subsequently in the central and western provinces.

Particularly noteworthy is that economic growth in China has been sustained at an average rate of about 10% annually since 1978, placing it among the highest of the dynamic nations during the same period. Furthermore, according to the World Bank standard, China has just moved from a 'least developed economy' status to a 'lower-middle-income economy' status based on per capita GNP. It should be noted, however, that if calculated using the PPP rates, China's economic size would be much larger than when measured by the current exchange rate. Because of its vast population, rapidly growing economy, and large research and development investments, China has been called an 'emerging superpower', with one of the world's largest economies, measured by any indicator. China is also a permanent member of the United Nations Security Council and the Asia-Pacific Economic Cooperation. Since 1978, China's market-based economic reforms have brought its poverty rate down (from 53% in 1981 to 8% by 2001). In 2008, the global economic crisis began to reduce China's growth rate. The government decided to pump Rmb 4 trillion into the economy in the form of an economic stimulus package consisting largely of investment in fixed infrastructure and human capital. The government vowed to continue reforming the economy and emphasized the need to increase domestic consumption in order to make China less dependent on foreign exports for GDP growth in the future.

3.3 Regional Policy and Disparity

The importance governments attach to regional policy has varied considerably over time between countries. Some have argued that, comparing one country to another, regional policy is likely to be more important in countries which are large and regionally diverse than in countries which are small and relatively homogeneous regionally (Groenewold et al. 2008).

Geographically vast countries invariably face the problem of regional disparity because natural endowments, climate and physical conditions can be expected to differ significantly across their regions; as a result, economic opportunities based on such factors are not uniformly available to the population residing in different regions. Regional policies are often assessed against their effects on regional disparities. Policy makers in country after country have regularly expressed concern about the growing disparities between rich and poor regions and about the adverse affects of regional disparities for national integration. Moreover, regional disparities have long been recognized and have always been at the forefront of macroeconomic policy of both Canada and China since Second World War. There are great differences between Canada and China in income levels, economic development status and government administration systems; and these differences are bound to result in differences in the content and institutional expression of regional policy.

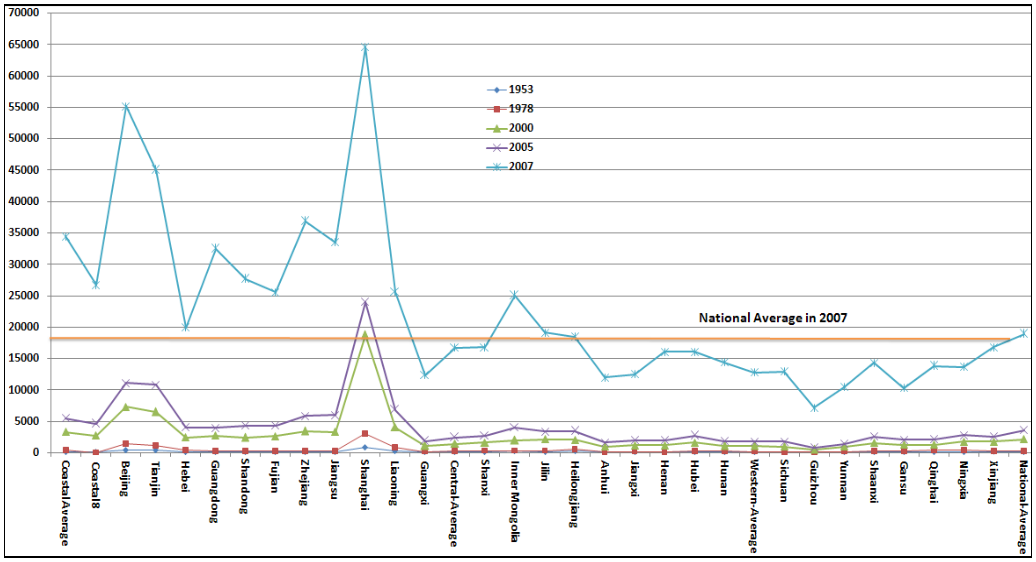
3.3.1 The Case of China

China's economic growth has averaged about 8% per annum over the past 50 years, a truly remarkable performance and one without precedent in modern economic history. This has led to a substantial reduction in poverty, but this rapid growth has also been accompanied by rising regional and intra-regional disparities.

China's vast territorial size and wide diversity of physical environments and natural resource endowments have inevitably resulted in great differences between Chinese regions. China has a population of more than 1.3 billion, with different ethnic groups. China has three kinds of provincial-level units in its territorial-administrative hierarchy: provinces, autonomous regions and municipalities directly under the central government. In short, the Chinese economy is one of the most complicated and most highly differentiated spatial systems that can be found in the world. With the rapid development of China after the implementation of the open-door policy and the growth centre strategy after the mid-1980s, clear economic disparities appeared not only between the Western, Central and Eastern Coastal provinces but also within provinces. While the facts of China's regional disparities are reasonably well known, the uneven geographic distribution of output and output growth has been the subject of much policy deliberation in China although concerns and proposed solutions have varied considerably over this period.

Natural resources (such as land, climate, biology, water, minerals, energy, and so on) represent the basic component among the factors that influence social and economic activities, especially for less-developed economies lacking capital and technology. Until recently, the natural resource-based sectors still played the most important role in the less-developed areas of China. As a geographically diverse country, China exhibits vast differences among regions in terms of natural endowments. Undisputedly, the coastal area (the eastern part of the country) enjoys the advantage of climate and geographical accessibility compared to inland regions. In addition, the coastal area was able to capture significant advantages when the country started to implement a more liberal trade policy. Putting this into the core-periphery framework, the coastal region can be regarded as the core area while the inland area can be considered as the periphery area.

Figure 3.6 Regional Per Capita GDP Change of China, 1953-2007



Sources: The population data used to compute per capita GDP come from: 1953 to 2005: *Comprehensive Statistical Data and Materials on 55 Years of New China* (State Statistical Bureau, 2005) and for 2005 from *China Statistical Abstract 2006* (State Statistical Bureau, 2006). GDP data come from Wu (2004) and *China Statistical Yearbook* (State Statistical Bureau, various issues). The "Coastal 8" excludes the three city-provinces of Beijing, Tianjin and Shanghai from the coastal region; 2007 data come from my own calculation.

The economy of China was weak, modern industry limited, foreign dominated and geographically concentrated in 1949. At that time, industry was in its early stages, with the estimated per capita gross national product and per capita GDP not exceeding \$250 per capita a year according to different data sources (Vladislav Leonidovich 2002).

There were large inter-provincial income disparities in 1952. The enormous disparities were to have an important influence on regional policy under Mao for the next two decades. In 1980, the per capita GDP of Shanghai, the richest region in China, was 11.6 times that of Guizhou, one of the poorest regions in the western part of the country, while in 1952 the difference was 7.5 times. However, by 1999, the difference had again increased to a factor of 12.5, although by 2007 the difference had declined to a factor of 9.6 times; nonetheless, these are large disparities by any standard. High income was generally associated with industrialization and was concentrated in the coastal cities of Beijing, Shanghai and Tianjin and in the north-eastern provinces of Heilongjiang, Jilin and Liaoning (Figure3.6).

In China, inequality has thus followed a U-shaped pattern, with inequality falling until the mid-1980s and rising since. Regional disparities have become a dominant issue of great concern for Chinese government policy makers since the 1990s, because it is increasingly viewed as the most disturbing factor affecting contemporary China in relation to social stability (Zhao and Tong 2000). There are two main streams of studies that have dealt with regional disparities in China. The first one has mainly focused on the measurement of regional disparities and convergence analyses (Zhang et al. 2001; Fujita and Hu 2001; Sun 2000; Dèmurger 2000). Despite the different observation periods used by these researchers, all of these studies confirm the presence of increasing disparities since the adoption of economic reform and the open door policy. Nevertheless, as Fujita and Hu (2001) argue, these studies have not sufficiently explored the reasons behind the increasing disparities. The second stream of research has focused on explanation of the increasing regional disparities in China (Yao et al. 1998, 2001; Jean et al. 1996; Tian 1999; Dèmurger 2002). Most of these studies have found that export and foreign direct investment (FDI) have a positive impact on the growth of the coastal regions, but not on the inland regions (Fu 2004). These studies assume the presence of regional disparities and focus on FDI and export performance in relation to regional disparities (Chen et al. 2004).

China adopted a growth centre strategy after the implementation of market oriented reforms and open door policies. Almost two decades into the implementation of Deng Xiaoping's 'Get Rich First' policy and 'Coastal Development Strategy', income inequality and an imbalance in regional development have emerged as two of the most disturbing factors affecting contemporary China, and have stimulated both national and global concern.

During the central planning period (1949-1978), China implemented the two key sets of guiding principles behind the Soviet development strategy: (1) the Marxist principles of common ownership with the state as trustee and of generalized egalitarianism; and (2) the Stalinist practices of central planning for resource allocation, suppression of light industries and services in favour of heavy industries, and minimization of trade and financial linkages with capitalist economies. Mao added a third guiding principle to China's economic policy-making, the principle of regional economic self-sufficiency. This third principle unquestionably had the greatest impact on regional economic outcomes. The self-reliance principle had several virtues. The first was that it overlapped with the egalitarian principle because it reduced provincial inequality, which Mao had identified as one of the key social contradictions to be eliminated in the new China. The second virtue was that the biggest beneficiaries of the self-reliance principle were the poorest provinces (because they were overwhelmingly agricultural). The pouring of investment funds into the interior provinces was a clear violation of the comparative advantage principle. Not only did the growth of the interior provinces occur at the expense of the coastal provinces, it also lowered the overall growth rate of the economy. The discrimination against the coastal region was so severe that although Shanghai provided more than 40% of the state's revenue during the Cultural Revolution period, it was not even allowed to retain enough funds to cover the depreciation of its capital stock (Dèmurger 2002). From 1972 to 1978, China reduced its discrimination against investments in the coastal provinces and increased its economic interaction with capitalist economies. This policy shift occurred because the government realized that China's economy and technological capacity was falling further behind the rest of the world (Table 3.2).

Mao's long-implemented redistributive and egalitarian policy, compounded with a series of political movements, such as the Cultural Revolution, had resulted in pushing the whole national economy towards the edge of total collapse (Zhao 1996). In particular, the extreme inefficiency and failure of Mao's enduring 'Third Front' development in China's interior provinces, which exhausted about two thirds of

China’s investment but produced little output in real terms for the period 1963-1975, made Deng Xiaoping and the new generation of Chinese leaders eager to look for a new policy dimension that could revitalize the national economy and make its ‘equally poor’ people rich (Zhao 1996; Fan 1997).

Table 3.2 Investment, GDP and Per Capita GDP by Region of China

Period	Investment (% of Total)			GDP (% of Total)			GDP Growth (%)			Per Capita GDP Growth (%)		
Mao’s	Interior	Costal		Interior	Costal		Interior	Costal		Interior	Costal	
1953-57	55.92	44.08		48.30	51.70		9.08	8.72		6.33	5.95	
1958-62	59.36	40.64		46.10	53.90		-1.74	0.07		-2.46	-1.31	
1963-65	62.51	37.49		46.91	53.09		13.74	14.03		10.70	11.39	
1966-70	70.60	29.40		45.42	54.58		7.93	7.93		2.85	5.56	
1971-75	60.54	39.46		43.40	56.60		5.20	6.81		2.61	5.01	
Post-Mao	Coast	Centre	West	Coast	Centre	West	Coast	Centre	West	Coast	Centre	West
1976-80	45.8	32.7	21.6	57.8	27.8	14.4	8.2	7.1	9.8	6.8	5.6	8.4
1981-85	50.7	31.1	18.3	57.7	27.9	14.4	11.1	10.9	10.4	9.6	9.5	9.3
1986-90	56.2	26.5	17.2	58.9	26.6	14.5	8.2	6.8	8.0	6.4	5.1	6.2
1991-95	58.7	25.4	15.9	62.1	24.4	13.5	15.3	11.5	10.2	14.2	10.3	9.0
1996-00	56.5	25.3	18.3	64.2	23.8	12.1	10.6	9.9	8.8	9.6	9.2	7.8
2001-05	52.8	26.9	20.3	65.6	23.0	11.4	12.1	11.2	10.5	11.3	11.3	10.5

Sources: Groenewold et al. Linkages between China’s Regions –Measurement and Policy

Notes: Investment data come from China’s Fixed Investment Directory 2000 (State Stataistical Bureau, 2000). GDP data are derived from Wu (2004) and the China Statistical Yerabooks (State Stataistical Bureau, various issues)

Since economic reforms were introduced in the late 1970s, China’s national development priority switched from the inland to the eastern coastal regions. Most Chinese policy makers, along with Deng Xiaoping, have been strongly influenced by two western schools of regional development theory, namely Williamson’s (1965) inverted-U hypothesis and the centre-down paradigm (Fan 1997). Deng’s open-door policy introduced both western development theory and experience to Chinese policy makers and academics. Deng and other Chinese policy makers strongly believed Williamson’s theory that inequality is a matter of development – ‘increasing regional inequality is generated during the early development stages, while matured growth produces regional convergence or a reduction in differentials' (Williamson 1965), which echoes Friedman's core-periphery model (Friedmann 1966).

Deng and other Chinese policy makers also thought that China should centralize all scarce and limited resources and develop only one sector and/or area first, assuming that the spill-over effects would follow a pattern of hierarchical diffusion and eventually extend to all other sectors/areas - the basis of the centre-down paradigm (Fan 1997). During the market-oriented reforms period (1978-1998), China started opening its doors to the outside world partially at the beginning, and implemented effective development strategies such as the decentralization of agricultural production, the decentralization of the fiscal system and the deregulation of prices; the strategy on the international front was the Open Door Policy. The practice of each provincial government's covering more of its expenditure from local revenue necessarily meant reduced development expenditure in the poorest provinces, which had been receiving fiscal subsidies from the central government. The Open Door Policy consisted of attracting foreign direct investment and promoting foreign trade in targeted areas. From this moment on, China started to adopt the economic growth pole strategy, afterwards reformulated into strategies based on economic growth centres, open special economic zones and the more node-axle model and implemented regional preferential policies.

In the 1970s and 1980s, as a vast developing country where technology and capital were scarce, China did not appear to have much choice and its initial economic growth had to depend on the development of some growth centres. By design, the Chinese government adopted a trickle-down growth strategy to develop a few regional centres, beginning with those that possessed initial advantages such as location, infrastructure, human and natural resources. According to this plan, disparity of growth would inevitably occur initially. The government under Deng hoped that by supporting the growth centres in the eastern regions first, these centres would ultimately lead the rest of the economy to expand. However, the spillover effect from growth centres in the coastal provinces to inland areas has not happened as expected.

In the early 1980s, Deng's 'special economic zone' policy became extremely effective by adopting the node–axle theory. According to this theory, the rapidly expanding economy would quickly lead to the reduction of regional disparities. The strategy specifically used the West Hai-lan New Railway Line, the Yangtze River upper stream and Nanning Guiyang Kunming as the connecting lines. Clearly, this strategy was an application of the node–axle model. This theory is closely related to the life-cycle theory of industrial production developed by Vernon (Zhao and Tong 2000). Since the 1980s, the Special Economic Zones in the eastern Chinese coastal area have played a leading role in attracting foreign investment, and in stimulating trade. These zones are examples that support leading theories of economic development: Rostow's 'leading sector', Lewis's 'satellite city', Hirschman's 'linkage effect' and Perroux's 'development poles'. The relevant common feature of these theories is that when resources are scarce, the priority development of a pilot sector or area would eventually lead to the overall development of the country. It would thereby quickly achieve the objectives of improving productivity and people's living standards. The coastal areas were thus rapidly modernized, thus creating a haven for development.

The open economic zones provided investors with various preferential tax treatments and exemptions on duties and from labour regulations.

In summary, the implementation of regional preferential policies went through the following three broad stages:

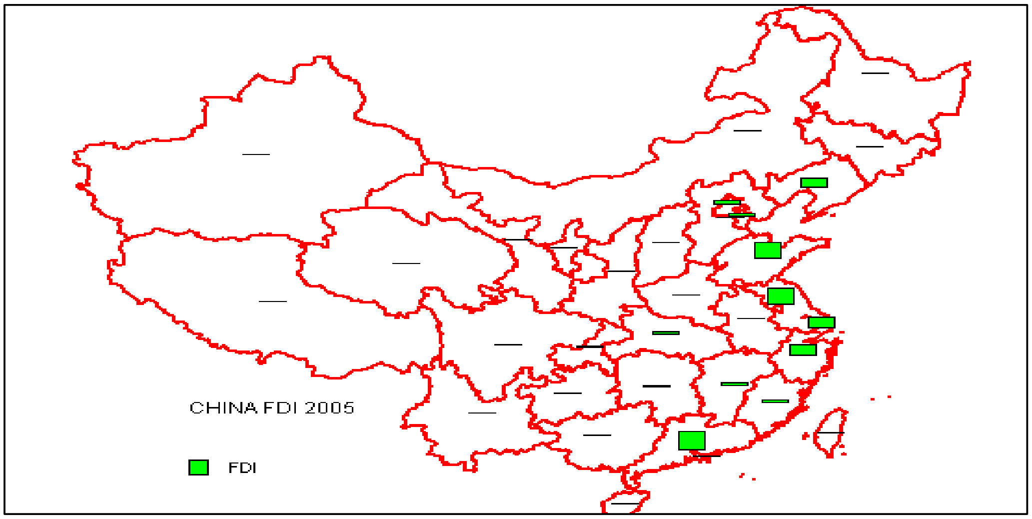
1. Early 1980s: opening to a limited extent, in Guangdong and Fujian provinces, with the establishment of special economic zones in 1979-1980.
2. Middle to end of the 1980s: coastal preference strategy enforcement, with the designation of Coastal Open Cities, which were entitled to set up their own Economic and Technological Development Zones, in 1984; this was followed by the establishment of Coastal Open Economic Zones in 1985, an Open Coastal Belt in 1988 and the Shanghai Pudong New Area in 1990.

3. Early 1990s: further extension of the Open Door Policy to all of China, after Deng Xiaoping's southern inspection trip in 1992. During that year, new open economic zones were officially started in major cities along the Yangtze River, Border Economic Cooperation Zones, Capital Cities of inland provinces and autonomous regions. The acceleration in the opening-up process in 1992 led to a boom for a large number of so-called open economic zones, set up by local officials without proper authorization. Hong Kong, Macau and Taiwan were to prove an important gate for trade and foreign investment flows to China in the succeeding period. Besides the official policy launched by the State Council, all the provinces, as well as hundreds of counties and townships, started to formulate their own preferential policies for foreign investment in specific 'development zones'. As a consequence of this 'zone fever' (i.e. a 'growth centre fever'), there were around 2,000 open economic zones of various kinds at and above the county level by 1993 (and probably even more below the county level), offering tax exemptions and reductions of all sorts in order to attract investment. Following the implementation of the austerity program in 1993, most of these unapproved zones were closed, and regional policies have tended to equalize over time (at least up to 2000).

In addition, the central government invested large amounts in infrastructure development to facilitate the expected growth in industrial production and exports. As a result, the national real GDP growth for the 1953-1976 period was 5.4% at an average annual rate of 9.5% for 1976-1990. The corresponding per capita growth was 3.2% and 7.9% respectively. Deng Xiaoping's policy had played a significant role in relation to the development of the market economy and promoting a greater openness to the outside world appeared to be a policy whose time had come.

The leading role of this selective open-door policy in regional growth has been emphasized by a large number of studies (e.g., Lee 1994; Mody and Wang 1997; Berthélemy and Démurger 2000; Chen and Feng 2000; and Démurger 2000). Most of them have found that an economic dualism has emerged which often manifests itself in spatial terms as a core-periphery contrast. However, various negative consequences of liberalization also appeared, such as more regional inequality, income disparity, a backward social welfare system and unemployment. The severity of these problems had not been anticipated by government.

Map 3.1 Provincial Foreign Direct Investment, China 2005



Data source: Calculated based on the 2005 China Yearly Statistical Book

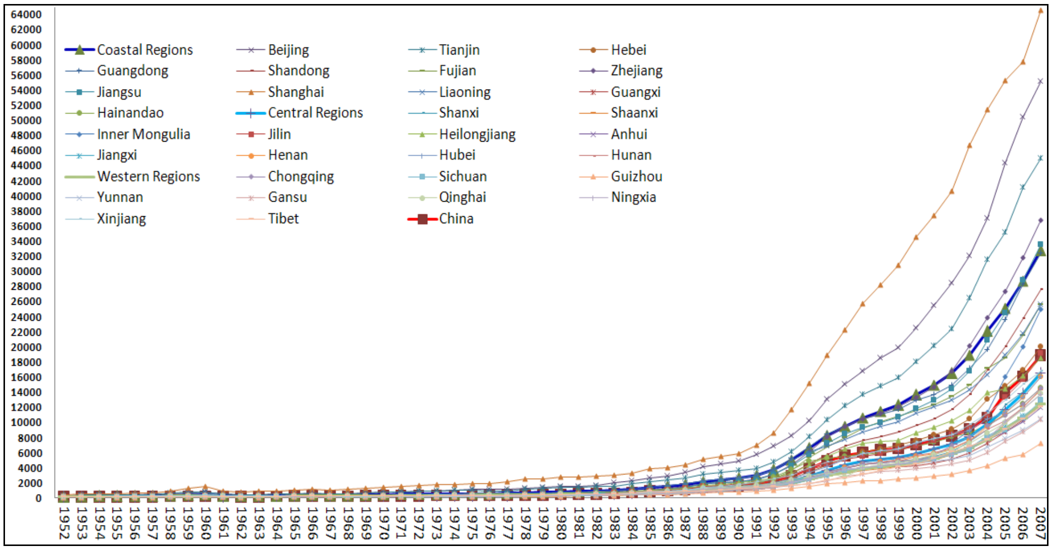
China’s early reforms were focused mainly on the development of the coastal areas, with the aim of attracting investments from abroad. Until 2000, according to the Chinese Statistical Yearbooks, 86% of FDI was invested in the coastal regions, and only 10% in central China and 4% in the western regions causing more unequal development among regions (Map 3.1). China’s current regional inequalities are to a great extent due to the growth centre policies of the government. In order to control rising regional inequality, the central government decided to make some substantial efforts to control regional disparities.

Fan (1997) shows that there was widespread criticism of the regional development theory underlying the uneven development policy and a vigorous discussion of a range of alternative theories (once it was recognized that the authorities would countenance criticism of the policy).

To counter this potentially destabilizing problem, the government initiated the China Western Development strategy (called by some the Coordinated Development

Program) that was put into practice in 1998, the Revitalize Northeast China initiative (2003), and the Rise of Central China policy (2004), all of which are aimed at helping the interior of China catch up and decrease the huge provincial disparities.

Figure 3.7 China Per Capita GDP Change 1953-2007 (at current prices: Yuan)



Source: Calculated based on the 50 years of Chinese Statistical Yearbook in 2004 and Chinese Statistical Yearbook2008.

During the 9th five year plan (1991-95), disparities in growth rates narrowed considerably from five years earlier; the growth rates of real GDP for the currency of the ninth FYP were 10.6% (coast), 9.9% (centre) and 8.8% (west), compared to 15.3%, 11.5% and 10.2% respectively for five years earlier.

Despite all these measures to spread the benefits of China's rapid expansion all around the country, there was still a strong concentration in the coastal region. Growth during the period of the tenth FYP (1996-2000) was 12.1% for the coast, 11.2% for the central provinces and 10.5% for the west. As a result, by 2005 the coastal region had achieved a record share of 65.6% of national real GDP, compared to shares of 23.0% for the central region and 11.2% for the west.

National real GDP growth for the period 1990-2005 ran at an annual average of 11.8%, with the coast region growing at an annual average of 12.7%, the central area at 10.9%, and the west at 9.9%. These regional differences are larger than those for the preceding period (1978-1990). While the difference in growth rates of one to two percentage points is modest perhaps, they are nevertheless important when they accumulate over a 15 period. Thus, the 2.2 percentage-point difference between the coast and interior meant that the coast's share of real GDP increased from 60.1% in 1991 to 65.9% in 2005.

During the eleventh FYP (2006-2010), continued concern was expressed about the level of regional disparities. According to some commentators (Li and He 2006), there was a fear at the national level that dissatisfaction with uneven development had reached a stage of potential national crisis with the disillusionment being expressed by leaders in the poorer regions and amongst ethnic minorities (who had often become marginalized during the economic development process) to such an extent that the cohesion of China was being threatened. Li and He (2006: 20) suggested in relation to the eleventh FYP that "the gap between different regions and between income groups will be further enlarged" and that much of the population will benefit only minimally from economic growth (Figure 3.7). Thus, for example, in a recent conference presentation, Li Shantong expressed the view that growing disparities during the period of the eleventh FYP "will not only reduce the consumption inclination of the Chinese as a whole but also aggravate social conflicts and jeopardize the stability in domestic economy and social environment" (Li and He 2006: 20) (Nicolaas et alé 2008). What makes things worse is that there are also huge existing intra-provincial and urban-rural disparities in China (see Chapters 4 and 5 for further development of this theme).

Furthermore, since the reform, income disparities between urban and rural China have experienced different patterns. In the early period of the economic reform which was concentrated on the agricultural sector, rural income increased very rapidly and the gap between rural and urban areas narrowed until 1985. Since then, the rural-urban gap began to increase again as a result of the diminishing marginal returns of the agricultural sector on the one hand and of urban-industrial reform on the other hand. The ratio of urban to rural per capita income fell from 2.36 in 1978 to 1.70 in

1983, but it then increased to reach 3.0 in 2007.

It is not surprising, therefore, that there was a continuing emphasis placed on the reduction of regional disparities and a commitment to bring prosperity to the whole country. Through all these government sponsored development programs, a huge amount of central state funds has been invested in infrastructure, energy, environment and resources projects in those areas. These development policies promoted rapid and continual growth in the coastal areas, but had little impact on the inland provinces. The gap between the coastal and interior areas continued to widen, which also brought many economic, social and political repercussions (Figures 3.5 and 3.6).

Changes in fiscal policy and economic reform over time are affecting the dynamics of the relationships between China's central government and the provinces. However, in spite of this great endeavour (changes in fiscal policy and economic reform), it is becoming increasingly difficult for the government to control and direct the economy, as market economy mechanisms now appear to have a far greater influence than the government. Some of the relatively prosperous provinces are able to manifest greater independence from Beijing than in the past, making it difficult for the central government to ensure that its policy objectives are put into action. The conventional regard is that the economic reforms have considerably weakened control by the central government over economic activities in the localities. Su et al. (2000) argued that those provinces that enjoyed greater representation on the central committee stood to benefit more from the allocation of state sector investment. Huang (1999) disputed the contention that economic decentralization has been accompanied by a strengthening of China's unitary political system. This has direct bearings on local economic conduct. Because of the political and institutional constraints, local officials surrender tax revenues to the central government and curb their inflationary investment demand. Wedeman (1999) noted that even though fiscal reforms may have given provincial governments independent sources of income, they remain dependent upon the centre for budgetary subsidies and that without central subsidies provincial governments would face serious budgetary shortfalls.

Not surprisingly, compared with Deng's opening up policies, the later development policies are becoming less and less effective in terms of their implementation. It could even be concluded that there is something unchangeable about regional disparities in China during the last six decades! Average growth rates and their dispersion seem more often than not follow in directions opposite to those intended by policy (Tables 3.5 and 3.6 below). It can be concluded that public policy in China has had little effect on convergence since 1980.

3.3.2 The Case of Canada

The discussion of Canada's place in the world by growth level and pace in section 3.2.1 highlights the major development in the performance of the Canadian economy since 1960. However, all the provinces and regions of the country did not benefit equally from these developments and regional disparities have been a significant issue to be tackled. The presence of economic disparities in Canada is well documented and is a widely discussed subject. Polèse (1984) argues that Canadian economic policy has been influenced by regional considerations. Since Confederation, national policies have important repercussions at the regional level, intentional and unintentional, often creating tensions between the provinces and the federal government and among provinces.

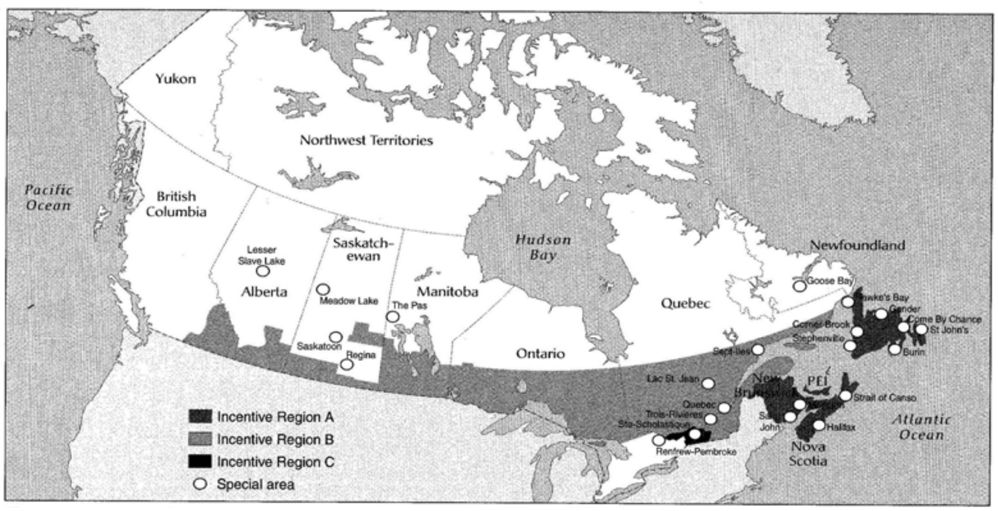
Canada has implemented development policies based on growth pole (and growth centre) theory and decentralization policy during different time periods to address the problem of regional disparity. Though there have been some successes over the years, more often than not, regional development policies have not reduced disparities in Canada.

By the late 1950s, with the persistence of regional economic inequalities, the federal government was prompted to inaugurate a system of "equalization payments" program. After the Second World War, a "system of fiscal equalization" program was adopted to equalize provincial public services through augmenting the revenues of low income provinces with equalization payments. This step marked the first important phase of federal regional policy in Canada and played an essential role in preventing provincial gaps from widening (Francis et al. 1973)[13].

In the late 1950s, Canada then began to focus attention on persistent regional disparities. Specific federal regional development programs (RDPs) targeted at low-income regions have existed since the 1960s, initially aimed at depressed rural regions but have been broadened since.

A major change in federal-provincial fiscal arrangements came into place in 1962, when tax-sharing was replaced by tax-collection agreements, instituting the system still in place today. The most visible elements of regional policy in the 1960s and 1970s sought to assist poorer areas to achieve higher rates of economic growth.

Map 3.2: DREE Designated Regions and Special Areas, 1973



Source: Department of Regional Economic Expansion, 1972.

Federal efforts to formulate development policies and to implement programs aimed at reducing regional disparities led to the creation of the Department of Regional Economic Expansion (DREE) in 1969. DREE accepted Francois Perroux's theory of growth poles (i.e. the geographic extension of the growth pole theory). Two programs were set up: a 'Special Area' program and a 'Regional Industrial Incentives' program. The 'Special Area' program sponsored and funded such projects as highways, water systems, industrial parks, sewer systems and schools in defined areas.

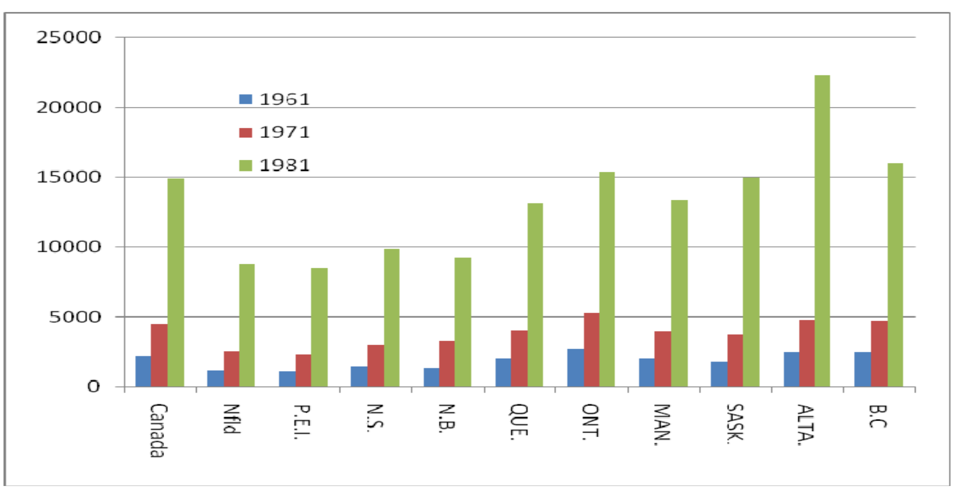
[13] The Canadian Equalization Program is embedded in the Constitution of 1982 (Milne 1994).

The Regional Industrial Incentives program provided grants to companies on the basis of the new jobs created in designated regions (Beaumier 1998).

In particular, DREE targeted overall the Atlantic Provinces and eastern Quebec. DREE was to focus its efforts on 23 areas of the country (growth 'centres') from which further development would spin off into the regions (see Map 3.2). At these growth 'centres', DREE offered assistance for improving infrastructure, for implementing social adjustment measures, and for helping private investment in a designated area.

Figure 3.8 shows GDP per capita by province relative to the Canadian average. From 1961 to 1981, two observations are obvious. First, there is a considerable difference between the average income of the richest province and that of poorest. Second, these disparities have not changed much from what they were in 1929 or, for that matter, 1870 (Norie et al. 2002). For instance, personal income per capita in Newfoundland in 1961 was 50% of the national average, while in Ontario it was 120%%, more than twice as great. Personal income per capita in Newfoundland in 1973 was 52% of the national average, while in Ontario it was 116% , more than twice as great. The disparity between provinces has converged since the late 1970s. Personal income per capita in Newfoundland in 1981 was 59% of the national average, while in Ontario it was 103%, more than 1.7 times as great.

Figure 3.8 Canada Provincial Per Capita GDP (at 1986 income base)



Source: Provincial Economic Accounts: Historical issues 1961-1986, Catalogue: 13-213S

The efforts of the new department would be focused on eastern Canada, with as much as 80% of DREE’s expenditure being spent east of Trois-Rivières. Even these expenditures were to be concentrated into selected growth poles (centres) in the belief that this would create new opportunities for economic growth in Eastern Canada's urban centres. While the establishment of DREE addressed the need for a coordinated and rationalized federal effort, it did not deal adequately with the problems of regional disparity. DREE was also criticized for discriminating in favour of certain communities and against others. After four years there was no convincing evidence that it had accomplished anything in terms of reducing regional disparities. The centralized system established under DREE was subsequently discarded in favour of one that placed more emphasis on provincial government participation. In 1972, the so-called ‘growth pole’ approach was abandoned in favour of a more flexible multi-dimensional approach involving increased cooperation between the federal and provincial governments as well as among federal departments.

Beginning in 1974, each province signed a General Development Agreement (GDA) with the federal government to establish the goals of regional development in each jurisdiction and broad guidelines as to how the programs were to be implemented. Predictably, GDAs soon became criticised and they were abandoned in 1982. Later the GDAs were replaced by Economic and Regional Development Agreements (ERDAs). ERDAs provide greater visibility to the federal government than GDA for its regional development spending.

In 1982-1983, DREE was amalgamated with the Department of Industry, Trade and Commerce to create the Department of Regional Industrial Expansion (DRIE). Economic and Regional Development Agreements were signed with each province, and the federal role in planning and administration was made more explicit. The cycle of regional development polices in those years was complete. In fifteen years, a highly centralized system (DREE) had given way to the highly decentralized one (GDAs), which had, in turn, been abandoned for something in between (Norrie et al 2002). DRIE was dismantled in 1988 and replaced by 4 regionally based agencies:

Western Economic Diversification Canada (WEDC); Atlantic Canada Opportunities Agency (ACOA); the Federal Office of Regional Development for Quebec (FORD-Q); and the Northern Ontario Program (FEDNOR). The agencies are active in promoting industry via varying financial support measures for local firms and entrepreneurs, as well as inheriting many of the programs of the old federal departments (Polèse 1999).

During the 1980s, steps were taken to facilitate a deeper integration of the Canadian and American economies. While this move, culminating in the signing of the FTA in 1988, had parallels in the other parts of the world, it marked a significant departure from the century-old Canadian policies of economic nationalism (Wallace 2002).

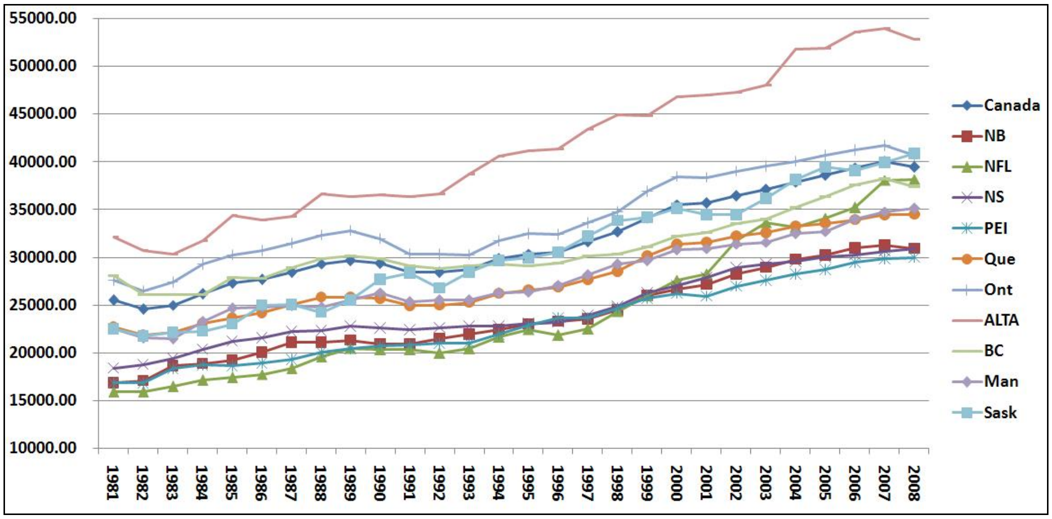
For over two decades the most important objective of regional development policy in Canada had been the reduction of regional disparities, with "regions" defined as provinces, or occasionally as groups of provinces; or more rarely, smaller regions in one province. Resource frontier development has played some role, but not a very important one. By and large, Canadians have been content to leave development of the north, or other resource frontiers if they are proven to exist, mainly to private enterprise or the "market" (Higgins and Savoie 1994).

Since the expansion of FTA to NAFTA in 1993, the Canadian economy has become more broadly integrated into the North American economy. By the early 1980s, however, the federal government had clearly become dissatisfied with the political and economic impacts of its regional policies. DREE was disbanded and residual regional commitments were integrated into the sectoral mandates of the Department of Industry.

There are still large differences between the different regions of Canada in terms of per capita production. The persistence of such large regional disparities has created major problems for the management of economic policy. To reduce these disparities and enable comparable service delivery nationwide, for a long time the federal government pools and transfers moneys through equalization payments from the 'have' provinces (those with above average economies) — namely Ontario (at least until the current year, 2009) and Alberta — to 'have-not' ones (those having below average economies). Equalization payments are made by the federal government to ensure that reasonably uniform standards of services and taxation are kept between the richer and poorer provinces (Milne 1994). In absolute terms, Quebec is a major long-standing beneficiary of equalization as are the Atlantic Provinces. In the last decade, British Columbia and Saskatchewan had both subsidized and received equalization. Newfoundland had become a 'have' province because of successful development of the oil industry. Courchene (1978, 1994) has argued that federal transfers may lessen the need for lagging regions to make necessary adjustments through wages and factor mobility to improve their economic future. It has also argued that these transfer payments inhibit the adjustment process, create dependence and thereby widen disparities (Milne 1994).

Canada has set up a vast structure for inter-regional redistribution; the principal feature of the new policy was a decentralization of administrative and policy functions away from Ottawa and towards the regions. In 1987, Ottawa established agencies to plan and promote regional economic development in the Atlantic provinces (Atlantic Canada Opportunities Agency), Northern Ontario (FedNor) and the Western provinces (Western Economic Diversification), and it did the same for Quebec (Federal Office of Regional Development-Québec) in 1991 (Colombo 1997). The ability to support these programs and policies is directly linked to the persistence of regional economic disparities. While Canada's ten provinces and three territories exhibit high GDPs, there was wide variation among them still in 2007 (Figure 3.8). Though there have been marginal successes over the years, more often Canada's regional development programs have not reduced disparities. Regional disparities in per capita incomes have long been a feature of the Canadian economy. While studies in the early 1990s of relative per capita incomes in Canada, such as Swan and Sera (1991) and Maxwell (1994), noted a narrowing of disparities since the 1970s, regional per capita income disparities are far from completely eliminated, despite decades of economic growth and an active regional development policy instituted by the federal government. The disparities have been maintained at similar levels; from a positive respective, at least greater divergence has been avoided.

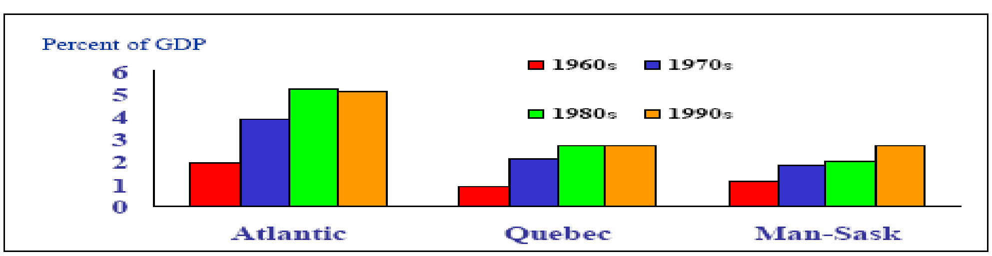
Figure 3.9 Canada Provincial GDP Per Capita, 1981-2007 (in 2002 dollars)



Sources: Calculated based on the data tables of Statistics Canada, Provincial and Territorial Economic Accounts: Data tables, catalogue number 13-018-X

In 2007, in per capita GDP by 2002 dollars P.E.I was 74.6% of the national average, while Alberta was at 136% of the national average, more than 1.8 times as great. In 1981, the per capita GDP in 2002 dollars for P.E.I was 65% of the national average while for Alberta it was 137% of the national average in 1981, more than 2 times as great. From this it can be concluded that provincial disparity of Canada converged but only weakly since 1980 (Figure 3.9).

Figure 3.10 Equalization as a Percentage of GDP



Source: Special Report- Micro-Economic Policy Analysis, Industry Canada , 2004

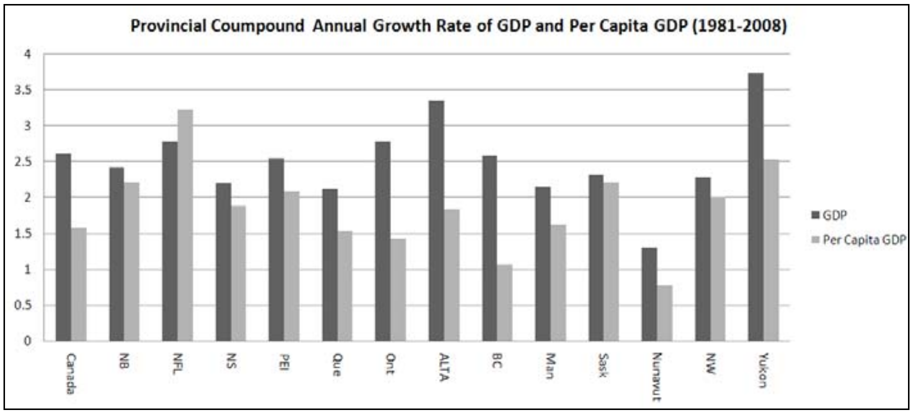
A recent study conducted by the IMF (International Monetary Fund 2008) further concluded that equalization may have reduced provincial income disparities in Canada (Figure 3.10). Equalization payments reduce fiscal disparities. Paid by the federal government, it has probably allowed poorer provinces to finance better education and narrow their human capital gap over time (Chalifoux et al. 2004).

All Canadian provinces benefited from the strong economic boom of the late 1990s. But Gross Domestic Product (GDP) per capita, the most often used indicator of standard of living, remains uneven across the country. Other measures, such as personal income and earned income are also uneven reflecting different industrial structures between provinces.

Canadian provinces also had slightly different GDP growth rates during this period from 1961 to 2007. Over the 1981-2008 period, Yukon, Ontario, Alberta and Newfoundland posted the best performance in terms of GDP growth at around 3%, while Nunavut was the only province with an average GDP growth below 1.5% for the short period 1999-2008. In terms of per capita annual growth rates, Newfoundland and Yukon had the highest annual growth rates of 3.23% and 2.53% respectively while British Colombia had the lowest annual growth rates of 1.06% for this period. In 2002, Newfoundland and Labrador's GDP surged by 15.4% due to crude oil production. This boosted its average annual GDP growth rate to 4.1% over the 1995-2002 period. But the GDP growth rate in Newfoundland and Labrador has fluctuated substantially during this period. It is clear that the eastern provinces have higher compound annual growth rates (CAGR) during this period (Figure 3.11).

Over a period of almost 5 decades, the relative GDP per capita of all the provinces has converged towards the national average except that Alberta has maintained the highest rate, Quebec has kept the same rate and Ontario and British Colombia have seen their rates decreasing. The other provinces have been increasing their relative per capita rate towards the national average. Although the difference in growth rates between periods and provinces may appear small, minor differences in growth rates can lead to very large differences in the level of real GDP per capita in the long run.

Figure 3.11 Provincial GDP: Compound Annual Growth Rate (CAGR) and Per Capita GDP, 1981-2008

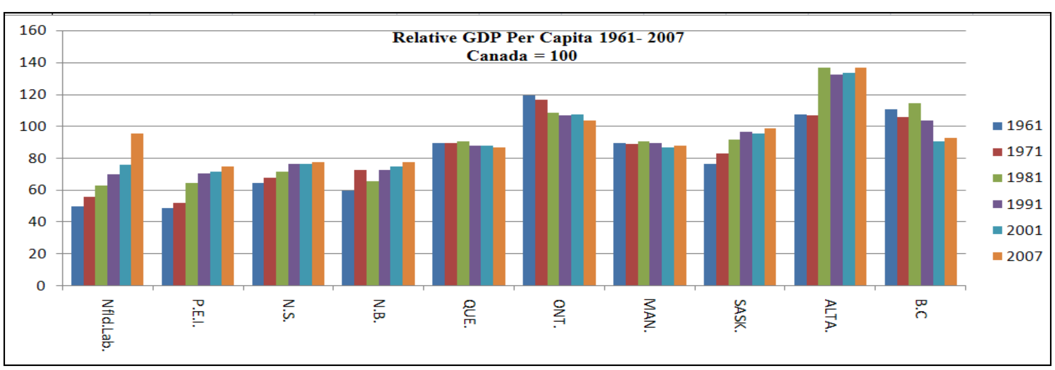


Sources: Calculated based on the data tables of Statistics Canada, Provincial and Territorial Economic Accounts: Data tables, catalogue number 13-018-X. Notes: Gross Domestic Product (2002).

Note: The Statistic Data of Nunavut is calculate based on the period 1999-2008.

Substantial changes in the relative position of provinces with regards to GDP per capita have occurred since 1990. Alberta started the 1990s above the national average current dollar GDP per capita and moved up over time to increase the gap between itself and the rest of Canada. Saskatchewan started behind the national average, but moved upward over time.

Figure 3.12 Relative per Capita GDP, 1961-2007

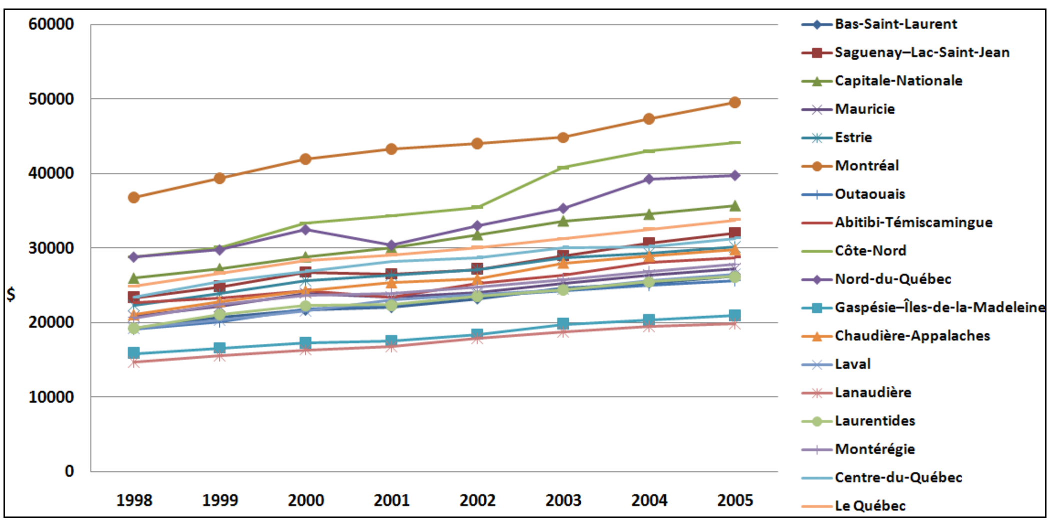


Source: Calculated based on the data tables of Statistics Canada, Provincial and Territorial Economic Accounts: Data tables, catalogue number 13-018-X, Provincial Economic Accounts: Historical issues 1961-1986, Catalogue: 13-213S

Newfoundland and Labrador started well behind the national average and moved up to substantially close the gap between itself and the national average. The other Atlantic Provinces also tended to increase their relative position, but by smaller amounts. Ontario and British Columbia saw their relative position deteriorate over the same period. Ontario was still above the national average by the end of the period, but British Columbia moved further below it (Figure 3.12).

Apart from the weak inter-provincial disparity in Canada, there is also strong intra-provincial disparity in Canada. For example, in Québec, Montreal had the highest per capita GDP of $36,800 in 1998 and $49,595 in 2005 while Lanaudière had the lowest per capita GDP of $14,715 in 1998 and $19,926 in 2005 among Quebec's Administrative Regions (Figure 3.13). More analyses of regional and provincial case will be given in the following chapters.

Figure 3.13 Per Capita GDP of Quebec's Administrative Regions, 1998-2005



Sources: Calculated Based on data from Web Site·

http://www.stat.gouv.qc.ca/publications/regions/flash_pibr.htm

3.4 Cross Country Analysis

Regional development, as noted earlier, is concerned with getting poorer regions to catch up to richer ones. As noted earlier, regions, in this sense, may be within a country or across countries, and comparisons can be made among "developed" or "developing" regions, or between both of these types.

For a number of reasons, analysts who study the evolution of the “catching up” countries pay special attention to China. First of all, the history of that country, its size and its share of the world’s population all make the sweeping economic and social transformations in the PRC a phenomenon having an immediate effect on the world economic situation and the world balance of political forces. The successes achieved by the Chinese economy over the past three decades are indisputable. The gross national product growth rate has averaged over 10% a year, with most of the fast-growing exports going to the post-industrial nations; and the country is successfully becoming an integrated part of the world information economy. China is turning into a mighty regional superpower rapidly superseding Japan as the leader of the Asia-Pacific Region.

According to the World Development Report of 2009, all regions have made progress in human development in the past 30 years, but advancing at very different paces and achieving very different levels. Differences among regions and countries are particularly marked in economic growth. Per capita income in China grew at an impressive 8% a year, and in India at an average rate of 3.2%. OECD countries had an average growth of 2% a year. Although there are reasonable data within countries on inequality for different points in time, the data are not based on uniform surveys across countries and so comparisons must be treated with care. Has the situation been improving or deteriorating? The answer is not clear.

Income levels across countries have been both diverging and converging, with some regions closing the income gap and others drifting away. Despite a reduction in the relative differences between many countries, absolute gaps in per capita income have increased. Even for East Asia and the Pacific, the fastest growing region, the absolute difference in income with high-income developed countries and income growth has varied considerably among countries in recent decades, more so than trends in many human development indicators.

When inequality decreases over time in the income level of countries or regions, it is known as a convergence process. Convergence analysis has become particularly relevant over the last few years with new tools contrasting the convergence process, such as absolute or conditioned β-convergence, being added to the older measurement tools, such as the study of income dispersion (σ-convergence). Results of the above mentioned analyses usually depend on the group of territories studied (see more on this in Chapter 2). When countries or regions of similar ranking or with similar institutions are examined, the results usually show clear convergence processes, where the territories which were poorer at the beginning of the period are those which grow more, decreasing the initial inequality. By contrast, when countries or regions with different conditions and institutions are compared, the results are not so conclusive: convergence is less obvious and at times, there is divergence. Some of the economic disparities among nations can be better explained when rich and poor countries or societies are contrasted. The evolution of the income gap between poor and rich countries is related to convergence. Convergence can be defined as "the tendency for poorer countries to grow faster than richer ones and, hence, for their levels of income to converge" (Sala-i-Martin 1995: 26). Convergence is a matter of current research and debate, but most studies have shown a lack of evidence for absolute convergence based on comparisons among countries (Cole and Newmayer 2003).

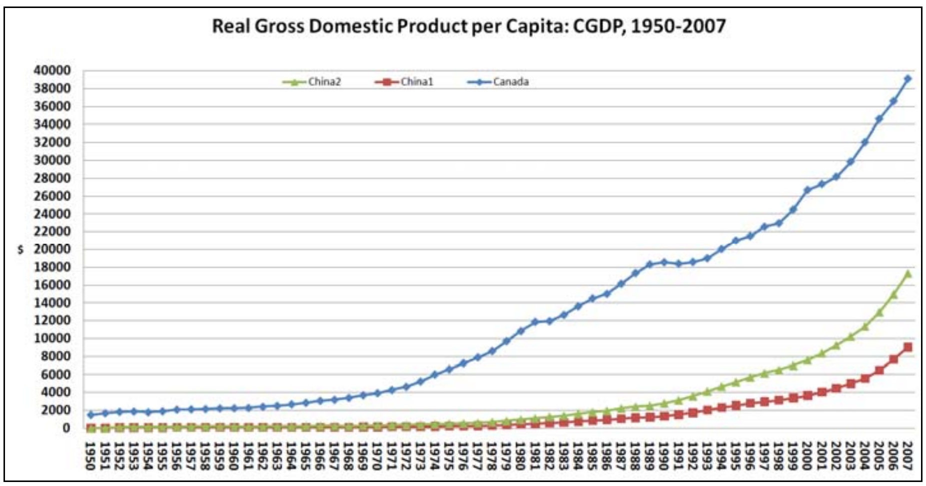
The great difference between Canada and China is the status of their economies and their population size. The difference in terms of real GDP per capita between Canada and China has widened since 1965 (Figure 3.14). China's population since the Second World War has always been equal to 40 times Canada's population. According to World Bank Data in 2007, the per capita GDP of China at current US$ was $92 in 1960 and reached $2,432 in 2007, while per capita GDP of Canada increased from $2,294US in 1960 to $43,280US in 2007.

Based on the IMF, WB and CIA[14], the per capita GDP (PPP) of China was

[14] see http://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP)_per_capita

$6546 (IMF,2009), 5962$ (World Bank, 2008), $6500 (CIA, 2009) respectively, giving it a ranking of 97, 89 and 101 respectively in the world while the per capita GDP (PPP) of Canada was $38,290 (IMF,2009), $36,444 (World Bank, 2008) and $38,400 (IMF, 2009), giving it a ranking of 12, 12 and 19 respectively in the world. Based on the Penn Data Table (PWT6.3[15]), the economic openness of China has grown quickly and converged with Canada to an extent since 1980 as a result of its opening policy and enrolment in the WTO (see Figure 3.15).

Figure 3.14 Real Gross Domestic Product per Capita for China and Canada CGDP[16]



Source: Calculated based on the data of PWT6.3. Note: For China1 and China 2, see note12.

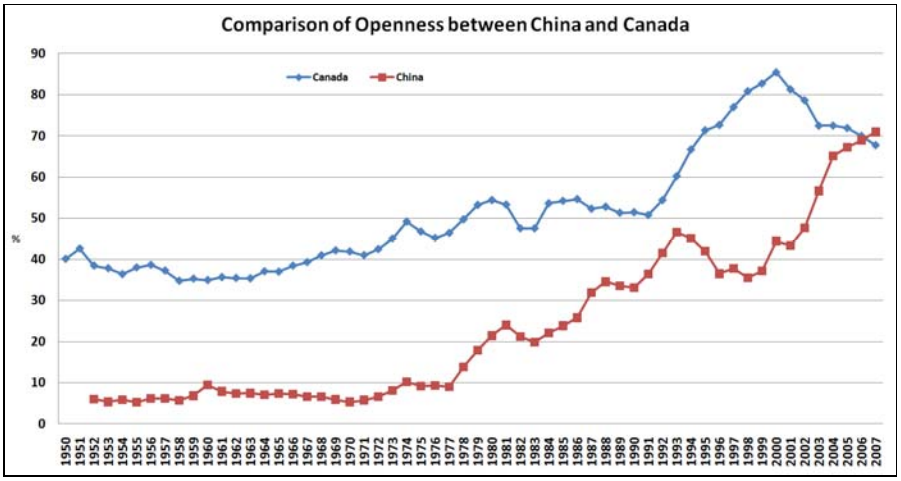
From the regional policy and disparity analyses of Canada and China above, it can be seen that both countries have similar interprovincial and intra provincial disparities and even somewhat similar regional policies. But the degree of disparity in China is always higher than that of Canada. The other discernible characteristic is that the national and provincial regional growth rates of economic indicators in China are faster than in Canada since 1980. Is there any convergence between China and

[15] http://pwt.econ.upenn.edu/php_site/pwt_index.php

[16] Note: Due to data differences between official data and the modifications of some researchers, in PWT6.3, users are offered a choice of 2 Chinas in PWT6.3: 'China Version 1' uses the official growth rates for the whole period as in PWT 6.2; in 'China Version 2', PWT 6.3 uses the recent modifications of official Chinese growth rates contained in Maddison and Wu (2007 in the Papers section of the PWT site) for the period before 1990, and apply the modification of the official rate from 1995-2000 to the official rate after 2000.

Canada in terms of per capita gross domestic product (GDP)? Are the standards of living of China catching up with those of Canada?

Figure 3.15 Comparison of Openness[17] between China and Canada



Source: Calculated based on the data Penn Data Table PWT6.3

3.4.1 Evaluation of the Opportunity of Achieving a Real Convergence of China with Canada

The successes achieved by the Chinese economy over the past five decades are indisputable. China's economic growth has averaged about 8% per annum over the past 50 years, a truly remarkable performance. The result has been a vast improvement in living standards, with per capita real gross domestic product (GDP) expanding about 21-fold over the 1953 to 2007 period. The gross national product growth rate has averaged over 10% a year, with most of the fast-growing exports going to post-industrial nations.

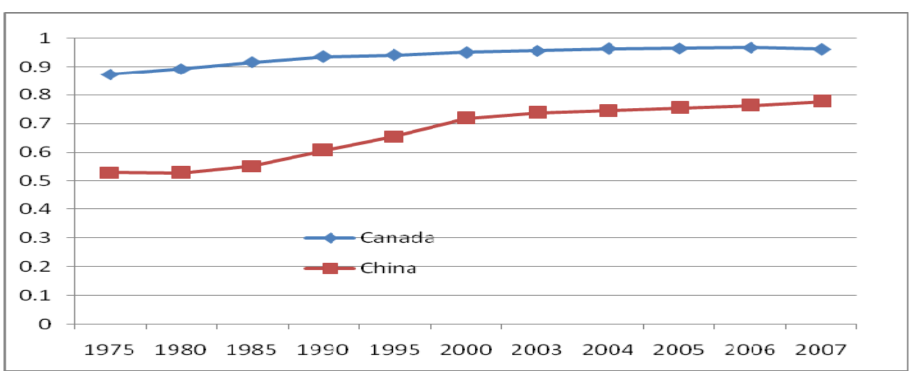
The degree to which incomes have converged across countries, over time, has been the subject of extensive research. So we raise the question of whether there has been

[17] Note: Openness: **OPENC-** Exports plus Imports divided by GDP is the total trade as a percentage of GDP. The export and import figures are in national currencies from the World Bank and United Nations data archives. Note that when the export and import figures and GDP are expressed in real values, the value of OPENC will be the same because the price level (conversion factor) for DA and exports and imports is the same.

convergence or divergence between Canada and China in economic development?

According to the Human Development Report Office for 2008, the HDI for China is 0.762, which gives the country a rank of 94th out of 179 countries, while the HDI for Canada is 0.967, giving it a rank of 3rd out of 179 countries. The HDI provides a composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), being educated (measured by adult literacy and enrolment at the primary, secondary and tertiary level) and having a decent standard of living (measured by purchasing power parity, PPP, income). To compare economic statistics across countries, the data must first be converted into a common currency. Unlike conventional exchange rates, PPP (Purchasing Power Parity) rates of exchange allow this conversion to take account of price differences between countries. GDP per capita (PPP US$) accounts for price differences between countries and therefore better reflects people's living standards. In theory, at the PPP rate, 1 PPP dollar has the same purchasing power in the domestic economy of a country as 1 US dollar has in the US economy. If we compare long-term HDI progress from 1975 to 2007, China had a 0.772% annual average growth rate for the HDI while Canada had a 0.275% average annual HDI growth rate (Figures 3.16 and 3.17).

Figure 3.16 HDI Trends of Canada and China, 1975-2007

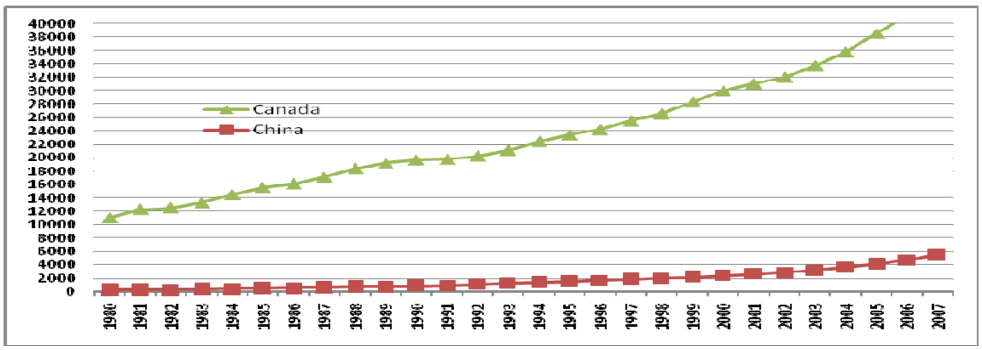


Source: Based on the World HDI annual reports 1975 to 2007.

What it does provide is a broadened perspective for viewing human progress and the complex relationship between income and well-being (HDI Report 2008). Since

1980, Canada has achieved a steady HDI with an average long-term (1980-2006) HDI rate of 0.075, while China saw its HDI increase rapidly until 2000, then slowing gradually with an average long-term (1980-2006) HDI rate of 0.233. This can also be explained by the fact that, when HDI reaches a certain level, it is very difficult to increase the value of this index significantly.

Figure 3.17 Gross National Income of per Capita (PPP) of Canada and China 1980-2007



Source: World Bank Data 2008

In order to answer the question in this section, i.e. an evaluation of the opportunity of achieving a real convergence of China with Canada, the convergence is measured by applying one of the economic convergence applications introduced by Iancu (2007). Iancu carried out a study to predict the opportunity of achieving a real convergence of Romania and the EU using the single indicator of GDP per capita.

But a single indicator GDP cannot fully explain real regional economic development. So some additional indicators such as GDP growth rate, openness, Per Capita Real GDP, HDI, and the Gini Index can be used to better explain the "catch-up" process of a fast increasing poor economy to a steady developed economy.

For such an evaluation, it is necessary to point out China's place in the world on the basis of GDP per capita. Second, we should define and evaluate China's advancing speed towards convergence with the developed country Canada, also taking into account the advancing speed of the developed countries or groups of countries (see Tables 3.3, 3.4 and 3.5).

The economies of Canada and the China are significantly different because of the differences in industrial structure and their contribution to GDP. In Canada, agriculture only accounted for 2.1% of GDP and 2% of employment while it accounted for 10.6% of GDP and 43% of employment in China in 2008. The service sector accounted for 40.2% of GDP and 32% of employment in China while the corresponding figures for Canada were 69.1% of GDP and 76% of employment in 2008. In Canada's GDP composition, agriculture accounted for 2.1%, industry 28.8% and services about 69.1% of total GDP in 2007 (Table 3.3).

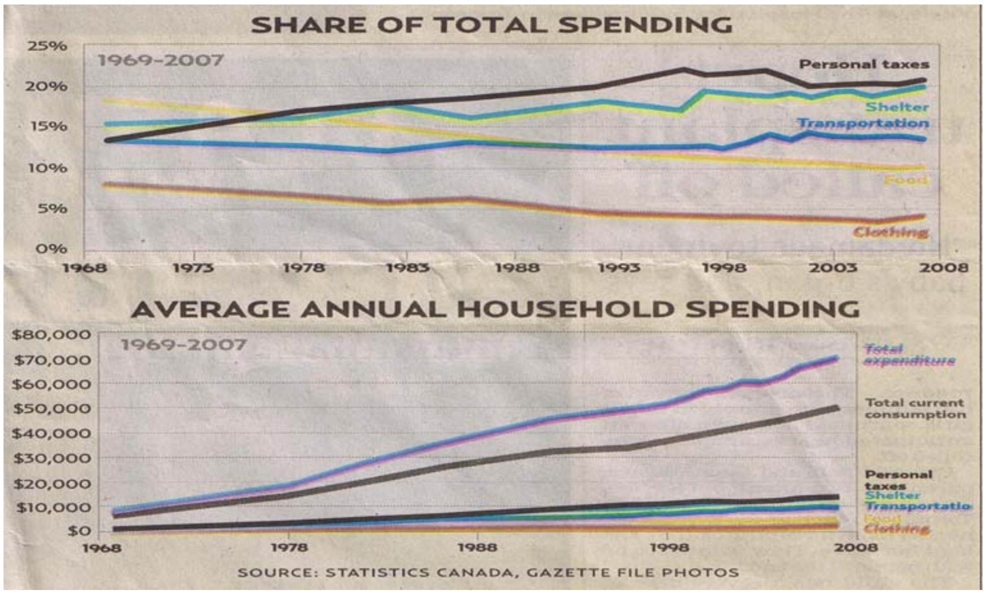
Table 3.3 Some Comparisons between Canada and China with the World

	GDP – composition by sector (2008 est.)	**Labour Force - by occupation**	**Urban Population/ Urbanization Rate**
World	*agriculture:* 4% *industry:* 32% *services:* 64%	agriculture: 40% industry: 20.6% services: 39.4% (2007)	50% (2008) *urbanization rate* :1.98% (05-10 est.)
Canada	agriculture: 2.1% industry: 28.8% services: 69.1%	agriculture 2%, manufacturing 13%, construction 6%, services 76%, other 3% (2006)	80% *urbanization rate:* 1%
China	*agriculture:* 10.6% *industry:* 49.2% *services:* 40.2%	*agriculture:* 43% *industry:* 25% *services:* 32% (2006 est.)	44.94%, *urbanization rate:* 2.7%

Source: Based on the https://www.cia.gov/library/publications/the-world-factbook/

When household incomes increase, consumption patterns change. Simply, the share of household (or individual) income spent on food will decline as income grows. The result of this change in consumption patterns is a steady decline in the share of expenditures on food (Polèse 2010). Engel's Coefficient in Canada is below 10 %, if it is calculated by the share of food spending in annual household total spending for major categories such as personal taxes, shelter (house), transportation, food and clothing. Foot (2009) noted that despite successive recessions, Canadians' standard of living has risen steadily for decades (Figure 3.18) and stated that food was the costliest household expense in 1969, accounting for 19% of total household spending. By 2007, the share of food spending had decreased to 10%.

Figure 3.18 Average Annual Household Spending for Major Categories of Canada, 1968-2008 (in constant 2004$)

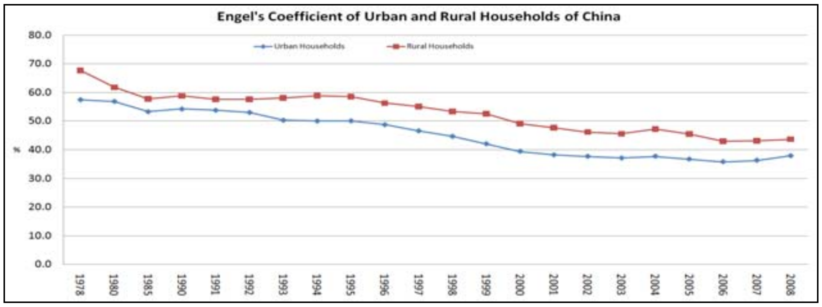


Source：Richard Foot (2009), For A nation in Crisis, We Live Well, Canwest News Service, The Gazette, montrealgazette.com, Wednesday, April8, 2009, A12.

Engel's Coefficient in China has diminished quickly from 62.6% in 1978 to 40.8% in 2008. Chinese urban and rural residents have witnessed a huge change in food consumption structure since 1980. The result of Engel's Coefficient statistics showed a decrease of 19.6% in Engel’s Coefficient for urban residents, from 57.5% in 1978 to 37.9% in 2008, and a decrease of 24% in Engel’s Coefficient for rural residents from 67.7% in 1978 to 43.7% in 2008 (Figure 3.19).

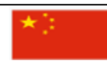
The status and level of economic development of both countries can clearly be seen based on the comparable indicators such as HDI, GDP, GDP (PPP) per capita, Life expectancy Index, GDP Index, GDP composition by sectors, labour force by occupation, urbanization and urban population from Tables 3.3 and 3.4 and Engel's Coefficient in Figure 3.18 and 3.19. China is a fast developing country with a high growth rate while Canada has maintained the steady status of a high developed economy with a low growth rate. Service and agriculture sectors in both countries are very different in composition by sector and by labour force in relation to GDP.

Figure 3.19 Engel's Coefficient of Urban and Rural Households of China, 1978-2008



Source: China Statistical Yearbook-2008, http://www.sei.gov.cn/hgjj/yearbook/2008/indexeh.htm

Table 3.4 General Comparison between Canada and China

Country	China 	Canada 
Capital	Beijing	Ottawa
Largest city	Shanghai	Toronto
Official Languages	Chinese	English & French
Government	Republic	Federation
Establishment	October 1, 1949	July 1, 1867
Total Area	9,640,821 km² (3rd)	9,984,670 km² (2nd)
Population – 2007	1,321,851,888 (1st)	33,261,000(36th)
Population Density	140/km² (53rd)	3.6/km²
GDP (PPP) 2007	$7.043 trillion (2nd)	$1.274 trillion (13th)
Per capita GDP(PPP)	$5,300 (105th)	$38,200 (21st)
GDP (nominal Total) 2007	$3.42 trillion (4th)	$1.432 trillion (9th)
Per capita GDP (nominal)	$2,800 (101st)	$42,738 (14th)
Gini(2007)	46.9 (UN)	32.6 ((UN))
HDI (2007)	0.777 (medium) (81st)	0.961 (high) (4th)

Source: World Bank Database; IMF Database; UN Database; FAO Database; UNCTAD World Investment Report 2007; UNDP Human Development Report 2007.

In Canada agriculture only accounts for 2.1% of GDP and 2% of employment while it took up 10.6% of GDP and 43% of employment in China in 2008. Service sector accounts for 40.2% of GDP and 32% of employment in China while it accounted for 69.1% GDP and 76% of employment in Canada in 2008. Canada had a high urban population of 80% while China had an urban population of only 44.94% in 2008.

Table 3.5 Some Comparisons between Canada and China

Indicators	Period	Canada	China
Population, urban (% of total population)	1975	75.6	17.4
	2005	80.1	40.4
	2015	81.4	49.2
Public expenditure on education (% of GDP)	1991	6.5	2.2
	2002-2005	5.2	1.9
Researchers in R&D (per million people)	1990-2005	3,597	708
Public expenditure on health (% of GDP)	2004	6.8	1.8

Source: World Bank Report (2007)

In terms of some other indicators, Canada had a higher HDI index of 0.961 (ranked 4th in the world) and lower Gini index of 32.6 while China had a high Gini index of 46.9 and low HDI index of 0.777 (ranked 81st in the world) in 2007. Public expenditure on education and health are higher in Canada (12.5%, 2000-2007) than in China (around 4%[18]). In addition, the number of researchers in R&D per million people was 3597 in Canada while it was only 708 in China based on the statistics of World Bank Report during the 1990-2005 period (Table 3.5). According to the World Development Indicators database, 2009, Net migration in China was -1,339,000 in 2000 and increased to -1,900,000 in 2005. In contrast, Canada receives a large number of immigrants and the average net migration of Canada has been over 225,000 since 1990 compared to its small population.

In terms of the indicators of communication, China had 365.4 million telephone (main line) users (coverage of total pop 27.65%) and 547.286 million telephones - mobile cellular users (coverage of total population of 41.42%) in 2007. In 2008, there were 253 million internet users (coverage of total pop 19.14%), 14.306 million internet hosts[19] (coverage of total population of 1.08%). These indicators were higher

[18] http://opinion.globaltimes.cn/observer/2010-02/506897.html

[19] An Internet host is a computer connected directly to the Internet; normally an Internet Service Provider's (ISP) computer is a host. Internet users may use either a hard-wired terminal, at an

in Canada than that of China if compared to its coverage to its population. Canada had 21 million telephone (main line) users (coverage of total population of 64.46%) and 18.749 million telephones - mobile cellular users (coverage of total population 57.55%) in 2006. There were 28 million internet users (coverage of total population of 85%) in 2007, 5.1196 million internet hosts (coverage of total pop 15.36%) in 2008[20].

China, the new superpower, is rapidly growing its consumption of the world's natural resources. Chinese energy consumption rose by 8.4% continued to account for the majority of global energy consumption growth. The Chinese oil consumption growth of 6.7% was close to the 10 year average.

The differences in energy production and consumption structure are closely related to the different resource availabilities in each country as well as their respective patterns of changing social and economic development. If the two countries are compared by energy production and consumption share of the world, the energy demand of China has grown – especially oil, coal consumption since 1996 – while Canadian energy consumption has almost remained at the same level (BP Statistical Review of World Energy, June 2007[21]).

China is the biggest coal producer and consumer in the world. It accounted for 39.36% of world coal production and 38.55% of world coal consumption of world in 2006. In China, coal accounted for 57.8% of Total Energy Consumption, while oil, gas and Water, Wind and Electricity only accounted for 23.9%, 14.1% and 4.2% respectively in 2007. For many years the US was the world's leading polluter, but in 2008 China took on the unenviable crown of being the biggest polluter in the world. So, air pollution (greenhouse gases, sulfur dioxide particulates) from its reliance on coal and the concomitant production of acid rain is the biggest environmental problem in China, although others may be just as important (e.g. soil erosion and

institution with a mainframe computer connected directly to the Internet, or may connect remotely by way of a modem via telephone line, cable, or satellite to the Internet Service Provider's host computer. The number of hosts is one indicator of the extent of Internet connectivity.

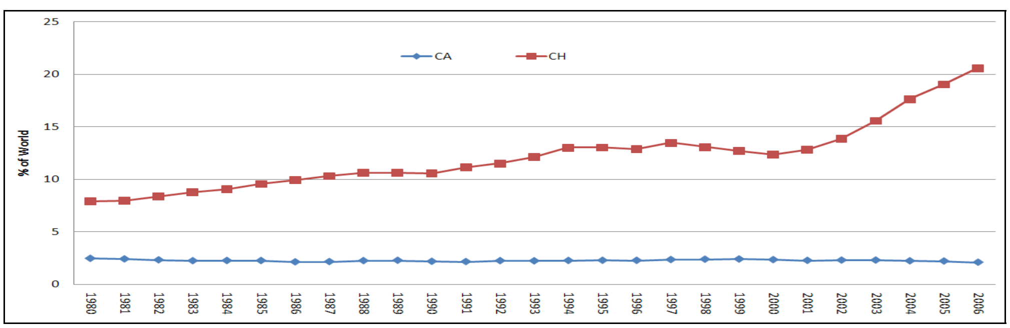
[20] https://www.cia.gov/

[21] www.bp.com/statisticalreview.

desertification). According to the World Watch Institute, China is home to 16 of the world's most polluted cities. Pollution is also draining China's economic reserves, costing $200 billion annually. According to 2008 HDI report, China took up 10.6% share of CO_2 emission of the world while Canada only had a 1.8% share in 1990. However, in 2004, China shared 17.3% of world CO_2 emission compared to Canada's modest 2% (Table 3.6). China's CO_2 emissions share of the world from the consumption and flaring of fossil fuels has increased continuously while it has diminished slightly in Canada since 1980 (Figure 3.20).

A detailed input-output analysis in China tracked the distribution of fuels, raw materials, and intermediate goods to and from industries throughout the economy. Taking carbon intensities and trade data into account, it estimated the energy-related carbon dioxide emissions embedded in domestic production for export at 34% of its 2004 emissions (IEA 2007).

Figure3.20: Carbon Dioxide Emissions from the Consumption and Flaring of Fossil Fuels, 1980-2006



Source: Calculated based on the data of Energy Information Administration, International Energy Annual 2006, 2008. www.eia.doe.gov/emeu/eia

With China's production facilities expanding rapidly, the figures for later years could be higher. Annual greenhouse gas emissions are projected to grow from 44 gigatons of carbon dioxide equivalent in 2005 to 60 gigatons in 2030, a 35% increase. Of the 23 gigatons of energy-related carbon dioxide emissions in the International Energy Agency sample, one-third was embedded in production for export. China alone accounted for 2.3 gigatons (31%) of this, and Europe and the Russian Federation combined for another 1.7 gigatons (23%). Africa and Latin America each accounted for just 2% of embedded emissions (IEA 2008a)[22]. If both countries are compared on the Environmental Sustainability Index (ESI)[23] score which consists of 5 components, 21 indicators and 76 variables published in 2005 by the Yale Center for Environmental Law and Policy (2005), Canada ranked 6th with a score of 64.4 while China ranked 104th with a score of 38.6 in the world in 2005. It can be seen from these data that environmental problems have been aggravated in China with its fast development and its pollution share in the world has increased substantially.

Table 3.6 Some Comparisons by Energy Production and Consumption Share of the World (Unit: Million Tonnes Oil Equivalent)

Indicator	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
(Ca)Oil Prod.	3.42	3.47	3.53	3.47	3.51	3.50	3.77	3.85	3.82	3.72	3.87
(Ch)Oil Prod.	4.69	4.60	4.51	4.60	4.49	4.57	4.67	4.58	4.51	4.64	4.69
(Ca)Oil Cons.	2.45	2.48	2.51	2.48	2.48	2.53	2.56	2.61	2.64	2.60	2.54
(Ch)Oil Cons.	5.19	5.71	5.71	5.96	6.29	6.38	6.86	7.39	8.36	8.49	8.99
(Ca)Coal Prod.	1.81	1.85	1.81	1.74	1.63	1.58	1.46	1.26	1.25	1.17	1.05
(Ch)Coal Prod.	30.63	29.75	27.94	28.72	28.90	29.39	30.73	34.11	36.59	38.39	39.36
(Ca)Coal Cons.	1.09	1.15	1.23	1.22	1.24	1.34	1.27	1.16	1.09	1.10	1.13
(Ch)Coal Cons.	30.96	29.92	28.52	28.82	28.23	28.57	29.29	32.40	34.87	37.06	38.55
(Ca)Gas Prod.	7.32	7.40	7.48	7.54	7.53	7.50	7.41	6.96	6.77	6.67	6.51
(Ch)Gas Prod.	0.90	1.01	1.02	1.07	1.12	1.22	1.29	1.33	1.51	1.79	2.04
(Ca)Gas Cons.	3.79	3.74	3.73	3.57	3.42	3.38	3.38	3.56	3.43	3.29	3.39
(Ch)Gas Cons.	0.80	0.85	0.87	0.90	0.98	1.09	1.13	1.28	1.44	1.64	1.95
(Ca)Nuclear Energy Cons.	3.85	3.45	2.94	2.91	2.82	0.29	2.80	2.82	3.28	3.32	3.51
(Ch)Nuclear Energy Cons.	0.59	0.61	0.58	0.60	0.65	0.07	0.93	1.64	1.82	1.91	1.94

Note: Ca-Canada, Ch-China, Prod-Production, Cons-Consumption. Source: Http:\\www.bp.com

The openness of the Canadian economy to international trade has been a major factor of Canadian economic growth. But there are great differences in international trade direction, structure and partners between the two economies. Trade accounts for roughly a third of GDP of Canada. Canada has signed two agreements with the US –

[22] 2009 World Development Indicators, Environment :pp.131

[23] 2005 Environmental Sustainability Index- The ESI score is the equally weighted average of these 21 indicators. 2005 Yale Center for Environmental Law and Policy

the 1989 US-Canada Free Trade Agreement (FTA) and the 1994 North American Free Trade Agreement (NAFTA) (which includes Mexico), which has brought a trade boom for Canada. The relationship which Canada enjoys with US is thus another major defining factor for Canada's dramatic increase in trade. The US and Canada have the world's largest trading relationship and US absorbs more than 85% of Canadian exports[24]. In terms of international trade, high technology exports (% of manufactured exports) of Canada increased 13.7% in 1990 to 14.4% in 2005 while it augmented in China from 6.1% in 1990 to 30.6% in 2005. Canada merchandise export trade value increased $1.78 billion in 1977 to $46.3 billion in 2007 and merchandise import trade value increased to $41.5 billion in 2007 from 1.53 billion $ in 1977.

International export-import trade structure of Canada are composed of agriculture and fishing (7.65%-6.35%), energy (20.4%-9.1%), forestry (6.51%-0.74%), industrial goods (23.25%-21.2%), machinery and equipment (20.8%-29%), auto (17.2%-19.92%) and consumer goods (4.17%-13.6%) in 2007. The main export commodities of Canada are motor vehicles and parts, industrial machinery, aircraft, telecommunications equipment; chemicals, plastics, fertilizers; wood pulp, timber, crude petroleum, natural gas, electricity, aluminum while imports – commodities are concentrated on machinery and equipment, motor vehicles and parts, crude oil, chemicals, electricity, durable consumer goods.

The main export partners of Canada are the US (76.9%), the UK (3.5%), other European countries (5.22%), Japan (2.1%), China(2.1%) while the main import partners are the US (64.99%), the UK (2,1%), other European countries (7.8%), Japan (2.8%), China (9.4%) and Mexico (4.2%) in 2007. It can be seen clearly that the US has always been the main international trade partner of Canada. In China, foreign trade is the main booster of Chinese fast economic development in recent decades. After the entrance to WTO, China has augmented its export based foreign trade amount at a high speed. Total value of exports and imports increased from 206.4×10^8 US$ in 1978

[24] http://www.economywatch.com/world_economy/canada/export-import.html

(exports 47.2%, imports 52.8%) to 25632.6 $\times 10^8$ US$ (exports 55.8%, imports 44.2%) in 2008. Its average annual growth rate was 17.4% (exports 18.1%, imports 16.7%) from 1979 to 2008. Foreign direct investments has increased from 34.0 $\times 10^8$ US$ in 1990 to 924 $\times 10^8$ US$ in 2008 with an average annual growth rate of 20%. The main export commodities of China are electrical and other machinery, including data processing equipment, apparel, textiles, iron and steel, optical and medical equipment while the major import commodities are electrical and other machinery, oil and mineral fuels, optical and medical equipment, metal ores, plastics, organic chemicals. The major export partners of China were the US (19.1%), Hong Kong (15.1%), Japan (8.4%), South Korea (4.6%), Germany (4%) and is main imports partners were Japan (14%), South Korea (10.9%), Taiwan (10.5%), the US (7.3%) and Germany (4.7%) in 2007.

From the above-mentioned figures, it can be seen clearly that the Chinese share in Canadian international trade has also increased in recent years even though there has been some frictions in the relationship. China is Canada's second largest trading partner, second only to the United States, with bilateral trade reaching $36.6 billion in merchandise in 2005, an increase of 19.1%. In 2005, Canadian exports to China grew by 6.7%, reaching $7.1 billion, while imports from China reached $29.5 billion, an increase of 22.5% compared to 2004. Canada's direct investment in China increased from $6 million in 1990 to $1 billion in 2005. Likewise, Chinese direct investment in Canada increased from $54 million in 1991 to $1.4 billion in 2005.

According to the World Human Development Report (2008), Canada ranked 4th (HDI 0.961), while China ranked 81th (HDI 0.777) out of 179 countries in 2008. For example, if compared to the world average of 2007, China’s GDP per capita calculated by the purchasing power parity index (PPP) was 7.2 times lower than Canada’s. In 2008, China ranked 2nd (after the USA) based on total GDP calculated by PPP in $, while Canada ranked 14th in the world by the International Monetary Fund, World Bank, CIA. If calculated on a per capita basis, China ranked in a worse position with a ranking of 105 based on GDP per capita PPP ($6,546 in 2009), while

Canada ranked in 12th position ($38,290) in GDP per capita (PPP)[25]. Still, according to the index of Inequality measures in the Human Development Report 2007 Data, the ratio of the richest 10% to the poorest 10% of Canada and China are 9.4 and 21.6 respectively, while the ratio of the richest 20% to the poorest 20% are 5.5 and 12.2 respectively. The gap between the extreme cases seems to be more dramatic than on the world level. China is listed far from the high level countries on the rank, but above the average world level if calculated by the GDP index, per capita GDP, HDI, Life Expectancy Index and Education Index, among the 208 countries and independent territories in the world (Table 3.6).

Table 3.7 Canada and China: Relationships to Development Indicators in the World in 2005

Indicators	(HDI) value 2005	GDP per capita (PPP US$)2005	Life expectancy index	Education index	GDP index
Canada	0.961	33,375	0.921	0.991	0.97
China	0.777	6,757	0.792	0.837	0.703
Developing countries	0.691	5,282	0.685	0.725	0.662
Least developed countries	0.488	1,499	0.492	0.519	0.452
OECD	0.916	29,197	0.888	0.912	0.947
High-income OECD	0.947	33,831	0.906	0.961	0.972
High human development	0.897	23,986	0.854	0.922	0.915
Medium human development	0.698	4,876	0.709	0.738	0.649
Low human development	0.436	1,112	0.391	0.515	0.402
High income	0.936	33,082	0.903	0.937	0.968
Middle income	0.776	7,416	0.764	0.843	0.719
Low income	0.57	2,531	0.583	0.589	0.539
World	0.743	9.543	0.718	0.75	0.761

Source: UNDP Human Development Report 2007.

To explain whether China has succeeded in achieving convergence with Canada in relation to GDP per capita as well as the other indicators, we have to compare China's and Canada's progress in a comprehensive way using integrated indicators to provide a more robust explanation. If we define the progress by the annual average

[25] http://www.imf.org/external/data.htm

growth rate of the GDP per capita and analyze China's rate in relation to Canada (Table 3.7) over as long a period of time as possible, we conclude that, in fact, China's convergence is a mere hypothesis. Not only it is impossible to be achieved, but the gaps become broader, even though (see table 3.1) China's annual average rate was much faster between 1960 and 2007 and even into the double digits in some sub-periods during the period 1980-2007.

If we compare a recent trend, China achieved an 11.94% and Canada a 4.39% GDP (PPP) annual growth per capita in the period 1981-2009[26]. If we analyze a long series of data for GDP per capita, the annual growth rate (%) of China was 8% during the period while for Canada it was a 3.6% annual growth rate respectively during 1961-2008 (Figure 3.1).

Although the analysis and forecast calculations require a long series of data, we consider it is unreasonable to use the 1949-1978 data for China, since these three decades are non-typical as regards economic continuity and stability. The changes began to produce good results from 1980 since the onset of economic reform, when the stability and functioning of the economy were achieved on the basis of the new principles. Therefore, it is advisable to support the idea that for the convergence scenarios and calculations one should consider, in the case of China, the growth rates from 1980 onwards, as they are significant and credible for the future evolution of China's economy, when it entered into a more 'normal' phase of development.

3.4.2. The Assessment of the Time Required for Convergence

The most frequent question concerning economic growth convergence refers to the length of the process. Specifically, when we analyze the convergence of the real economies of China and of Canada, the first thing to be clarified is the length of the period necessary to achieve the future balance between China's annual average income per capita (Y_{cn}) and Canada's one (Y_{ca}). The initial level of GDP per capita (expressed by the PPP in US$) of the two entities ($Y_{CN}$ and Y_{CA}) is characterized by a

[26] http://www.indexmundi.com/

significant difference. The ratio of Y_{CA} to Y_{CN} was 1: 26.4 in 1961, and 1: 15.7 in 2007. The balance may occur in a reasonable period of time, only if China is able to achieve annual average growth rates per capita (r_{CN}) much higher than those achieved by Canada (r_{CA}), CA($\check{r}_{CA}$), *that is* $\check{r}_{CN} > \check{r}_{CA}$.

To assess the convergence period we start with the simple relationships concerning the GDP per capita growth of the two entities with different initial levels and annual average growth rates:

$Yt_{CN} = Y_{CN}\,(1+\check{r}_{CN})^t$ (3.1)

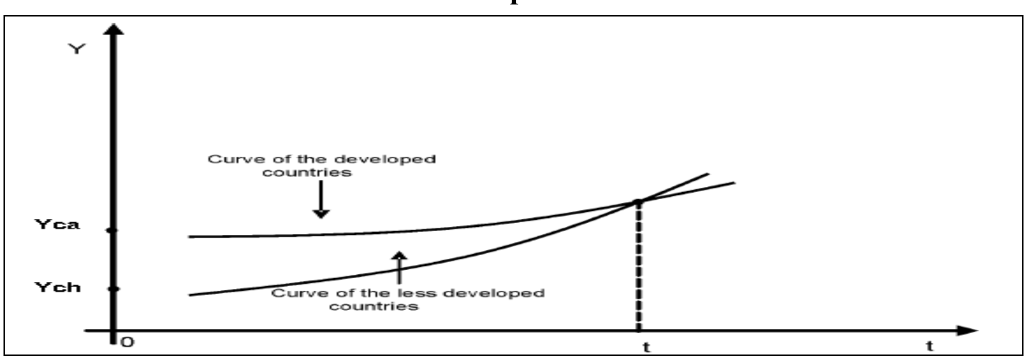
$Yt_{CA} = Y_{CA}\,(1+\check{r}_{CA})^t$ (3.2)

Convergence is achieved when the values of the two relations become equal according to the relation (3.3):

$Y_{CN}\,(1+\check{r}_{CN})^t = Y_{CA}\,(1+\check{r}_{CA})^t$ (3.3)

And the curves Yt_{CN} and Yt_{CA} meet in the balance point t^* (steady state see Figure 3.21), according to Figure 3.21.

Figure 3.21 The Convergence of the Economic Growth Curves of Developed and Less Developed Countries



Source: Modified from Dynamics in the neo-classical model (Barro and Sa1a-i-Martin, 1995)

By logging and rearranging the terms, one may assess the period of time (t) when the convergence (balance) of the GDP per capita of the two entities is achieved:

$T = \log Y_{CA} - \log Y_{CN} / \log(1+\check{r}_{CN}) - \log(1+\check{r}_{CA})$ (3.4)

Using this formula, we may calculate the period of time (in years) when China can catch up (in terms of the GDP per capita calculated by the PPP in US$) with Canada. Catching up with the developed countries is achieved through higher growth rates in the period 1980-2008, namely when the restructuring effects occurred and the system began to function on the basis of the new principles and in the new external context. Table 3.8 includes the data used in the calculation formula (initial GDP per capita and the annual average growth rates) and the results representing the number of years required to achieve convergence with Canada, in relation to China's annual growth rates, considered as alternatives (r_{CN1}=4%, r_{CN2}=5%, r_{CN3}=6%, r_{CN4}=7%, r_{CN5}=8%, r_{CN6}=9%) in relation to Canada's annual growth rates considered as alternatives r_{CA1}=1%, r_{CA2}=2%, r_{CA1}=3%, r_{CA1}=4%).

Table 3.8 Forecasting the Time to Achieve Convergence between China and Canada

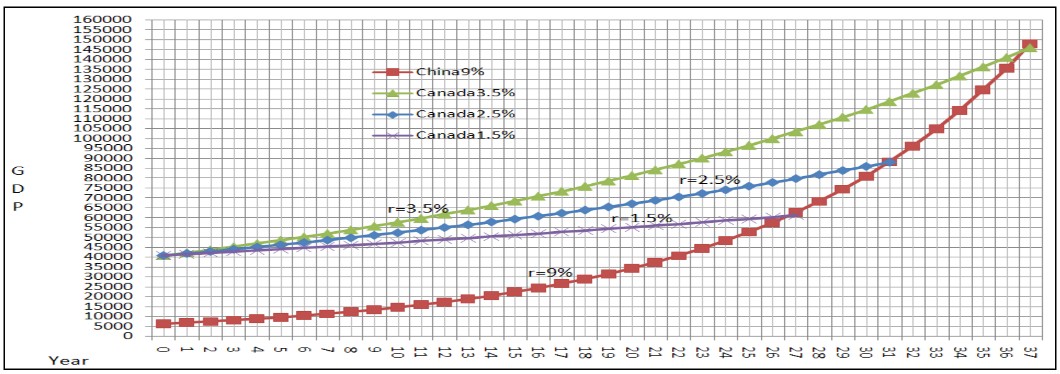
Indicators	Canada Y_{CA}	China Y_{CH}	Annual average growth rate of Canada	The time to achieve the convergence of alternative annual growth rates of China (r_{CN1},.. r_{CN6})					
				r_{CN1}=4%	r_{CN2}=5%	r_{CN3}=6%	r_{CN4}=7%	r_{CN5}=8%	r_{CN6}=9%
GDP(PPP)/2008	40900$	6100$	$\check{r}_{CA}$ =3.5%	395	132	80	57	45	37
	40900$	6100$	$\check{r}_{CA}$ =2.5%	131	79	57	44	36	31
	40900$	6100$	$\check{r}_{CA}$ =1.5%	78	56	44	36	31	27
HDI/2008	0.961	0.777	$\check{r}_{CA}$ =0.275	$\check{r}_{CN}$ =0.772	43				
Urban Pop 2008	80.1%	44.9%	$\check{r}_{CA}$ =0.143	$\check{r}_{CN}$ =0.89	78				
Gini index	32.6	46.9	$\check{r}_{CA}$ =0.16	$\check{r}_{CN}$ =0.66	73				
LEI 2006	0.924	0.795	$\check{r}_{CA}$ =0.21	$\check{r}_{CN}$ =0.006	151				
GDP I2008	0.986	0.642	$\check{r}_{CA}$ =0.0045	$\check{r}_{CN}$ =0.009	96				
OPENC2004	73.4	54.38	$\check{r}_{CA}$ =0.5	$\check{r}_{CN}$=1.5	30				

Note: The Annual average growth rate of indicators ř are calculated based on the data of GDP(1961-2008), HDI (1975-2008), UrbanPop, Gini index (1998-2008), Life expectancy index(LEI)(1995-2006), GDPI-GDP Index (2000-2008), OPENC-Openness(1950-2004), Engel Coefficient (Canada 1968-2008) China 1978-2008) from difference sources such as PWT6.2 Database, World Bank Database; IMF Database; UN Database; FAO Database; UNCTAD World Investment Report 2007; UNDP Human Development Reports of different years. Average urbanization rate is calculated based on 1980-2008 data of both countries.

If China maintains a high growth rate as shown in the Table 3.6 data, the convergence time can theoretically be estimated. At an annual average growth rate of

6%, China would need 80 years to reach Canada’s level. At a growth rate of 7%, the number of years to achieve convergence with Canada would diminish to less than half, i.e., 45 years, and at a rate of 9%, convergence with Canada requires 37 years. The dynamics of the GDP per capita points of convergence of China and Canada in relation to China’s average growth rates compared to Canada’s rate is shown in Figure 3.4, where the abscissa contains the time (number of years) necessary to achieve the convergence, and the ordinate indicates the evolution of the GDP per capita in China, as given by the 9% annual average rate of China and the 3.5% annual average rate of Canada (see Table 3.8).

Figure 3.22 The Dynamics of Convergence Between China and Canada, in Relation to GDP per Capita by Size of Annual Average Growth Rate in China



Source: Calculated based on World Bank Data.

At a 9% growth rate for China’s economy and one of 3.5% for Canada, the convergence point (curve intersection) of the two entities will be achieved at a GDP per capita of about 147000 $, that is 37 years, while with a rate of 9% for China and 1.5% for Canada, the convergence of the two entities will be achieved at a GDP per capita of about 62000 $, that is 27 years (Figure 3.22). These figures seem impossible and unbelievable to achieve. But fast economic growth even during the recent world economic recession became a distinguishing feature of the Chinese “economic miracle.” It is precisely by extrapolating the current trends into the future that many experiments have conjured up a picture of that formerly backward country as becoming an economic superpower that could catch up with the industrialized countries.

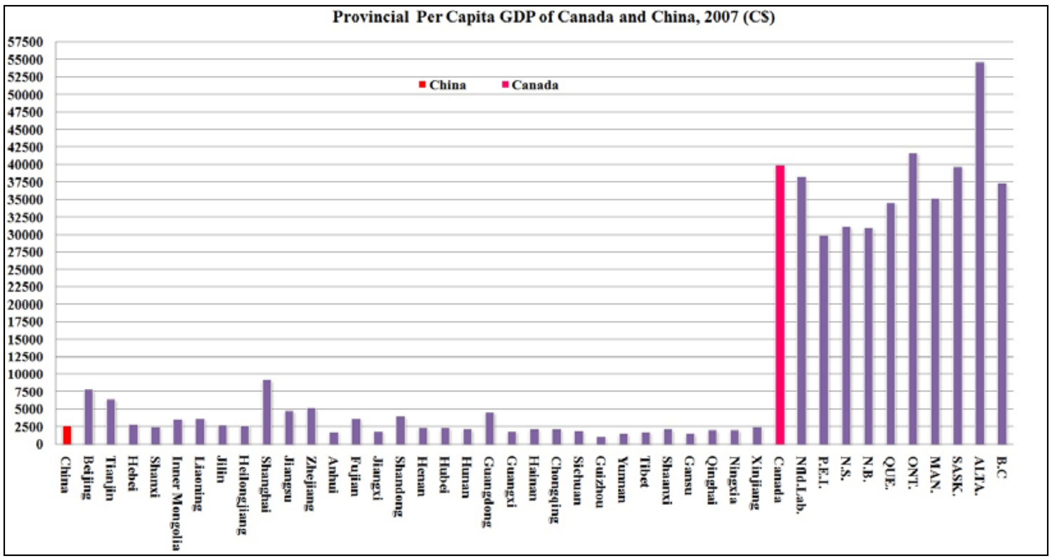
3.5 Conclusion

In this chapter, a brief description of regional growth, policy and disparity starting from 1950s until the present time has been provided, mainly in a descriptive vein. Clearly, much has happened in both countries during this time and to provide a thorough description even of something as narrow as regional development background would require far more than a single chapter. However, the intention has been primarily to provide background material against which to interpret the more detailed empirical results presented in Chapter 4 and which are the main focus of this study. In fact, economic development is a very complicated process affected by many factors and is always changing and fluctuating. If the other indicators are considered, such as the Human Development Index (HDI), Urban Population growth rate, Gini Index, Life expectancy Index (LEI), GDP Index, OPENC Index, it will take China 43, 78, 73, 151, 96, 30 years respectively to catch up with Canada under the different combinations of annual GDP growth rate scenarios. It is difficult to use the HDI to monitor changes in human development in the short-term because two of its components, namely life expectancy and adult literacy change slowly (HDIreport, 2008). Natural Disaster, World economic recession, war, and many other social economic and environmental problems also affect the stability and growth of regional economies.

In summary, it must be admitted that China has achieved impressive successes in a catching up effort on a range of total economic indicators on the world stage. But it will still remain a very poor country by international standards. However, China is now faced with a number of other economic and social problems, including pronounced regional disparity, an aging population, an increasing rural-urban income gap, and rapid environmental degradation. Today, just under 15.9% of the Chinese population is below the income poverty line of 1US$ a day, and there is still 36.3% population of China below the income poverty line of 2$ a day (HDI 2008).

According to the World Development Indicators database of April 2009: the inequality measure of the ratio of the richest 10% to the poorest 10% is 9.4 in Canada but in China it is very high at 21.6; another inequality measure, the ratio of the richest 20% to the poorest 20%, is at 5.5 in Canada, but in China it is at 12.2. Furthermore, in 2009, 90.9% of the population of China is relatively literate, compared to 20% in 1950. All Canadian regions had a much higher GDP per capita than all regions in China in 2007 (Figure 3.23).

Figure 3.23 Provincial per Capita GDP of Canada and China, 2007 (C$)[27]



Notes: Chinese Provincial GDP calculated based on Bank of Canada 2007 the average exchange rate of Canadian dollars to Chinese RMB. 1C$=7.096RMB in 2007.

From an economic point of view, China is still in a marginal position when compared with Canada. In 1950, GNP per capita was $1,349 in Canada while in China it was about $300. If we compare the two countries by using per capita GNI (Atlas method) from the World Bank data, it was $2,340 in 1962 for Canada, increasing to $39,650$ in 2007, while China had a per capita GNI of $70 in 1962, increasing to $2,370 in 2007. It would appear that China caught up with the 1960s' economic level of Canada after 5 decades of development. But significant gaps also

[27] This figure is given in this way to show clearly the pronounced cross-national and national per capita GDP disparities.

remain in terms of standard of living between China and Canada, with regional standards of living being much higher in Canada than China. Though the growth in gaps between the regions in each country or between both countries may be improved, the gaps are not likely to be eliminated in the near future. Hence, there is a recognition of the need to address regional disparities but little by way of policy specificity, which suggests that the long-standing problem is unlikely to be reversed in the near future.

In Chapter 4 that follows, more detailed econometric methodologies and measurement methods are presented and discussed for investigating differences between Canada and China at the national scale as well as within country provincial convergence in each country.

Chapter 4

Empirical Analysis

The focus of this chapter is the analysis of cross-country convergence between Canada and China at the national scale and of within country provincial convergence in each country using different measurement methods such as the traditional methods, beta convergence and sigma convergence (see Chapter 2). In order to overcome the heterogeneity bias associated with traditional convergence analysis, the spatial dimension is taken into consideration in the beta convergence analysis presented in this Chapter. The main purpose of presenting such material is to provide the tools for the interpretation of the empirical convergence analysis that is presented in the following chapters.

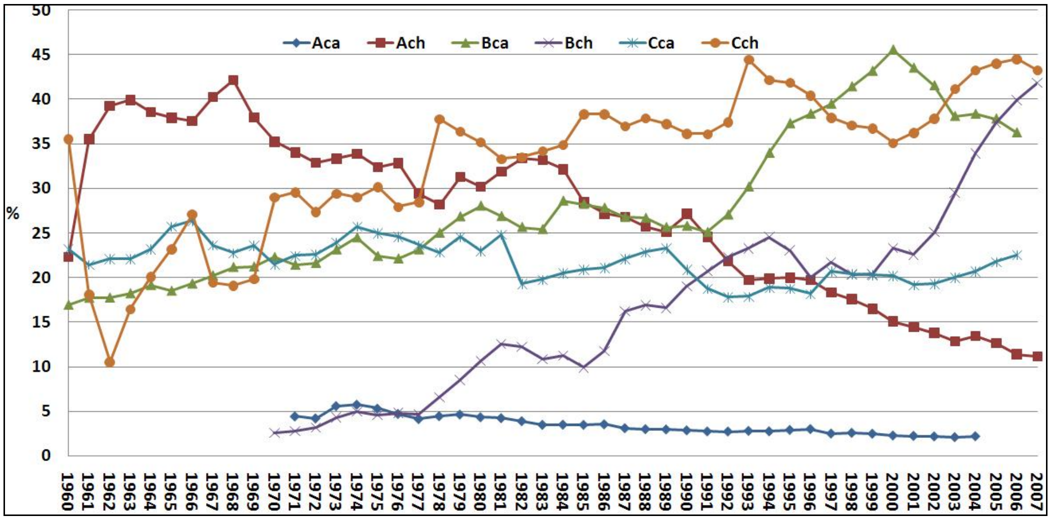
4.1 Traditional Methods

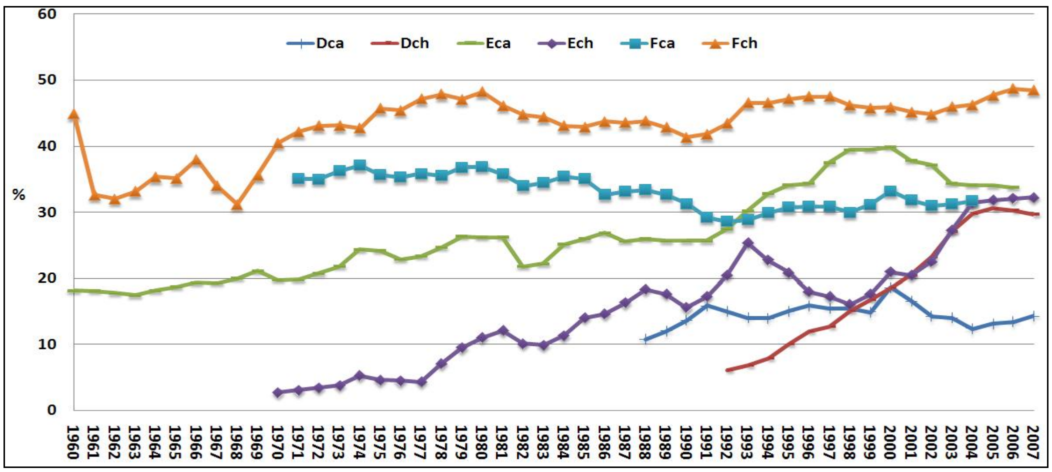
In order to measure the economy, a whole array of inequality indicators have been proposed, the most popular being some summary measure of dispersion, such as using Descriptive Statistics: Variance of logarithms, CV, the Gini index and the Theil index. Some of these are non-weighted measures of inequality as they do not incorporate the population size of each economy. Because of the huge difference in population between Canada and China, the population size of each economy should be taken into consideration.

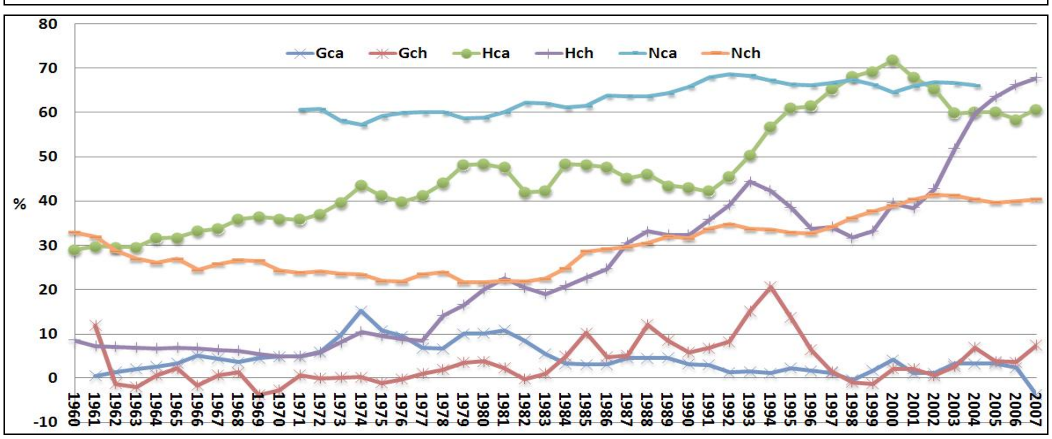
4.1.1 Descriptive Statistics

A fundamental and basic distinction can be drawn from the descriptive statistics of both countries. Here, only the Cross Country Comparison with Multi-Indicators are shown in Figure 4.1. The other provincial numerical measures for describing data are given in the Appendix of this thesis (Appendix A, Table 1 and Table 2).

Figure 4.1 Cross Country Comparison with Multi-Indicators, 1960-2007 (Unit: %)







Note: In Figure 4.1, A is Agriculture, value added (% of GDP), B is Exports of goods and services (% of GDP), C is Gross capital formation (% of GDP), D is High-technology exports (% of manufactured exports), E is Imports of goods and services (% of GDP), F is Industry, value added (% of GDP), G is Inflation, GDP deflator (annual%), H is Merchandise trade (% of GDP), N is Services, …., value added (% of GDP); ca is Canada, ch is China. Source: World Bank Data 2007.

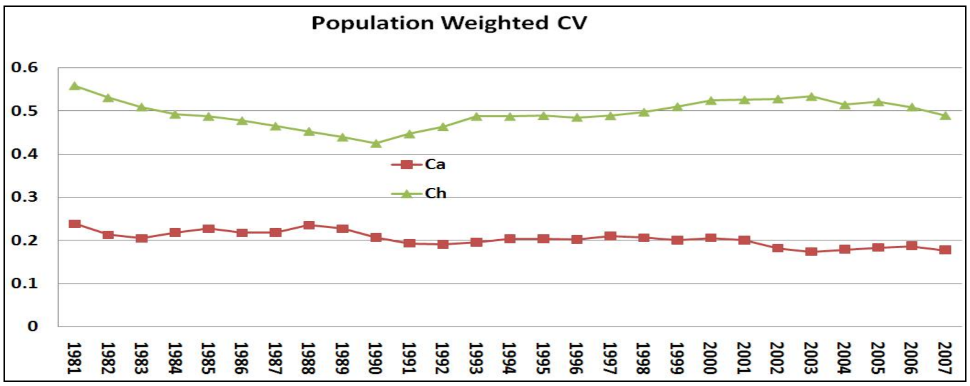
From Figure 4.1, it can be seen very clearly that Ac (Agriculture, value added (% of GDP)) has decreased faster in China than for Canada, but in China it exhibits greater variability as opposed to Canada where it experienced a steady decrease. B (Exports of goods and services (% of GDP)) has increased gradually in Canada since 1960, while for China it started from 2.61% in 1970 and reached 41.87% in 2007. C (Gross capital formation) has increased gradually and steadily in both countries but in China it picked up faster than for Canada. D (High-technology exports) has remained fairly steady for Canada while in China it increased continuously and reached 29.69% in 2007. E (Imports of goods and services) has increased steadily in Canada since 1960, while it started off slowly 2.7% in China in 1970, but reached the same level as Canada in 2006. In terms of F (Industry, value added (% of GDP)), both countries exhibit the same growth during this period. There was a considerable difference in terms of G (Inflation). Initially, the inflation rate was very unstable in both countries; since 1984, Canada has experienced a low inflation rate while China has experienced a much higher rate of inflation. There has been a significant gap in N (Services, …, value added (% of GDP)) in both countries. This indicator has played a very important role in the Canadian economy and has increased gradually, while it has increased only very slowly in China since 1960.

From the comparison of these indicators, the conclusion can be drawn that most of the indicators for China have increased faster than for Canada over the whole period under study. The rate of increase of these indicators was also higher in China that for Canada. Furthermore, there were large differences between the percentage (%) of GDP for the indicators of agriculture, industry and services. Both countries are very different in economic status and structure. This will be demonstrated even more forcefully with other statistical methods in the following sections.

4.1.2 Coefficient Variation

From the population weighted Coefficient Variation (CV) result (Figure 4.2), it can be seen that provincial disparity in Canada has decreased steadily since 1981, while in China it diminished during the period 1981 to 1990, then increased until 2003, and finally decreased again. If both countries are compared, there is divergence of the CV, showing the economies of the two countries are diverging from one another. This has been obvious since 1990.

Figure 4.2 Population Weighted CV for Canada and China



Note: In the calculation for Canada, GDP and Population data for three territories are excluded because of lack of data.

4.1.3 Variance of logarithms, weighted (VL_W) and unweighted (VL)

There are different variants of GDP for both countries because of different calculation methods. Here, per Capita GDP, per capita GNI and per Capita PPP (GNI) are used in the calculation of the weighted (VL_W) and unweighted (VL) Variance of logarithms and the log of these indicators to obtain a better comparative result for the two countries.

The Calculation Formulae for the weighted (VLW) and unweighted (VL) Variance of logarithms measures are respectively (4.1) and (4.2):

$$VL_w = \sum_{i=1}^{N} \frac{Pop_i}{Pop^*} \cdot \left(\log \frac{y_i}{y^*} \right)^2 \qquad (4.1)$$

$$VL = \sum_{i=1}^{N} \frac{1}{N} \cdot \left(\log \frac{y_i}{y^*} \right)^2 \qquad (4.2)$$

Note: For the above equation, y is the average per capita income, Y indicates the aggregate income, *Pop* is the population, i is the subscript for the ith territorial unit and the superscript '*' indicates national values.

Figure 4.3 Weighted (VLW) and Unweighted (VL) of Canada and China

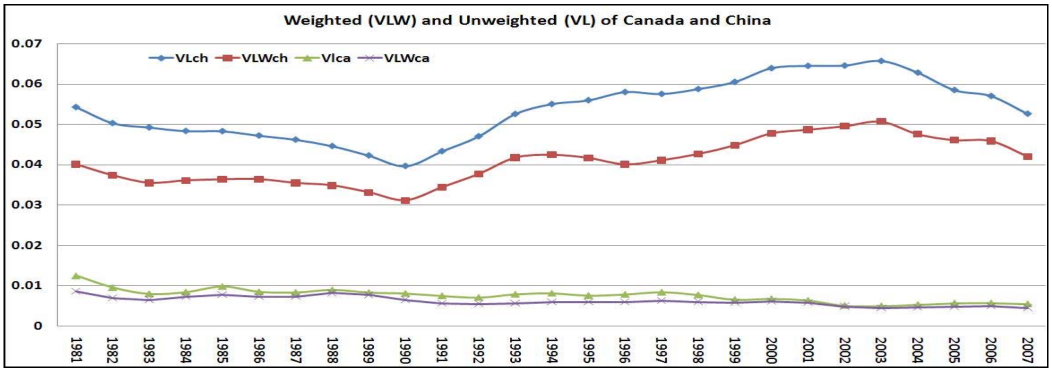
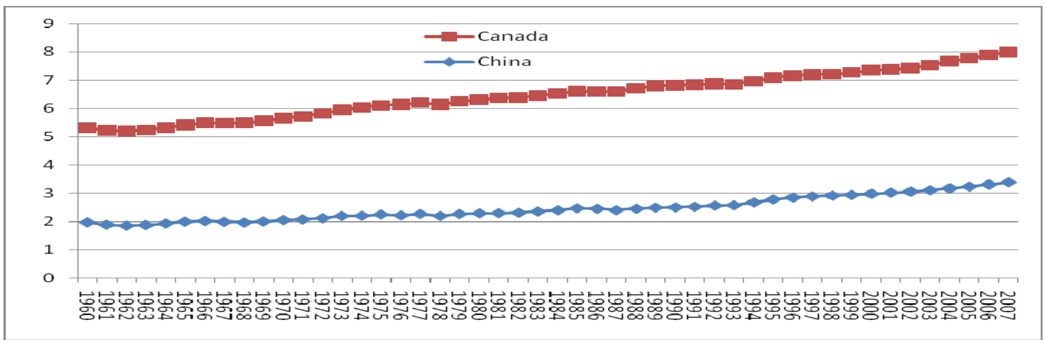
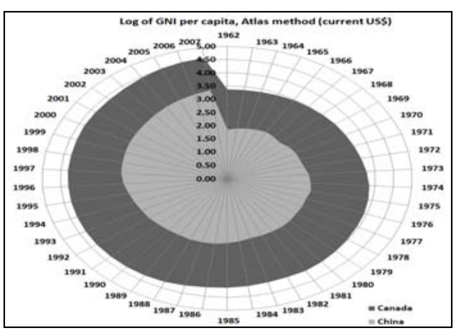


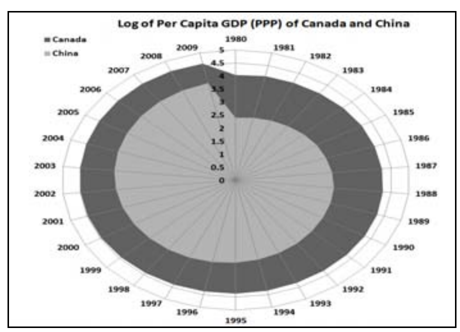
Figure 4.4 Log of Per Capita GDP



Note: Log of Per Capita GDP of Both Countries from 1960 to 2007

Figure 4.5 Log of GNI Per Capita **Figure 4.6 GDP per Capita (PPP)**





If the log of per capita GDP (Figure 4.4), per capita GNI (Figure 4.5) are considered, there is divergence between the two countries. But when per Capita GDP (PPP) is considered, there has been a slight convergence between the two countries since 2006 (Figure 4.6). The result is the same as the result obtained regardless of whether weighted (VL_W) and unweighted (VL) values are considered for comparison (Figure 4.3); in Canada, provincial disparity has gradually decreased since 1960, while in China provincial disparity decreased during the period 1981 to 1990, then increased until 2003, and finally decreased again. For the whole period, there was divergence between both economies. From the above-mentioned figures, it can be seen very clearly that the provincial per capita GDP inequality for China converged from 1981 to 1990, then diverged until 2003, then again began to converge. The case for Canada is slightly different. The provincial per capita inequality GDP generally converged gradually except for a few small periods of divergence from 1983 to 1985 and 1987 to 1988. It maintained almost the same level from 1991 to 1996, and from 2002 to 2007. From the comparation of following Lorenz plots in 1981 and 2007 in Section 4.1.4, Canada exhibits continued small change, but there was not much change in China. If we compare both countries, the distribution of provincial inequality converged from 1981 to 1990, and diverged since 1991.

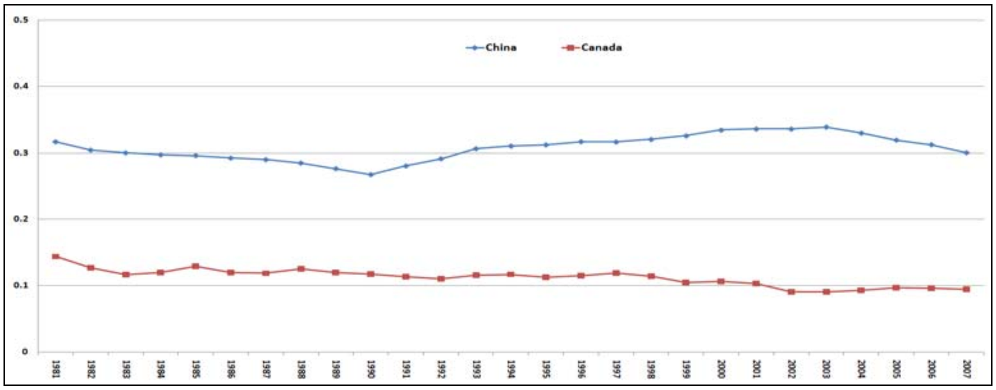
4.1.4 Gini Index

A very popular inequality indicator is the Gini coefficient. This is derived from the Lorenz curve (see Appendix A2), a cumulative frequency curve which plots the cumulative share of population of the economies in the sample on the X-axis and the cumulative share of total income of these same economies on the Y-axis. In both cases, the economies are ranked according to their per capita income from bottom to top. The Gini index (G) corresponds to twice the area between the Lorenz curve and the 45° line. The Calculation Methods for the Gini coefficient of inequality are given in the appropriate section of Appendix A3.

From the Gini coefficient of inequality index on Figure 4.7, it can be concluded that provincial disparity in China is greater that in Canada. Provincial inequality decreased between 1981 and 1990 in both countries, but since then it increased in

China until 2004 followed by a decrease, while it decreased gradually in Canada during this whole period. For the whole period, there was divergence of the Gini coefficient of inequality index between both economies.

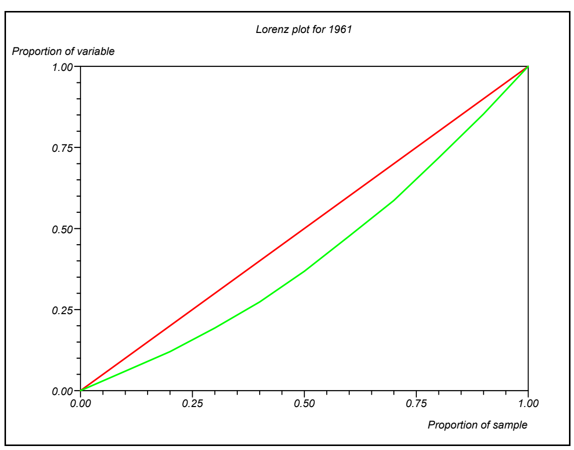
Figure 4.7 Gini Coefficient of Inequality for Canada and China



Note: Calculated with StatsDirect Software.

If we compare the Lorenz curves of 1961, 1981 and 2007 for the two countries on the graphs below, the change and difference can be very clearly seen. The Lorenz curve line (blue) between the line of perfect equality (red) and the line of perfect inequality approaches the line of perfect equality significantly in Canada, while it has not changed much during the period 1961 to 2007 for China (see data for the Lorenz Curves for both countries in 1961 and 2007, Figure 4.8).

Figure 4.8a Gini Coefficient of Inequality for Canada, 1961,1981 and 2007



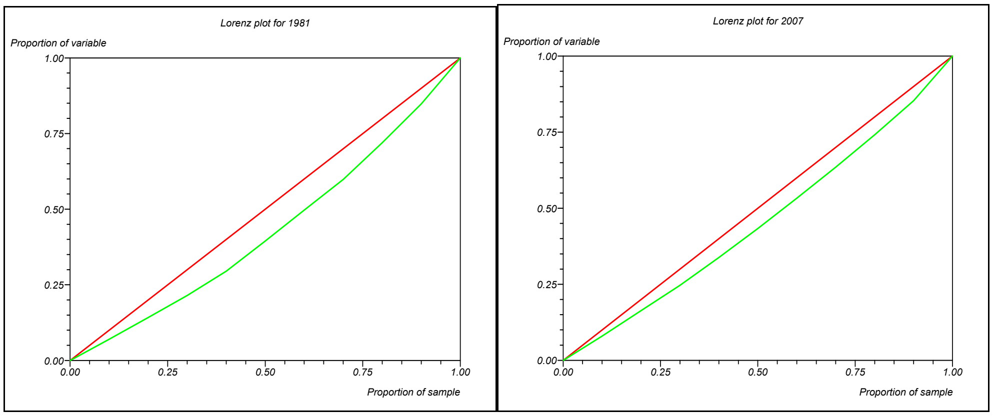
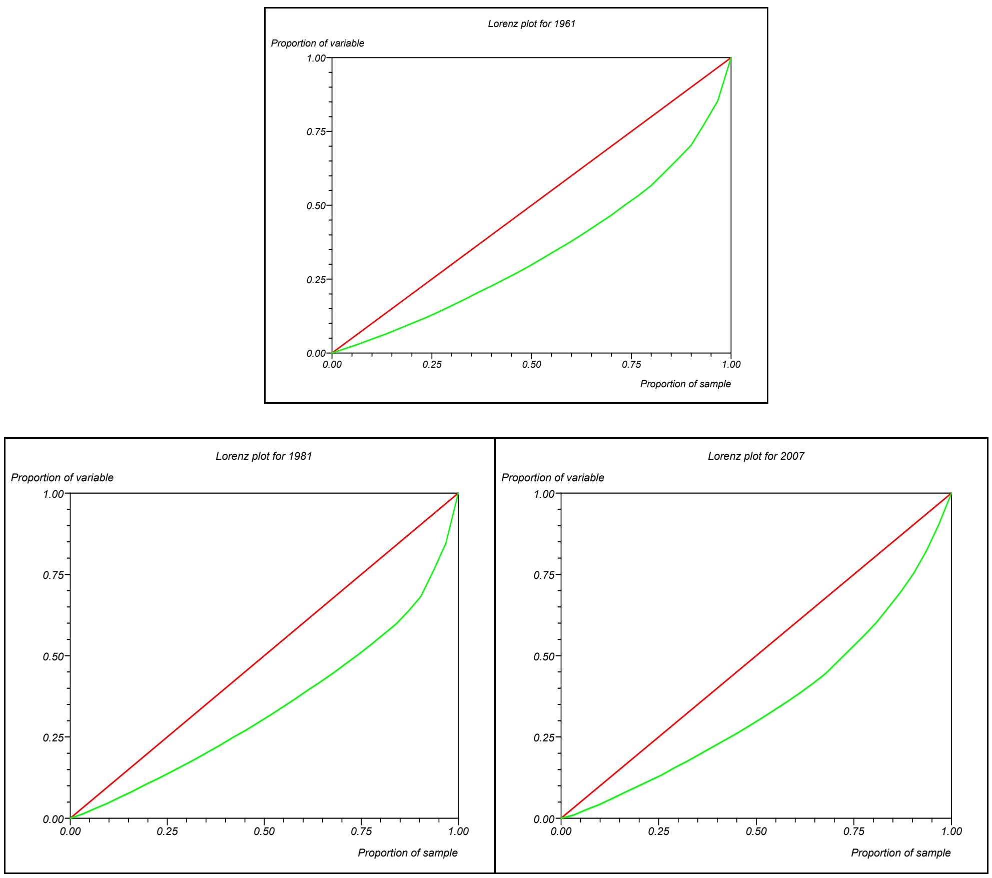


Figure 4.8b Gini Coefficient of Inequality of China, 1961, 1981 and 2007



4.1.5 Theil Index

The **Theil index**, derived by econometrician Henri Theil, is a statistic used to measure economic inequality. The Theil index ranges from 0 to infinity and the higher the value of Theil, the higher the inequality. If every region has the same mean income, then the index is 0. There are three types of Theil index of inequality identified as Theil, Theil1 and Theil0. The Theil indices of inequality are calculated as follows:

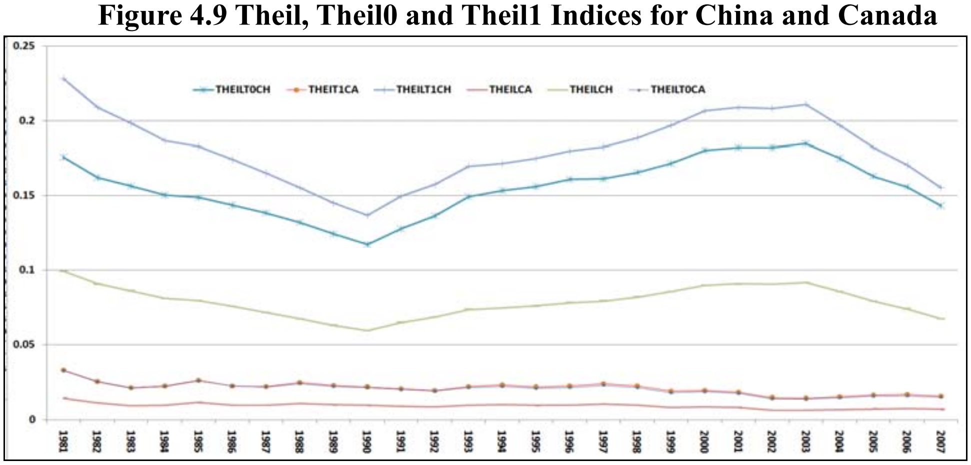
$$Theil = \sum x_i \log\left({x_i}/{\bar{x}} \right) \Big/ n\,\bar{x} \quad (4.3)$$

$$Theil1 = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{x_i}{\bar{x}}.\ln\left(\frac{x_i}{\bar{x}} \right) \right) \quad (4.4)$$

$$Theil0 = \frac{1}{N}\sum_{i=1}^{n}\ln\left(\frac{x_i}{\bar{x}} \right) \quad (4.5)$$

From the three types of Theil indices (Figure 4.9), it can be concluded that the results are the same as with the other indicators. China has a greater provincial disparity than that of Canada. It can be seen from this graph that from 1981 to 1990, both countries experienced provincial inequality but that the indices for both countries converged; then they experienced a divergence of provincial inequality from 1991 to 2003, followed by convergence again from 2004 onwards. In China, provincial inequality changed more significantly than that of Canada from 1981 to 2007. If we compare the cross-country analysis, the distance of the curved Theil index lines between both countries seems not to have changed significantly, almost keeping the same distance during the whole period.

Figure 4.9 Theil, Theil0 and Theil1 Indices for China and Canada



Note: x_i is the value of the variable of interest for the *i*th region; if there are *n* regions, $\bar{x}$ is the sample mean for x, or $\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i$.

4.2 Convergence

Two concepts of convergence appear in discussions of per capita income convergence across countries and across regions (see Chapter 2). In this section per-capita GDP data are used to estimate σ-convergence and β-convergence. Cross-sectional data are constructed for the 31 provinces of China, and for the 10 provinces of Canada from 1981 to 2007. Regression analysis is then undertaken for different time periods: (i) the whole period 1961-2007; (ii) the first sub period 1961-1980; and (iii) the second sub-period 1981-2007; and (iv) for shorter periods such as 1961-1970, 1971-1980, 1981-1990, 1991-2000 and 2001-2007. First, a simple descriptive per capita GDP is analyzed to see if there are signs of convergence.

Table 4.1 Simple Test of Convergence

Year	Canada	China	Disparity
1960 GDP (Current US$)	2200	92	2108
1980 GDP (Current US$)/ (PPP) per capita GDP	10987/11109	313/251	10674/10858
2008 GDP (Current US$)/ (PPP) per capita GDP	45085//39098	3259/5970	41826/33128
Total GDP Growth Rate from 1960 to 2008	20. 49	35.4	18.29

Data source: Calculated based on the GDP (Current US$) and population data report of World Bank 2009.

Figure 4.10 Standard Deviation of Per Capita GDP between Canada and China

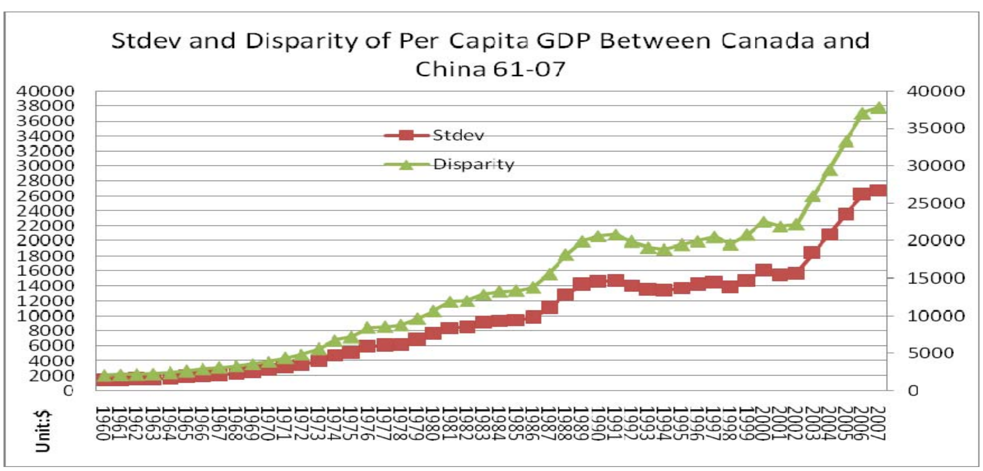
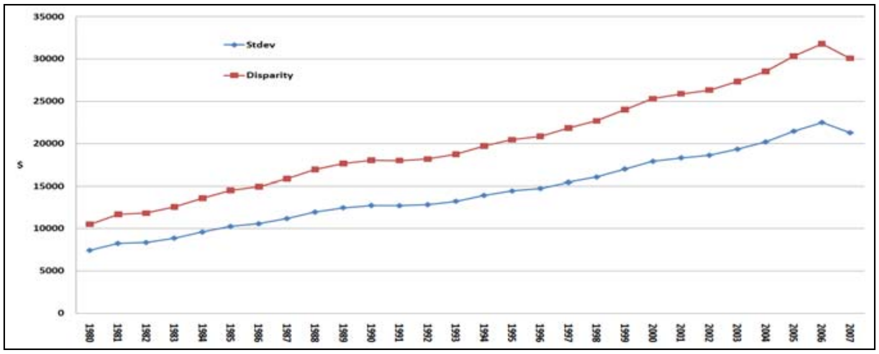


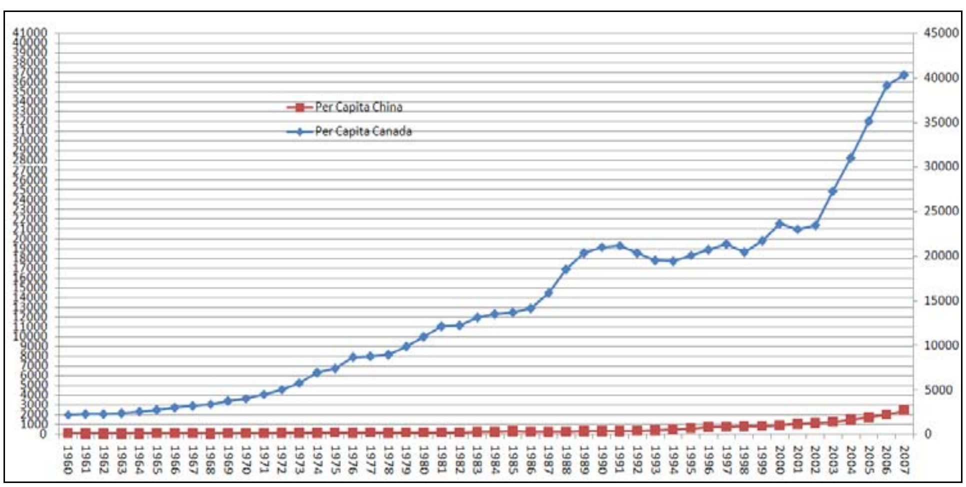
Figure 4.11 Standard Deviation of Per Capita PPP (GNI) between Canada and China, 1980-2007



From Table 4.1 and Figures 4.10, 4.11 and 4.12 it can be concluded that both economies increased gradually while the disparity of per capita GDP between both countries has become greater:

- The rate of growth of China is faster than Canada. It is not possible for the income gap between Canada and China to narrow if the initially 'poor', in this case China, does not grow faster than the initially 'rich', or Canada. From the table it can be seen that there is Absolute Beta-convergence between the two countries.

Figure 4.12 Per Capita GDP of Canada and China 1960-2007 (Current $US)



Note: Per Capita GDP ($US), World Bank Group Data

- The disparity in Per Capita GDP increases from $2108 in 1960 to $41826 in 2008 (and the standard deviation of Per Capita GDP increases from $1490.5 to

$29575 between 1960 and 2008). So there is a lack of Sigma convergence in this case (Figures 4.9 and 4.10). In other words, China growing faster than Canada is not enough to guarantee a fall in the standard deviation of GDP per capita in the cross-sectional analysis. If we consider the standard deviation and disparity per Capita PPP of both countries from 1981 to 2007 (Figure 4.9), the per capita PPP of both countries increased since 1981, and then decreased from 2007. But the disparity had diverged since 1981 gradually. In order to test the results of these descriptive statistics, the empirical convergence analyses are performed in the following sections.

4.2.1 Sigma Convergence

The concept of σ-convergence can be defined as when "a group of economies are converging in the sense of σ if the dispersion of their real per capita GDP levels tends to decrease over time" (Sala-i-Martin 1995: 323).

A frequently used indicator for the convergence measurement is the variation coefficient of the GDP per capita denoted by σ and calculated as follows:

$$\sigma = \sqrt{(1/n).\sum (x_i - \bar{x})^2} \Big/ \bar{x} \qquad (4.6)$$

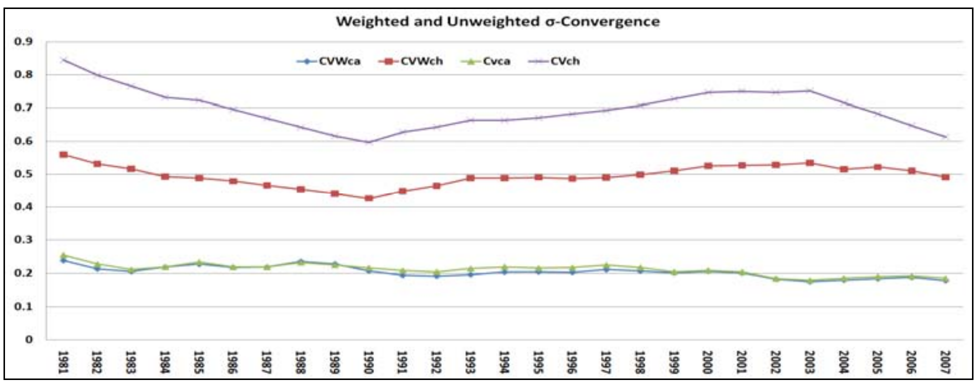
where x_i is the value of the variable of interest for the *i*th region, there are *n* regions, and $\bar{x}$ _is the sample mean for x. This indicator is also known as σ- convergence, first used by Sala-i-Martin, along with β-convergence (Iancu 2007). This type of convergence may be presented in terms of the standard deviation or coefficient of variation of per capita income across economies. It is widely used in the growth literature and displays a decrease over time in the dispersion of real per-capita income across a group of economies (see more on this in Chapter 2). A higher value of σ- convergence indicates a more serious income disparity, and *vice versa*. The σ-convergence not only quantifies the income inequality problem but also measures the development of an income gap between different economies.

To compare Canada and China, the population factor should also be taken into consideration. So σ can be transformed into a new weighted one, σ_w, by simply employing a population weighted variance $\frac{Pop_i}{Pop^*}$ given by the expression below:

$$\sigma_w = \frac{\sqrt{\sum_{i=1}^{N} \frac{Pop_i}{Pop^*} (x_i - \bar{x})^2}}{\bar{x}} \qquad (4.7)$$

where x_i, is the value of the variable of interest for the *i*th region, there are n regions, $\bar{x}$ is the sample mean for x , p_i is population of the *i*th region, and pop^* is the national population.

Figure 4.13 The σ-Convergence (the Variation Coefficient) of Canada and China 1981-2007 Calculated by GDP per Capita



Notes: China includes 31 provinces and cities. Canada includes 10 provinces; the 3 territories are excluded in the calculation because of data availability problems.

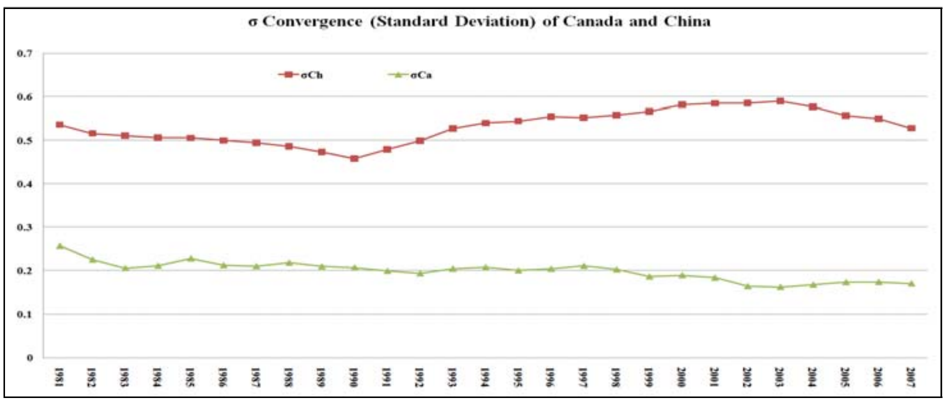
Barro and Sala-i-Martin (1995: 383) pointed out that the dispersion can be measured by calculating the standard deviation of the per-capita logarithm for each year. The following formula will be used to estimate the standard deviation for each year:

$$\sigma_t = \sqrt{(1/n).\sum_{t=1}^{n} (\ln \bar{x}_t - \ln x_{it})^2} \quad (4.8)$$

where σ_t stands for standard deviation at period t, $\ln \bar{x}$ and $\ln x_{it}$ represent the logarithm of the average per capita GDP of regions at period t and the logarithm of per capita GDP in region i at period t respectively; n is the number of regions. By computing the dispersion of provincial per-capita GDP of Canadian and Chinese regions, we can examine the provincial σ convergence rate of both countries' regional income disparity. If σ_{t-1} is less than σ_t, then σ-convergence exists. However, if σ_{t-1} is more than σ_t, then σ convergence does not exist.

Finally, to investigate whether the regional distribution of income tended toward being divergent during the period of high national economic growth or during the period of crisis, we can plot the σ convergence for each period. The growth rate across regions will be convergent if the period of the crisis, which is represented by the lower of the aggregate GDP growth values, exhibits decline in the value of σ convergence, and vice versa (Figures 4.13 and 4.14).

Figure 4.14 The σ- Convergence (the Variation Coefficient) for Canada and China



It can be seen from Figures 4.13 and 4.14 that from 1981 to 2007, Canada experienced a significant provincial σ convergence for the whole period while China experienced provincial σ convergence from 1981 to 1990 and σ divergence from 1991 to 2003, with convergence starting again from 2004. If we compare the cross-country analysis, the distance of the curved σ convergence lines between both countries seems to have converged slightly for the period 1981-1990, and then diverged gradually. If we compare the weighted σ convergence that takes into account the population factor, there is significant divergence between both countries.

4.2.2 Beta Convergence

To test if an initially lower income country has a higher rate of income growth, researchers often use two types of equation to estimate β convergence: absolute convergence and conditional convergence. First, absolute convergence is considered.

Beta convergence is defined as a negative relationship between initial income levels and subsequent growth rates. In order to test for regional Beta convergence, the common non-linear version of the basic growth regression approach with per capita income growth as the dependent variable and the initial income level as the explanatory variable are used to calculate Beta convergence. Beta convergence analysis has generally been employed in order to investigate convergence across economies or regions using cross-sectional data, and involves implementing the following model:

$\ln(y_{i0+T}/y_{io})/T=\alpha_0+\alpha_1\ln(y_{io})+\varepsilon_i$ (4.9)

where

y_{i0} – initial GDP per capita in region *i*

T – number of years in observation period

α_0,α_1 – parameters to be estimated

ε_i- normally and independently distributed error term.

In particular, if we consider estimations based on equation (4.9) these are referred to as absolute Beta convergence. The annual rate of convergence can be obtained from the equation $\beta = -\ln(1-\alpha_1)/T$, where T denotes the number of years between initial and the final year of observation (see Chapter 2). If $\beta<0$ and is statistically significant, it is inferred that there is β-convergence, i.e. the lower the initial level of income, the higher the growth rate, or, in other words, when poor regions grow faster than rich ones, as a consequence incomes inevitably converge. If, on the contrary, $\beta > 0$, then it is said there is β-divergence. A significant negative estimate can be interpreted as evidence of absolute convergence. The convergence rate measures how fast economies converge towards the steady state. The half-life $\Gamma= \ln(2)/\beta$ is defined as the time which is necessary for half of the initial income inequalities to vanish.

Model (4.9) is estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1961-2007, (ii) the first sub period 1961-1980, and (iii) the second sub-period 1981-2007(iv) short periods such as 1961-1970, 1971-1980, 1981-1990, 1991-2000, 2001-2007. The estimated results are presented below in Table 4.2 with a summary of the most important statistics.

Table 4.2 Cross Country Absolute Beta Convergence

Year	Country	ln(y0+t/y0)	lny0	Estimation Equation	Annual Rate
61-07	Canada	2.894349886	7.709756864	ln(y0+t/y0) = -0.169453 lny0 + 4.200791	-0.00326
	China	3.467219724	4.329055273		
81-07	Canada	1.203146018	9.400960732	ln(y0+t/y0) = -0.319544 lny0 + 4.207165	-0.01027
	China	2.521710491	5.274564506		
61-80	Canada	1.586761204	7.709756864	ln(y0+t/y0) = 0.210089 lny0 -0.03297	0.011792
	China	0.876514501	4.329055273		
61-70	Canada	0.596715296	7.709756864	ln(y0+t/y0) = 0.061779 lny0 + 0.120416	0.006377
	China	0.387859528	4.329055273		
71-80	Canada	0.884685392	8.411832676	ln(y0+t/y0) = 0.121389 lny0 -0.136419	0.012941
	China	0.441844969	4.763724805		
81-90	Canada	0.551316985	9.400960732	ln(y0+t/y0) = 0.018204 lny0 + 0.380179	0.001837
	China	0.476198901	5.274564506		
91-00	Canada	0.107245529	9.961756461	ln(y0+t/y0) = -0.228183 lny0 + 2.380351	-0.02055
	China	1.057268887	5.798331997		
01-07	Canada	0.56085726	10.04324949	ln(y0+t/y0) = -0.092697 lny0 + 1.491837	-0.01266
	China	0.847727074	6.948547923		

The regression results do not confirm the convergence hypothesis in all cases with the "beta" coefficient being negative. For the whole period, countries converge at a speed of 0.32% per year, but it is not very significant. In the first sub period 61-80, the rate of divergence is 1.17% per year while in the second sub-period 81-07 the convergence rate is 1.02%. Generally, the estimation results are not satisfactory and no serial correlation has been found in all cases. For the short periods 61-70, 71-80 and 81-90, there was divergence at different rates 0.63%, 1.29% and 0.18% respectively, but during the other short periods both countries converge at a rate of 2% in the period of 1991-2000 while they converge at the rate of 1.26% in the period 2000-2007. Finally, the results are partially consistent with the "sigma" convergence analysis where we found a fall in the dispersion of per capita income in the last sub-period 2001-2007 and divergence in the period 1981-1990. However, the "beta" divergence for the whole period is not consistent with the "sigma" convergence indicating that the rate of "beta" convergence was not sufficient to ensure a close approximation in the absolute levels of per capita income ("sigma" convergence).

The Absolute Beta Convergence approach assumes that all regions or economies under consideration have the same steady-state income path. But this is a highly restrictive assumption and may induce a significant heterogeneity bias in estimates of the convergence coefficient between different countries with different steady status.

In this case, the cross-country absolute convergence of Canada and China does not fully support the absolute convergence hypothesis. Furthermore, the absolute convergence hypothesis is not supported by any empirical proof though, particularly when studying the economies of different states or regional economies of different states. Barro and Sala-i-Martin (1991) themselves admit the need to take some other factors – called conditioning variables – into account, as they prevent the convergence to a unique steady-state taking place (Brasili 2005).

4.2.3 Estimation Results of β-Convergence at National Level

Based on Model 4.10, the provincial beta convergence of each country can be calculated as follows:

- by regressing the average growth rate of per Capita GDP between time t_{beg} = 1981 and time t_{end} = 2007 on initial income at time t_{beg} = 1981 where:

$$(\ln Yit_{(end)} - \ln Y_{it(beg)})/\ T = \alpha + \beta \ln Y_{it(beg)} + \mu_i \quad (4.10)$$

Here, i is the index for each region where i = 1 to 10 in Canada while i = 1 to 31in China. Time is indexed by t where t(beg) = 1981 and t(end) = 2007. The sample period is indexed by T where T = 27 years for the whole period.

lnY = natural log of real per capital income.

α = constant term and μ_i = random error term.

Model (4.10) is estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1981-2007, (ii) the first sub period 1981-1990, and (iii) the second sub-period 1991-2000, and (iv) the short period 2001-2007.

Table 4.3 National Beta Convergence for Each Country

Country	Year	B	R	(5% significance)
Canada (10 regions)	1981-2007	-0.442724	(r) = -.719245 (r^2 = .517313)	65.24%
	1981-1990	-0.201322	(r) = -.883984 (r^2 = .781428)	95.05%
	1991-2000	-0.076575	(r) = -.28943 (r^2 = .08377)	11.81%
	2001-2007	-0.144079	(r) = -.372104 (r^2 = .138462)	17.28%
China	1981-2007	-0.160544	(r) = -.28066 (r^2 = .07877)	32.49%
	1981-1990	-0.171818	(r) = -.52254 (r^2 = .273048)	85.71%
	1991-2000	0.154364	(r) = .43113 (r^2 = .185873)	67.31%
	2001-2007	-0.116753	(r) = -.44046 (r^2 = .194005)	69.45%

From Table 4.3, it can be clearly seen that the beta coefficient is negative ($\beta<0$), and is significant in Canada during the whole period and the sub-period 1981-1990. It shows there is strong convergence during the 1981-1990 period, and convergence during the whole period while there is weak convergence during the 1991-2000 and 2001-2007 periods.

Table 4.4 Absolute Beta Convergence, Canada

Canada	Year	B	R	(5% significance)
13 region	1981-2007	-0.131897	(r) = -0.218094 (r^2 = 0.047565)	10.15%
	1981-1990	-0.127565	(r) = -0.419275 (r^2 = 0.175792)	28.25
	1991-2000	-0.093729	(r) = -0.466586 (r^2 = 0.217703)	34.71
	2001-2007	0.101807	(r) = 0.326526 (r^2 = 0.106619)	18.15

Most of the previous analytic studies excluded the three territories of Canada due to their sparse population within a large territory. There is a slight difference in the results of the Beta coefficient if these three territories of Canada are included in the absolute beta convergence calculation (Table 4.4). The results are also not very significant. For the whole period 1981-2007 and sub period 1981-1990, there are signs of convergence with smaller beta coefficients of -0.131897 and 0.127565 respectively than the previous ten region beta coefficients of -0.442724 and -0.201322 respectively (Table 4.3). The results are similar for the sub-period

1991-2000, but the result for the last sub period 2001-2007 is totally the opposite.

In the case of China, per capita provincial income converged for the whole period from 1981 to 2007, but it is not very significant. For the sub-periods there is convergence during the period 1981-1990, then divergence during 1991-2000, and convergence again during 2001-2007, and all of these results are very significant. The result can be interpreted as reflecting very closely the regional development policy of China during these periods. The results are consistent with the "sigma" convergence of China where we found a divergence of per capita income dispersion during the first sub period (1981-1990) and a fall in the dispersion of per capita income in the whole period 1981-2007 for China. In the case of Canada, there is convergence for the whole period (1981-2007) and this is consistent with the sigma convergence of this country. However, the "beta" divergence for the last short period is not consistent with the "sigma" convergence indicating that the rate of "beta" convergence was not sufficient to ensure a close approximation in the absolute levels of per capita income ("sigma" convergence) during the last period.

4.2.4 Conditional Beta Convergence

Conditional convergence implies that a country or a region is converging towards its own steady state while absolute convergence implies that all countries or regions are converging to a common steady state. To test for conditional β-convergence, equation 4.11 is extended below by using a set of dummy variables to control for country-specific effects that differ between individual countries and affect the change in the per capita growth rate. These country-specific effects could include (but are not limited to) differences in industrial structure (agriculture, industry, service sectors proportion of GDP), Labour Force, High-technology exports (% of manufactured exports), Imports of goods and services (% of GDP), Foreign direct investment, net inflows (BoP, current US$), Exports of goods and services (% of GDP), Gross capital formation (% of GDP), and population in both countries. By accounting for these unobserved differences for both countries, it can be determined whether or not country-specific effects influence the test of convergence.

$1/T \log(Y_{it}/Y_{i0}) = \alpha - 1/T(1\text{-}e^{-BT}) \log Y_{i0} + \lambda X_{it} + u_{it}$ (4.11)

This traditional regression model can be changed into the following form:

$(\ln Y_{it(end)} - \ln Y_{it(beg)})/ T = \beta_0 + \beta_1 \ln Y_{it(beg)} + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_n X_n + \mu_{it}$ (4.12)

where $yi0$ – initial GDP *per capita* in region i,

T – number of years in observation period,

$\beta_0, \beta_{1\ldots} \beta_n$ - parameters to be estimated,

εi– normally and independently distributed error term.

When the estimated coefficient β_1 is negative, poor economies tend to grow faster than rich ones. The annual rate of convergence β_1 can be obtained from the equation $\beta=-\ln(1-\beta_1)/T$, where T denotes the number of years between the initial and the final year of observation.

Table 4.5 Conditional Beta Convergence

Year	Country	Ln(y0+t/y0)	lny0	x1	x2	x3	x4	x5	x6	Beta	
61-07	Canada	0.06	7.71	21.22	23.75	22.67	22.90	23.23	17.02	β_1	-0.001045
	China	0.07	4.33	23.34	23.64	20.93	23.13	22.23	20.70	β_w	-0.002033
81-07	Canada	0.04	9.40	23.26	25.92	25.12	25.04	25.68	17.03	β_1	-0.005139
	China	0.09	5.27	24.85	24.48	23.92	25.33	24.51	20.72	β_w	-0.008701
61-80	Canada	0.08	7.71	21.39	23.92	22.84	23.07	23.40	17.06	β_1	0.005429
	China	0.05	4.33	23.29	23.59	20.88	23.09	22.19	20.76	β_w	0.004342
61-70	Canada	0.06	7.71	21.60	24.13	23.05	23.28	23.61	17.08	β_1	0.002233
	China	0.04	4.33	23.55	23.85	21.14	23.34	22.44	20.79	β_w	0.003478
71-80	Canada	0.09	8.41	22.18	24.92	23.76	23.81	24.27	16.89	β_1	0.003586
	China	0.05	4.76	24.25	23.88	21.72	24.09	22.31	20.55	β_w	0.005374
81-90	Canada	0.06	9.40	23.88	26.54	25.73	25.65	26.30	17.13	β_1	0.000895
	China	0.05	5.27	25.42	25.05	24.49	25.94	25.08	20.72	β_w	0.001195
91-00	Canada	0.01	9.96	23.52	26.73	25.74	25.44	26.25	17.15	β_1	-0.0109
	China	0.11	5.80	25.26	25.57	25.09	25.64	25.63	20.86	β_w	-0.017639
01-07	Canada	0.08	10.04	25.89	26.88	26.46	25.64	26.91	17.25	β_1	-0.00527
	China	0.12	6.95	25.97	27.01	26.43	26.90	26.96	20.96	β_w	-0.011165

Note: β_1 is the estimated coefficient, β_w the estimated coefficient of regression weighted by the population factor X6. X1 is Agriculture, value added (% of GDP), x2 is Services, etc., value added (% of GDP), x3 is Exports of goods and services (% of GDP), x4 is Gross capital formation (% of GDP), x5 is Merchandise trade (% of GDP), and X6 is population.

Model (4.12) is estimated by a multiple (general) linear version of the generalized growth regression, for different periods: (i) the whole period 1961-2007, (ii) the first sub period 1961-1980, and (iii) the second sub-period 1981-2007, and for (iv) short periods such as 1961-1970, 1971-1980, 1981-1990, 1991-2000, 2001-2007. The estimated results are presented in Table 4.5 which contains a summary of the most important statistics. The regression results do not confirm the convergence hypothesis in all cases with "beta" coefficient being negative. For the whole period, the countries converge at a speed of 0.1045% per year, and 0.2033% per year by population weighted regression; the results are not very significant. In the first sub period 61-80, the rate of divergence is 0.5429% per year while in the second sub-period 1981 - 2007 the convergence is 0.5139%. Generally, the estimation results are not satisfactory (little significance) and no serial correlation was found in any of the cases. For the short periods 61-70, 71-80, 81-90, there was slower than absolute beta divergence at different rates (0.2233%, 0.3586%, 0.0895% respectively), but during the other short periods both countries converge at a higher speed - 1.09% rate in the period 91-00 while they converge at the rate of 1.11% in the period 00-07. If the population weighted conditional Beta Convergence results are compared, there are higher speeds of convergence during the periods 61-07 (0.2033%), 81-07 (0.8701%), 91-00 (1.7%), 01-07 (1.11%) while there is a lower speed of divergence during the period 61-80 (0.4342%). The difference of weighted and unweighted regression during the other periods is very slight. Finally, the results are partially consistent with "sigma" convergence where we found a decrease in the dispersion of per capita income in the last sub-period 2001-2007 and divergence in the period 1981-1990. However, the conditional "beta" divergence for the whole period is not consistent with "sigma" convergence while it is consistent with absolute beta convergence indicating that the rate of conditional "beta" convergence was not sufficient to ensure a close approximation in the conditional levels of the per capita income "beta" convergence between two countries.

4.3 Spatial Data analysis

Another dimension of the convergence analysis is that regional economic growth may follow a particular spatial pattern. It is important to investigate the spatial patterns that may indicate the spillover effects among regions.

Convergence patterns can be expected to differ between Canada and China, because of the large territorial size of both countries and the unequal distribution of population and economic centres. Therefore, separate spatial models for both countries are estimated individually. Spatial dependence can be handled in beta convergence in alternative ways.

4.3.1 Spatial Dependence

The statistical device usually employed to test for the presence of spatial dependence (spatial correlation) is the Global Moran's I statistic. The spatial dependence measure for each period *t* is provided by a global statistic such as Moran's I statistic, which can be represented by equation 4.13.

$$\mathrm{I} = \frac{n\sum_{i}^{n}\sum_{j}^{n} w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{(\sum_{i}^{n}\sum_{j}^{n} w_{ij})\sum_{i}^{n}(y_i - \bar{y})^2} \qquad (4.13)$$

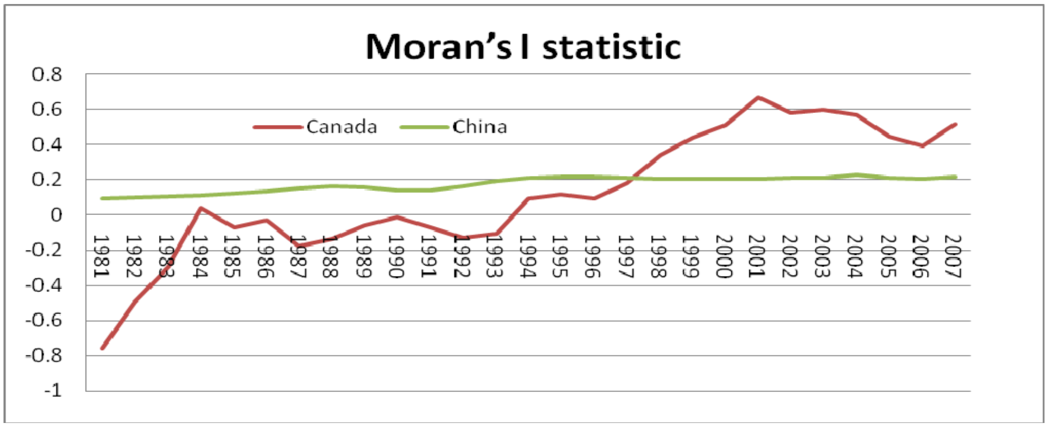
where is y_i is the variable under consideration in spatial unit i in year *t*; $\bar{y}$ is the average of the variable over all regions in year *t*; n is the number of spatial units (in this case the number of provinces in a country); w_{ij} is an element on the *i*th row and *j*th column of the matrix of $n \times n$ weights; w_{ij} is a non-stochastic square matrix the elements of which represent the intensity of the interdependence between each pair of economies; in the simplest case w_{ij}=1 if the economies *i* and *j* are neighbors and 0 otherwise.

It is interpreted much like a correlation coefficient. Values near +1 indicate a strong spatial pattern (high values tend to be located near one another); values near -1 indicate a strong negative spatial autocorrelation; high values tend to be located near low values (spatial patterns with negative autocorrelation are either extremely rare or nonexistent!); and finally values near 0 indicate an absence of spatial pattern.

The results in Figure 4.15 show that there has been a stronger tendency for spatial dependence among the regions in Canada than that of in China since 1997. In Figure 4.15 Moran's I shows that there is a very gradual increase in spatial interaction among the Chinese regions, but the speed (of increase) is very slow. This pattern becomes stronger in the last decade; since 1991 it is statistically significant and it has been rapidly growing since 1981, which is coincident with the beginning of the new regional development policy. Interestingly, the measure of spatial autocorrelation also tends to co-move with the measure of income dispersion. But it is interesting to observe that provincial spatial correlation has increased in Canada since 1981. In particular, the spatial dependence tends to reach its minimum values in 1981, followed by slow long term increases from 1984 to 2001; then there is a slight decrease until 2006 and then an increase in 2007, coinciding with the period some have previously identified with a long term regional income convergence (Colombo 1996; Sala-i-Martin 1996b; Shiller 2009). It revealed no evidence of departure from normality; this is partly consistent with convergence trends. In the case of China, spatial correlation coefficients have increased gradually since 1981 (leveling off from 1995 onward), which is consistent with beta convergence during the whole period.

Global Moran's I statistic provides only a limited set of spatial association measurements. The Moran's I statistic provides a visual impression of the overall stability of the global pattern of dependence, as well as the ability to identify local regimes of spatial dependence that may depart from the overall pattern. So in order to obtain a better insight of spatial dependency, it is necessary to carry out an analysis using Local Moran's I_i Statistics. Local Moran's I is a local spatial autocorrelation statistic based on the Moran's I statistic. It was developed by Anselin (1995) as a local indicator of spatial association or LISA statistic. It is used to evaluate whether clustering occurs around particular points or may be used to detect clusters. The local Moran for state i takes the following form.

Figure 4.15 Dynamic Change of Moran's I for Regional GDP per Capita of Canada and China



Note : The three territories of Canada are included.

According to Anselin (1995), a local Moran statistic for a point i is defined as

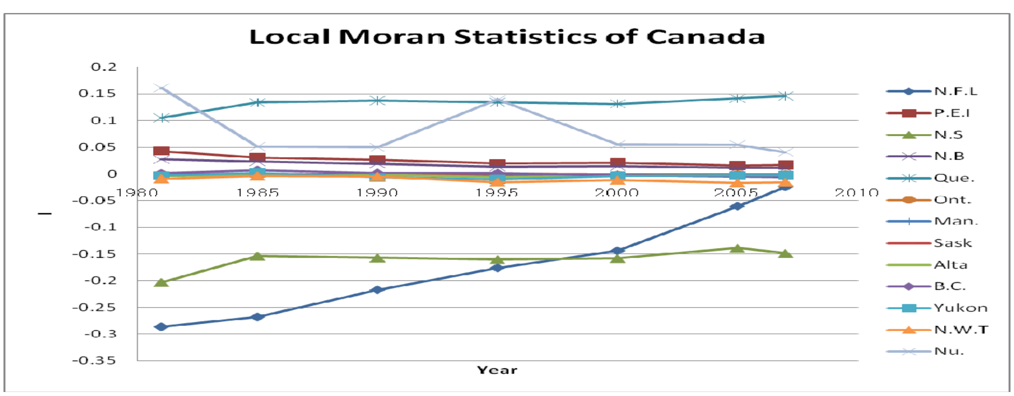
$$I_i = \frac{x_i - \bar{x}}{S^2} \sum_{j=1}^{N} w_{ij}(x_j - \bar{x}) \qquad (4.14)$$

where

$$S^2 = \frac{\sum_{j=1, j \neq i}^{N} x_j^{\,2}}{N-1} - \bar{x}^2 \qquad (4.15)$$

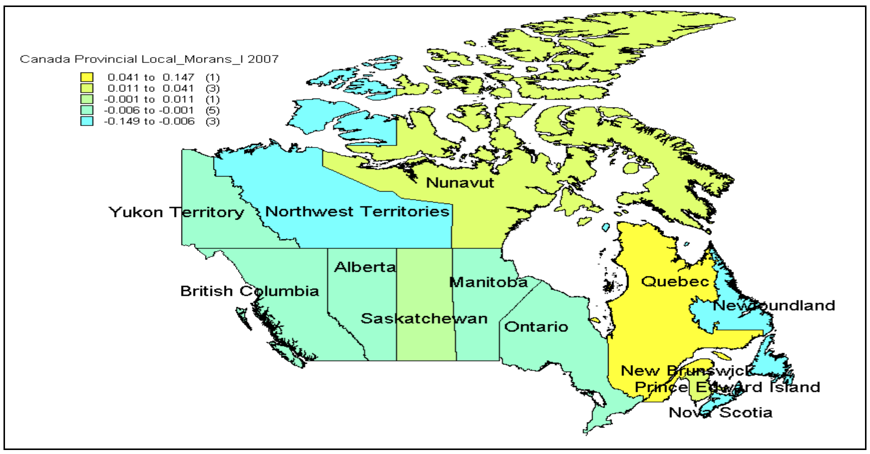
In this analysis, Local Moran's I is used to look for spatial association around each individual location.

Figure 4.16 Local Moran's I Statistics for Canada



In terms of the spatial autocorrelation of Canada with provinces as the spatial units (Figure 4.16), the Local Moran's I analysis can be used to confirm that there is positive spatial autocorrelation in this area. Quebec has high values for Local Moran's I, but it is not very significant. It can be concluded from this analysis using Local Moran's I that there is not a clustering tendency with most provinces having zero proximity on Local Moran's I in Canada (Map 4.1).

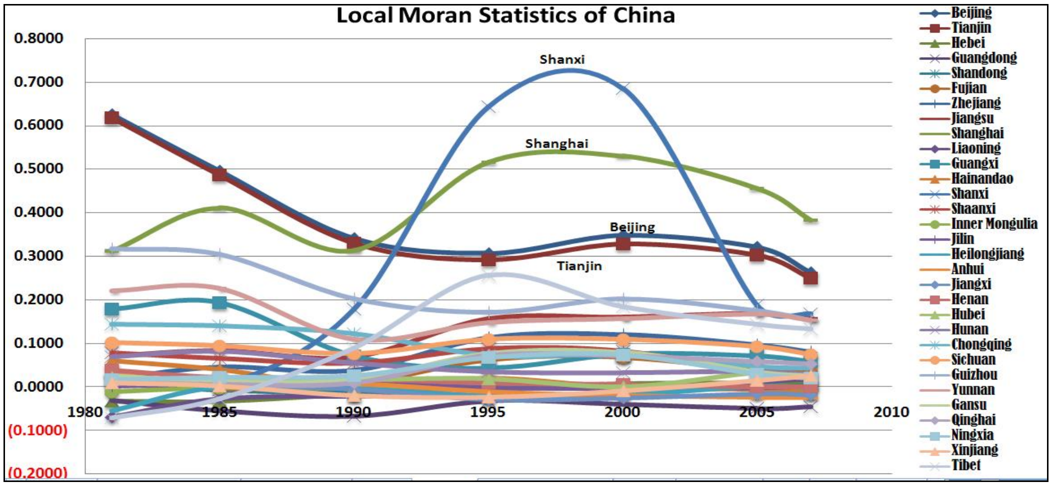
Map 4.1 Map of Local Moran's I Statistics 2007, Canada



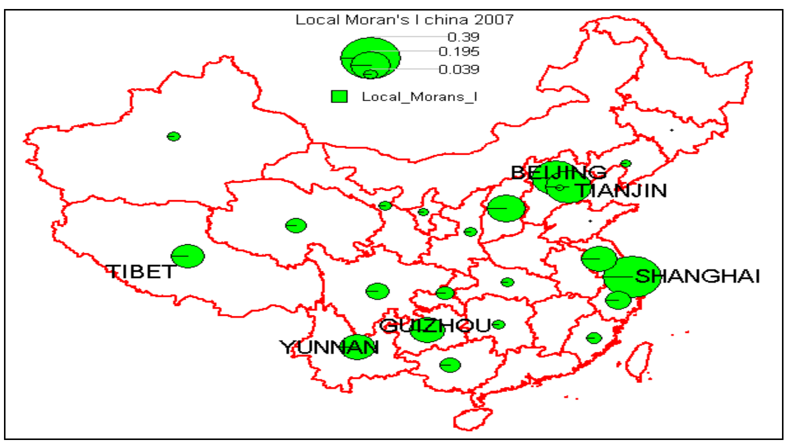
In the case of China and using the province as the spatial unit to analyze spatial autocorrelation (Figure 4.17), the Local Moran's I analysis confirms that there is more positive spatial autocorrelation in China. There is a clustering trend in China's provincial level development.

However, the Global Moran's I cannot indicate on which side the clustering trend takes place: high values cluster or low values cluster? The three economic centres of China, Shanghai, Beijing, and Tianjin, have the high values of Local Moran's I since 1981 and are statistically very significant. It can be concluded from this analysis using Local Moran's I (Map 4.2) that there is a high clustering tendency for Beijing, Tianjin, and the provinces around Shanghai. Shanxi province (the dark blue curve) has the unsteady Local Moran's I due to its fluctuating per capita rank during the period.

Figure 4.17 Local Moran's I Statistics for China



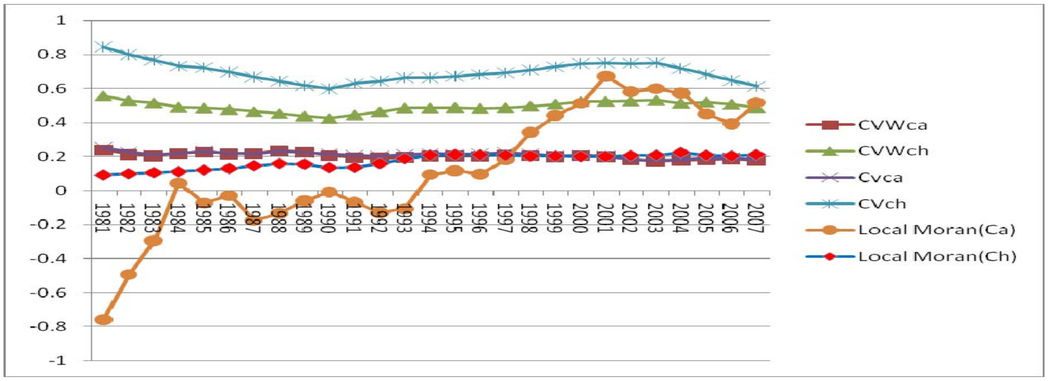
Map 4.2 Map of Local Moran's I Statistics 2007, China



Guizhou, Yunnan and Tibet, three provinces in southwest China, also contributed relatively highly to the Moran index in 2007, meaning that the poorest provinces tend to form a 'poor' cluster; but their Local Moran's I value has decreased with the economic increase of other economic centres.

In contrast to the weighted and unweighted σ Convergence series and Local Moran's I (Figure 4.18), it can be seen that there is convergence, if the Local Moran's I increases. This provides support for positive spatial dependency. This is important since it implies that any convergence models that ignore such spatial dependency would be incorrectly specified.

Figure 4.18 σ Convergence and Spatial Autocorrelation for China



In brief, the number of regions and w (the scaling factor equal to the sum of all the elements of the w_{ij} matrix) are significantly different in each country. Canada has only 13 regions, and the w_{ij} matrix is very simple while China has 31 regions and its w_{ij} matrix is very complex. Most of the provinces border with 4 or 5 other provinces, with the maximum number of bordering provinces reaching 8 (e.g. Inner Mongolia) in China; in Canada, most of the provinces border with 1 or 2 other provinces, with the maximum number of bordering provinces reaching 5 (e.g. Northwest Territory). The sum of all the elements of the w_{ij} matrix is only 34 in Canada if three territories are included, but in China it is 136. The most important factor is that the average territorial size of provinces in Canada is much larger than that of China. Thus, if the smaller spatial units such as cities and counties are taken into consideration in Moran's I statistics, the results are more more convincing.

4.3.2 Spatial Analysis

Another dimension of the convergence analysis is that regional economic growth may follow a spatial pattern. Spatial dependence can be handled in beta convergence in alternative ways.[1] The first approach, the spatial error model, assumes that the spatial dependence operates through the error process, where any random shock follows a

[1] For a detailed analysis of spatial econometric techniques and methods see Anselin (1988) and Henley (2003).

spatial pattern, so that shocks are correlated across adjacent regional economies, such that the error term in equation (4.16) may reveal a significant degree of spatial covariance, which can be represented as follows:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + u_i \quad (4.16)$$

$$u_i = \rho W u_i + \varepsilon_i \quad (4.17)$$

So substituting (4.17) into model (4.16) results in a spatial error regression given by (4.18) as below:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + \rho W u_i + \varepsilon \quad (4.18)$$

where ρ is the spatial error coefficient, ε_i is a white noise error component and *W* is a spatial weighting matrix. *W* may be constructed using information on physical distance between pair wise combinations of economies in the sample or may be defined such that element $w_{ij} = 1$ if *i* and *j* are physically adjacent and 0 otherwise. Here, the latter approach is preferred.

Alternatively, the spatial lag model examines the extent to which regional growth rates depend on the growth rates of adjacent regions, conditional on the level of initial income:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + \rho W \log(y_{it}/y_{i0}) + u_i \quad (4.19)$$

where ρ denotes the spatial autoregressive parameter.

Moreover, the spatial cross-regressive model allows any spatial spillovers to be reflected in the initial levels of income as follows:

$$\log(y_{it}/y_{i0}) = \alpha + \delta \log y_{i0} + \tau W \log y_{i0} + u_i \quad (4.20)$$

where τ represents the spatial spillovers.

Table 4.6 Beta Coefficient of Spatial Dependency Models

		Beta Coefficient				Rate			
Country	Period	Absolute	SEM	SLM	SCM	Absolute	SEM	SLM	SCM
Canada	81-07	-0.442724	-0.418118	-0.476003	-0.942018	0.0216554	0.0200551	0.023935901	0.105467506
	81-90	-0.201322	-0.094568	-0.146172	-0.092583	0.0224797	0.0099343	0.015802551	0.009715318
	91-00	-0.076575	-0.083692	-0.127604	-0.085734	0.0079666	0.0087403	0.013651183	0.008963372
	01-07	-0.144079	-0.316555	-0.071866	0.468023	0.0222253	0.0543727	0.010654166	-0.054845228
China	81-07	-0.160544	-0.050355	0.013448	-0.065913	0.0064815	0.0019136	-0.000494755	0.002525396
	81-90	-0.171818	-0.203154	-0.132257	-0.192486	0.0188522	0.0227094	0.014185969	0.021379489
	91-00	0.154364	0.144622	0.245982	0.20297	-0.014355	-0.013507	-0.021992397	-0.01847935
	01-07	-0.116753	-0.027899	-0.017103	-0.055646	0.0177358	0.0040422	0.002464421	0.008179169

Notes: Detailed Tables of Calculation are given in Appendix A4. SEM, SLM, SCM indicate the spatial error model, the spatial lag model, and the spatial cross-regressive model respectively.

4.3.3 Econometric Results of Spatial Models

SEM, SLM and SCM Models (4.18, 4.19, 4.20) are estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1981-2007, (ii) the first sub period 1981-1990, and (iii) the second sub-period 1991-2000, and (iv) the short period 2001-2007. From Table 4.6, it can be clearly seen that the beta coefficient is negative ($\beta<0$) and is significant in Canada during the whole period and the sub-period 1981-1990. The results of convergence are mostly consistent with the results of other researchers. For example, Sala-i-Martin (1996b) measured absolute convergence for Canadian provinces for the period 1960-1991 and found a Beta convergence of 0.024. Colombo (1996) who estimated per capita income of Canadian provinces over the period 1924-1994 period, found that there was no convergence prior to the entry of Newfoundland into Confederation in 1949; and also detected there was convergence of personal income at a rate of 0.0277 during the 1950-1977 period. Shiller (2009) found that Canadian provinces converge at an annual rate of between 2.15% and 2.37%. In this study, the difference is that all the 10 provincial and three territories of Canada are taken into consideration for the estimate of convergence. The Beta convergence rate of Canadian provinces is 0.022 during the period 1981-2007, 0.022 during the period 1981-1990, and 0.022 during the period 2001-2007, but it is not very significant at

0.008 during the period 1991-2000. If spatial independence is considered, Beta convergence results are similar at about the 0.02 level found by the models SEM and SLM for the period 1981-2007; the SCM model had a high convergence coefficient of 0.11. This implies that the growth rate of an individual province is affected by the initial per capita income level of its neighbours. For the short sub-periods 1981-1990 and 1991-2000, the beta coefficients SEM and SCM are not very significant, but the beta coefficients calculated by the SLM model are significant for the whole period and the sub-periods. This clearly indicates the growth rate of an individual province is affected by the growth rate of its neighbours. The beta coefficient 0.05 is the highest one found by SLM while the beta coefficient calculated by the SCM model is not consistent with the other models during the short sub period 2001-2008.

In the case of China, there is a weak convergence of per capita provincial income during the whole period from 1981 to 2007, but it is not very significant even if it is consistent with the results of the SEM and SCM models. If provincial spatial dependency is considered, the provincial convergence rates of China are not very significant for the different periods with exception of the subperiod 1981-1990. All the estimates of Absolute Beta, SEM, SLM and SCM models strongly confirm that there is convergence for the period 1981-1990 at the different rates of 0.02, 0.022, 0.0142, 0.021 respectively, and there is divergence for the sub-period 1991-2000; there is a very weak convergence if spatial SEM, SLM and SCM Models are considered for the last sub-period. The SLM model does not support the convergence for the whole period while the other models confirm a weak but not significant convergence. This indicates that actual interaction of provinces is not very positive for the period. However, for the last sub-period 2001-2007, the result is better if spatial dependency is considered. The result suggests it is very closely related with the regional development policy of China during these periods.

4.4 Conclusion

This chapter has attempted to compare and measure cross-country convergence between Canada and China at the national scale by using recently released long term data and to derive new evidence of convergence in each country using different measurement methods for the period 1961-2007.

At first, both countries were compared usiing multi-indicators and traditional methods such as Descriptive Statistics, the Variance of logarithms, the CV, the Gini index and the Theil index. The empirical results as reported in the previous sections showed that there is significant gap in both countries in many indicators such as GDP, per capita GDP, and GDP composition by sectors and both countries are very different in economic status and structure.

All the results of the analyses showed that in Canada provincial disparity has gradually decreased since 1960, while in China provincial disparity decreased during the period 1981 to 1990, then increased until 2003, after which it decreased or remained at the same level. If both countries are compared, for the whole period there was divergence between both economies. It can be concluded that provincial disparity in China is greater than in Canada. The analysis indicated that most of the indicators for China have increased faster than for Canada over the whole period under study.

Then, under this precondition of existence of absolute β-convergence, cross-country beta convergence (including conditional convergence) and σ-convergence were tested. The σ-convergence showed Canada experienced a significant provincial σ convergence for the whole period while China experienced provincial σ convergence from 1981 to 1990 and σ divergence from 1991 to 2003, with convergence starting again from 2004. If we compare the cross-country analysis, both countries seem to converge slightly, but not significantly. If we compare the weighted σ convergence that takes into account the population factor, there is significant divergence between both countries. The estimation results of β-convergence at the national level (in each country) showed that the beta coefficient is negative ($\beta<0$), and is significant in Canada during the whole period. There is a slight difference in the results of the Beta coefficient, if the three territories of Canada are included in the absolute beta convergence calculation. However, the territories cannot really be compared with the provinces, since their populations are so small.

However, this does not change the outcome of the analysis.

Thirdly, Conditional β-convergence was tested using a set of dummy variables to control for country-specific effects in terms of agriculture, services, exports of goods and services, gross capital formation, merchandise trade and population factors. Lastly, the estimated coefficient of regression was weighted by the population factor. For the whole period, the results are not very significant. The results are partially consistent with "sigma" convergence where we found a decrease in the dispersion of per capita income in the last sub-period (2001-2007) and divergence in the period (1981-1990). However, the conditional "beta" divergence for the whole period is not consistent with "sigma" convergence while it is consistent with absolute beta convergence.

Finally, the spatial analysis including Global Moran's I, Local Moran's I were calculated and the spatial error model (SEM), the spatial lag model (SLM), and the spatial cross-regressive models (SCM) were also taken into consideration in the beta convergence analysis of each country individually. Global Moran's I statistic showed that there has been a stronger tendency for spatial dependence among the regions in Canada than for China since 1997 and that there is a gradual increase in spatial interaction among the Chinese regions, but the speed is very slow. The Local Moran's I analysis confirms that there is more positive spatial autocorrelation in China. There is a clustering trend in China's provincial level development while there is not a provincial clustering tendency of Local Moran's I in Canada in regional per capita income. This spatial trend also indicates the larger provincial disparity in China and the smaller provincial disparity in Canada. The estimated results of spatial SEM, SLM and SCM are mostly consistent with the convergence results of other researchers (for example, Sala-i-Martin (1996b), Colombo (1996) and Shiller (2009)). The results of these spatial models supports the "sigma" convergence for China where we found a convergence of per capita income dispersion during the first sub period (1981-1990) and a fall in the dispersion of per capita income in the whole period 1981-2007. In the case of Canada, there is weak convergence for the whole period (1981-2007) and this is consistent with sigma convergence for this country.

In Chapter 5 that follows, regional, provincial and urban case studies based on recently released updated long-term statistical data are presented in order to provide more detailed evidence and to explore structural differences between both economies.

Chapter 5
Regional and Provincial Case Studies

The objective of this chapter is to present new evidence of regional and provincial patterns based on recently released updated long-term statistical data in both countries; further it provides an overview of regional economies with particular attention to structural differences between the two economies. An analysis of regional economic dynamics at a different scale is necessary in large countries to improve regional economic development policy. The focus of this chapter and the following Chapter 6 is on multi-scalar comparative studies of regional, and provincial and urban cases of Canada and China. First, the regional economic data are compared at the regional scale for each country using regions as units of observation. In addition, the provinces of Quebec in Canada and Xinjiang in China are selected as the provincial case studies.

5.1 Regional Case

The regional economic development of a country with a large territory is more complicated and difficult to analyze. The main problem with economic analysis at the sub-national level in this situation is the choice of the unit of analysis. The word "region" can mean very different things both within and between countries. One feasible approach that can be applied is, therefore, to divide its vast land area into smaller geographical scales which can yield a better interpretation of the spatial mechanisms at work and the regional characteristics.

5.1.1 Regional Division

Canada is a federation composed of ten provinces and three territories. The ten provinces are Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island, Quebec and Saskatchewan, while the three territories are the Northwest Territories, Nunavut and the Yukon. The provinces and territories of Canada combine to make up the world's second largest country in total area. Unlike the provinces, the territories of Canada have no inherent jurisdiction and only have those powers delegated to them by the federal government. In general, the 10 provinces and territories are geographically divided into 4 sub regions (Map 5.1), i.e. Atlantic Canada or Eastern Canada (Newfoundland and Labrador, Prince Edward Island, New Brunswick and Nova Scotia); Central Canada (Quebec and Ontario); Western Canada (Manitoba, Saskatchewan, Alberta and British Columbia); and Northern Canada (the Northwest Territories, Nunavut and Yukon) for different research purposes. However, the three Northern Canada territories combined are the most sparsely populated region in Canada with about only 107,000 people spread across a huge area. They are often referred to as a single region, the North. The three territories generally exhibit higher GDP per capita values, especially the Northwest Territories and Nunavut, attributable to heightened federal transfers that accommodate the high costs of living in the rather difficult Arctic climate and relative isolation of Northern Canada.

Map 5.1 The Major Regional Divisions of Canada

Politically, the North was long defined as comprising the Yukon and the Northwest Territories (NWT). Since 1999, that geography has evolved through the creation of Nunavut out of the eastern and central parts of the former NWT, leaving the western part with its original territorial name (Wallace 2002). Due to the sparse population of the three Northern Canada territories and their higher GDP per capita values, they are often excluded in geographical and scientific studies.

China is a republic or the People's Republic of China; it is geographically divided into 31 provincial-level administrations. China has three kinds of provincial-level units in its territorial-administrative hierarchy: provinces, autonomous regions and municipalities directly under the central government. In the Chinese state administration, 'autonomous' refers to self-government by a large and single (but not necessarily majority) ethnic minority in a given unit within the territorial hierarchy. In addition to these 31 administrative units there are the two Special Administrative Regions of Hong Kong and Macao.

Autonomous regions are provincial-level units of state administration where the presence of an ethnic minority is officially recognized. It should be noted that, in China, the three kinds of provincial-level administrations have different functions compared to each other. For example, the leaders of some top municipalities (4) directly under the central government leadership have been appointed as members of the Political Bureau of the Chinese Communist Party Central Committee (CCPCC), while very few provinces and autonomous regions leaders have been so appointed. The autonomous regions are only established in areas where one ethnic minority accounts for the major portion of the population. As a result of the cultural differences between the non-Han ethnic minorities and the Han majority, the autonomous regions are, at least in form, the most politically and socially autonomous units among the three kinds of provinces. Furthermore, all provinces are independent of each other in terms of designing local fiscal, tax, and labour and trade policies (Rongxingguo 2007).

Due to the diversified natural and geographical environments and the heterogeneous social and cultural conditions in China, the Chinese economy was spatially divided into 31 provinces (including five autonomous regions and four city-provinces) in mainland China. Before the sixth Five-Year Plan (1981-1985*),* the Chinese central government grouped China's provinces into two regions for policy purposes, the coastal and interior regions. In 1986, the definition of the regions was changed with the interior region being further disaggregated into central and western regions, making for three regions: coastal, central and western (see, for example, Tsui, Kai-yuen (1993) Thomas (1998), Tian, xiaowen (1999), Wangshaoguang and Anguanghu (1999), Weiyehua Dennis (2000), Carsten (2000), Sylvie (2001), Guang (2004), Liuxuhua (2004) and Yan Xiaopei (2004)).

This three-region division was used to implement the "ladder-step development strategy", in which the three regions were seen as steps of a ladder and they were expected to develop sequentially starting with the coast. Since then, the three-region definition has been widely used in government policy documents as well as in the research literature (see, for example, Yao and Zhang (2001), Brun et al (2002), Liu and Wei (2003) and Wu (2004)). It should be noted that the government's definition changed somewhat after 1999 when, for example, the south-eastern province of Guangxi, originally part of the coastal region, was re-allocated to the western region and Inner Mongolia, originally part of the central region, was reallocated to the western region.

Map 5.2 Three Regions of China

Note: The three regions are divided according to the Government's new reallocation. Taiwan, Hongkong and Aomen are not included due to missing data and other reasons.

The updated composition of the three regions is as follows (Map 5.2):

•Coastal Region: this consists of three municipalities directly under the central government and 8 provinces: Beijing, Tianjin, Hebei, Guangdong, Hainan, Shandong, Fujian, Zhejiang, Jiangsu, Shanghai and Liaoning;

•Central Region: this consists of 8 provinces: Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan;

•Western Region: this consists of five autonomous regions, 6 provinces and one municipality directly under the central government: Sichuan, Chongqing (Municipality), Inner Mongolia, Guizhou, Yunnan, Guangxi, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

Often, the method of regionalization of the national economy may be different, depending upon the analytical purposes. In this study, the four regions of Canada and the updated new regional division version of three regions of China (so the result might be somewhat different from previous studies) are selected for the analysis at the regional scale.

5.1.2 Regional Case of Canada

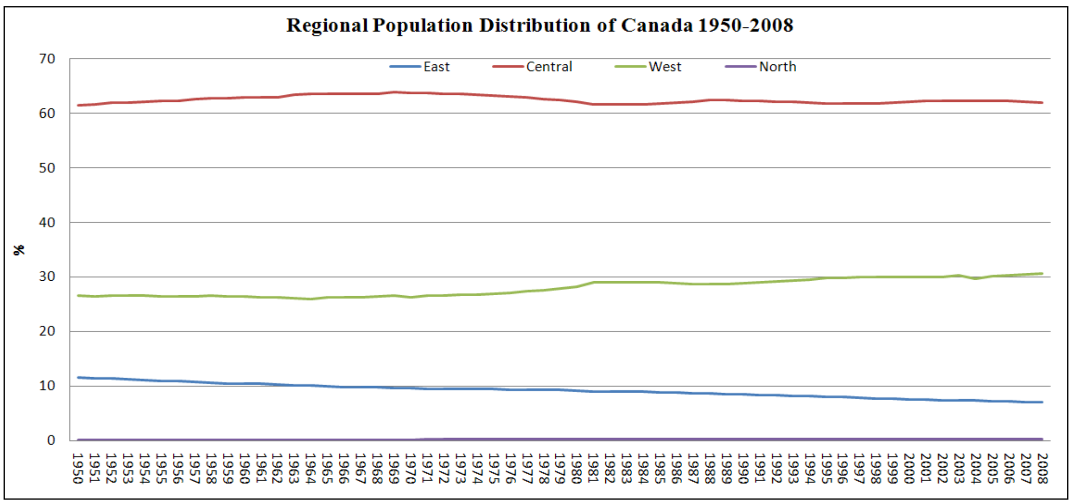
A relatively small population (33.3 million in 2008) is distributed unevenly across Canada. There are substantial differences in territorial size and population distribution between Canadian regions (Table 5.1). In 2008, 7% of the population lived in Eastern Canada, 62.1% in Central Canada and 30.6% in Western Canada respectively. The highest population density is 9.13 inhabitants per km^2 in Central Canada while the lowest value is 0.03 inhabitants per km^2 for Northern Canada. Because of the harsh climate, only 0.32% of Canada's population is found in Northern Canada which accounts for about 39.21% of the area of the country. If we compare the distribution of population change for the period 1950-2008 (Figure 5.1), Central Canada and Northern Canada have maintained almost the same percentage share, but the population of Western Canada has increased from 28.9% to 30. 6% while it has decreased in Eastern Canada from 9.01% to 7% for this period. This can be explained by the international and interprovincial immigration and natural increase of population. Based on the 2001-2006 data of Statistics Canada, there was a -1.5% and -1.1% decrease in population in Newfoundland and Labrador and Saskatchewan respectively, while population increased by 10.6% in Alberta and 8.7% in Northern Canada.

Table 5.1 Territorial Size and Population Distribution, Canada 2008

Region	Area%	% of GDP	Pop%	Pop Density/ Km^2	Employment%	Investment%
Atlantic	5.42	5.75	7	4.66	6.5	5.2
Central	26.17	60.42	62.1	9.13	61.93	36.9
Western	29.2	33.29	30.6	3.76	31.56	57.4
Northern	39.21	0.50	0.3	0.03	0.01	0.5

Source: Calculated based on data from Statistics Canada.

Figure 5.1 Regional Population Distribution of Canada

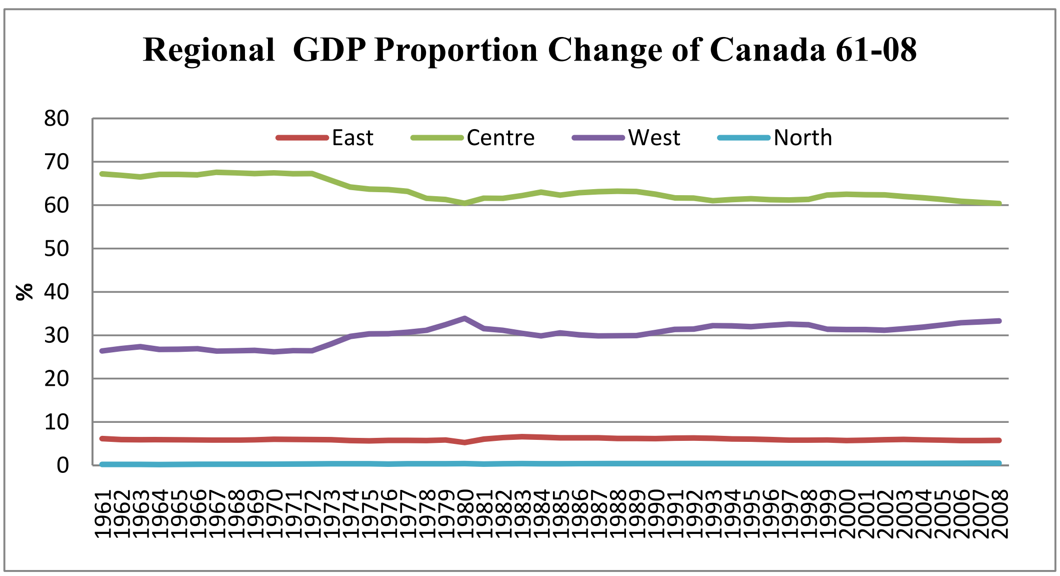


Source: Calculated based on the population data of Statistics Canada

The Canadian economy has undergone significant change since 1950. But in terms of population and economic activities, it differs greatly from region to region. Based on the regional GDP proportion and the population distribution, it can be seen from the data (Figures 5.1 and 5.2) that Central Canada has been the economic core of Canada, home to about 62% of its population and producing about 60% of its total GDP and containing much of its industry. But its regional GDP proportion has decreased gradually while Western Canada has gained both in terms of population and the regional GDP share since 1981, while the rapid growth in trade with Asia has enriched British Columbia and oil wealth has provided a major boost to Alberta and Saskatchewan. The regional per capita GDP of Western Canada has been higher that the other regions since 1973 except for the Northern Region. Eastern Canada has experienced a major decline both in terms of population and regional GDP share, and has traditionally been significantly poorer than the rest of Canada. However, Newfoundland and Labrador's offshore oil industry has made significant contributions to its provincial economy in recent decades. The oil industry accounted for 35 % of the provincial GDP in 2007, up from 13 % in 1999 and 24.3 % in 2004. According to Statistics Canada, Newfoundland and Labrador experienced greater economic growth in 2007 than any other Canadian province, largely due to its oil and mining industries[1].

The persistence of regional disparity in Canada reflects the country's diversity and its model of fiscal federalism. Interprovincial migration can potentially play an important role in the convergence of regional disparities. People tend to migrate from poor regions with high unemployment to rich regions with low unemployment. The decision to migrate or not is also tied to the costs of migration, to the political, institutional and cultural context, and to the geographic and climatic environment (Coloumbe 1999).

Figure 5.2 Change in Regional GDP Share for Canada, 1961-2008



Source: Calculated based on data of Statistics Canada. Source: Provincial Economic Accounts: Historical issues 1961-1986, Catalogue: 13-213S, Statistics Canada, *Provincial and Territorial Economic Accounts: Data tables*, catalogue number 13-018-X.

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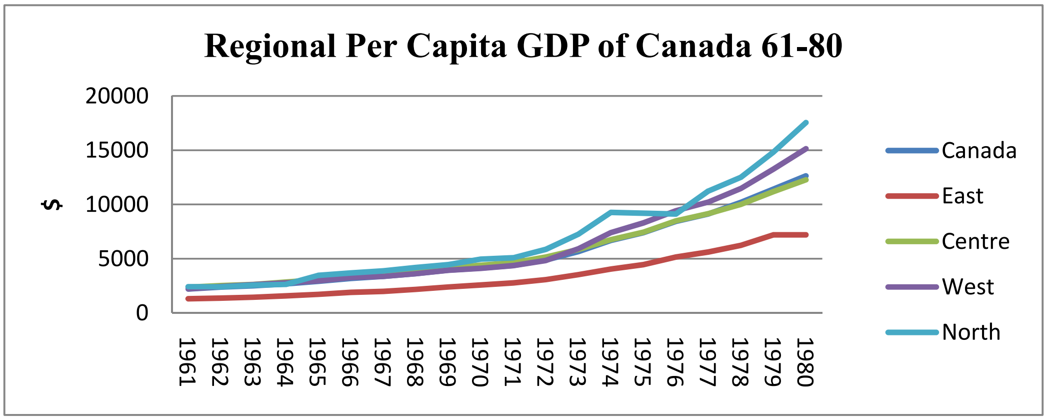
[1] http://www.heritage.nf.ca/society/oil_economy.html

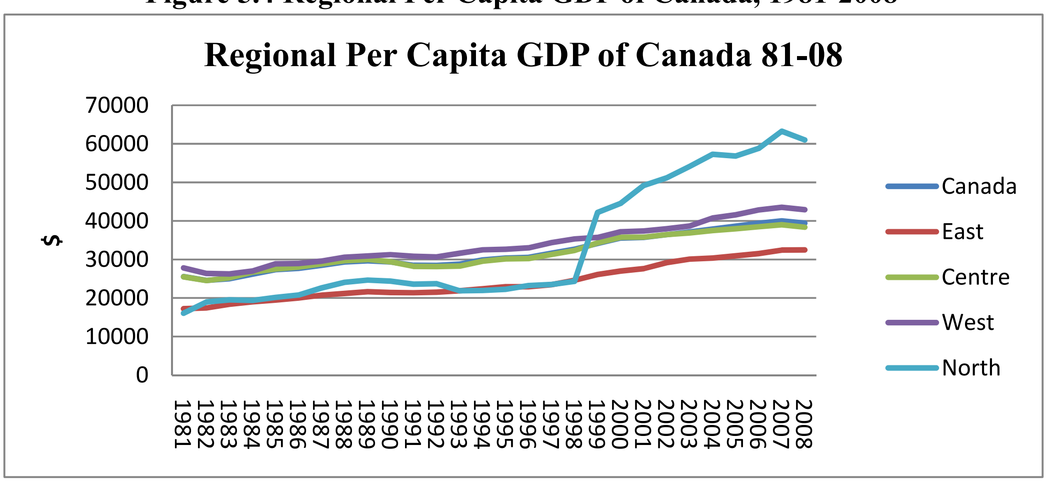
If the total number of interprovincial migrants (net-migration (persons)) from 1962-2007 is compared, the total number is -273,057 for the East region, -380,066 for the Central Region (Quebec -665,602 and Ontario +285,536) and for the Western Region (Alberta +516,361, B.C. +717,360, Manitoba -249,189 and Saskatchewan -312,908). The total regional GDP share and the population of the North have not changed much for the last six decades, but per capita GDP has increased sharply since 1976, then leveling off above the other regions since 1998 due to federal transfer payments for equalization (Figures 5.3 and 5.4).

Figure 5.3 Regional Per Capita GDP for Canada, 1961-1981



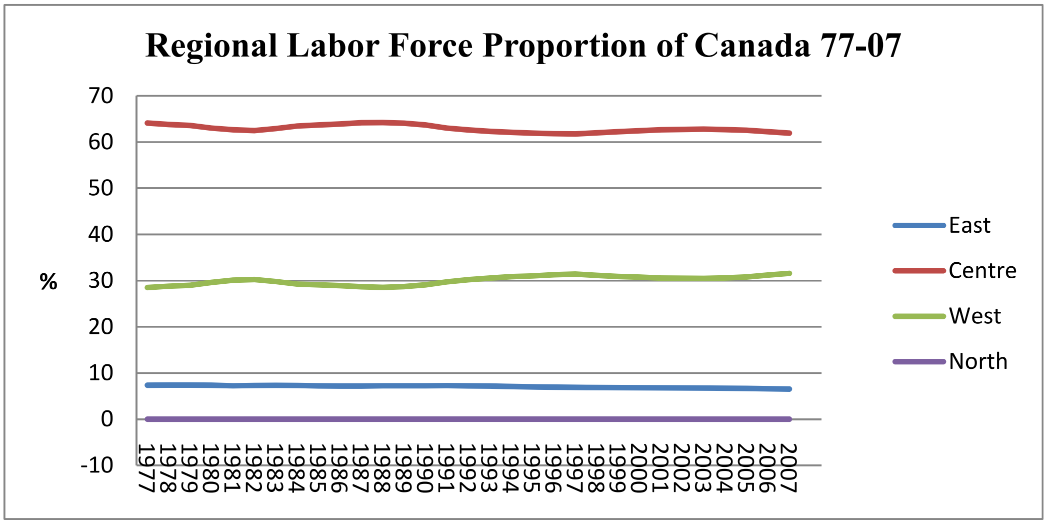
Source: Calculated based on data of Statistics Canada. Source: Provincial Economic Accounts: Historical issues 1961-1986, Catalogue: 13-213S

Figure 5.4 Regional Per Capita GDP of Canada, 1981-2008



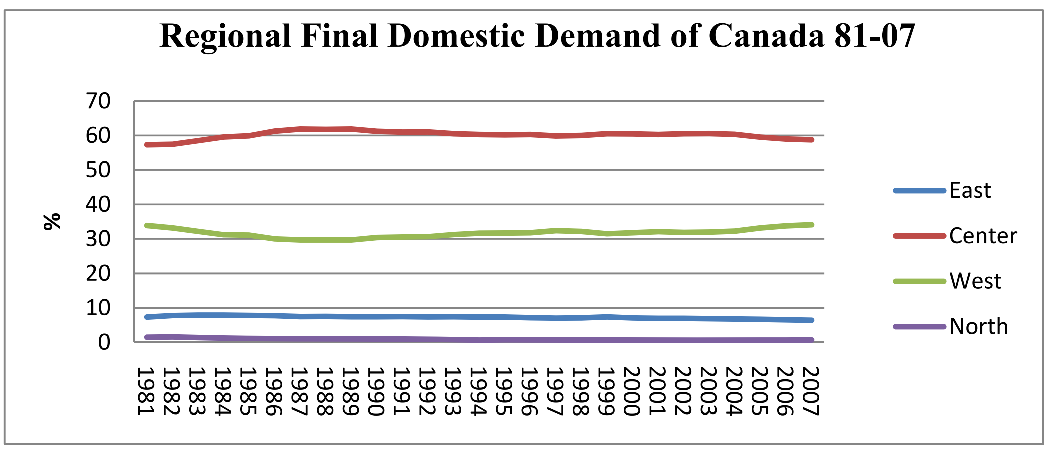
Source: Calculated based on the statistical data of Statistics Canada, *Provincial and Territorial Economic Accounts: Data tables*, catalogue number 13-018-X.

Figure 5.5 Regional Labour Force Proportion for Canada, 1977-2007



Source: Calculated based on the statistical data of Statistics Canada, Labour Force Information (Catalogue no. 71-001-XIE)

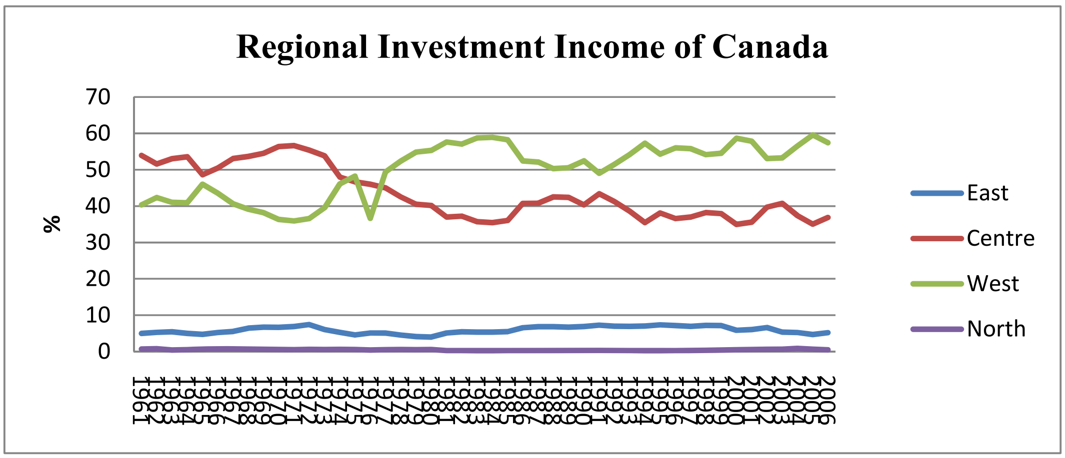
Figure 5.6 Regional Final Domestic Demand for Canada, 1981-2007



Source: Calculated based on the tables of Statistics Canada, Provincial and Territorial Economic Accounts: Data tables, catalogue number 13-018-X.

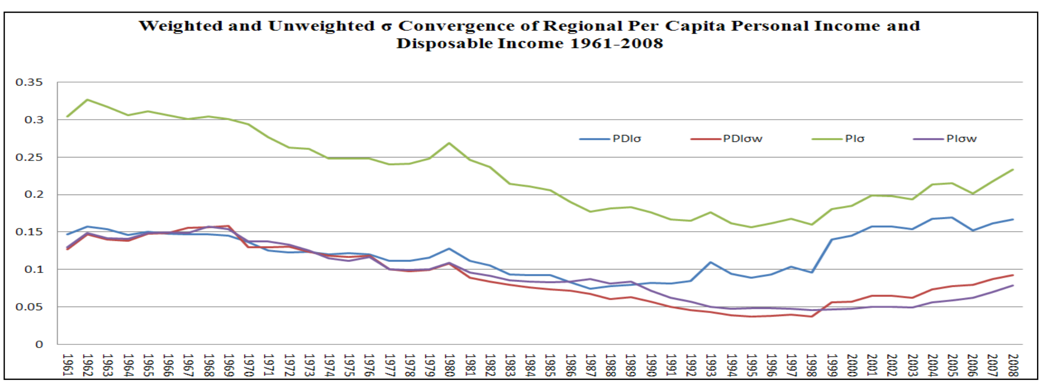
In Canada, almost 94.3% of government investment income is centred in the central and western regions, with roughly the same levels since 1961 (Figure 5.7). The government investment income of Canada includes total federal, total provincial, total local, Canada Pension Plan and Quebec Pension Plan investment incomes. The regional share of Government investment income in the Central Region has decreased gradually from 54% in 1961 to 36.9% in 2006 while it has increased in the Western Region due to the rapid increase in Alberta's provincial investment income with the boom of the oil industry since 1976 from 40.4% to 57.4% in 2006. In the Northern Territories and in the Eastern Atlantic Region, it has not changed much for the whole period.

Figure 5.7 Regional Investment Income of Canada



Note: Source: Statistics Canada, *Provincial and Territorial Economic Accounts: Data tables*, catalogue number 13-018-X. Provincial Economic Accounts: Historical issues 1961-1986, Catalogue: 13-213S.

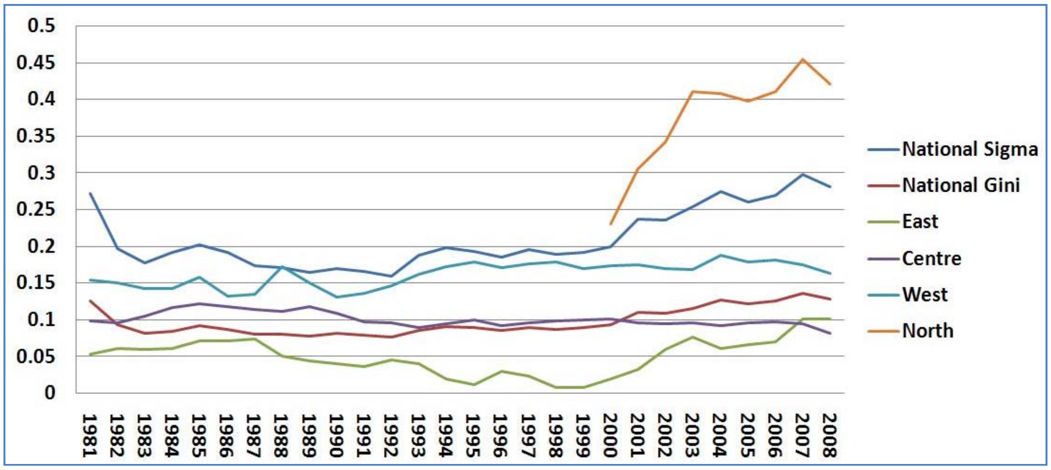
Figure 5.8 Weighted and Unweighted σ Convergence of Regional Per Capita Personal Income and Disposable Income, 1961-2008



Note: PI- Personal Income, PDI-Personal Disposable Income. Author's calculations from Statistics Canada data.

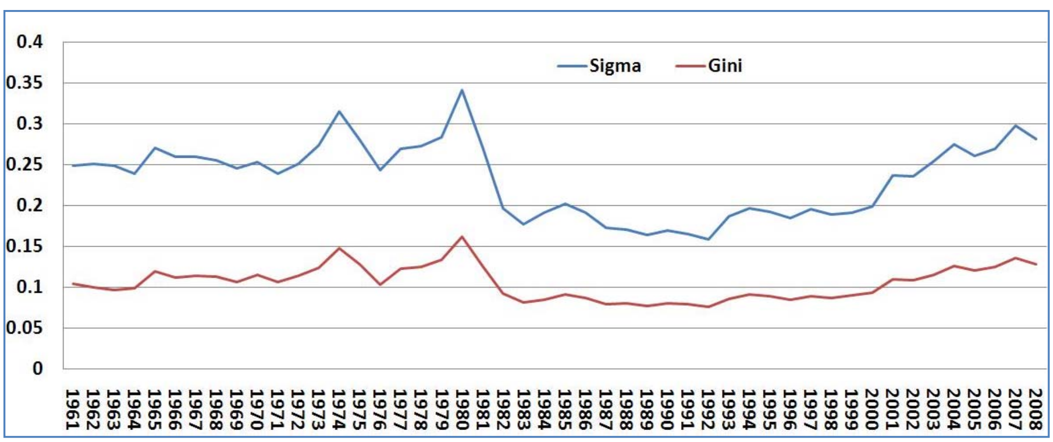
The regional labour force and final domestic demand are key indicators of the increase in regional GDP. Both indicators are significantly correlated with the total regional GDP (Figures 5.2, 5.5 and 5.6). The Central and Eastern regions have undergone a slight decrease in their share of all three indicators while the Western Region has experienced a gradual increase since 1991.

Figure 5.9 Regional σ Convergence and Gini Coefficients of Canada, 1981-2008



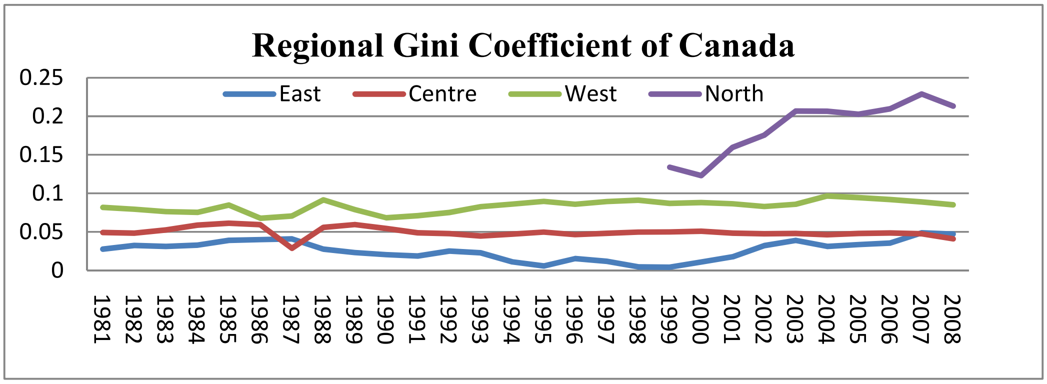
Source: Author's calculations from Statistics Canada data.

Figure 5.10 Cross Regional σ Convergence and Gini Coefficients for Canada, 1961-2008



Source: Author's calculations from Statistics Canada.

Figure 5.11 Regional Gini Coefficients of Canada, 1981-2008

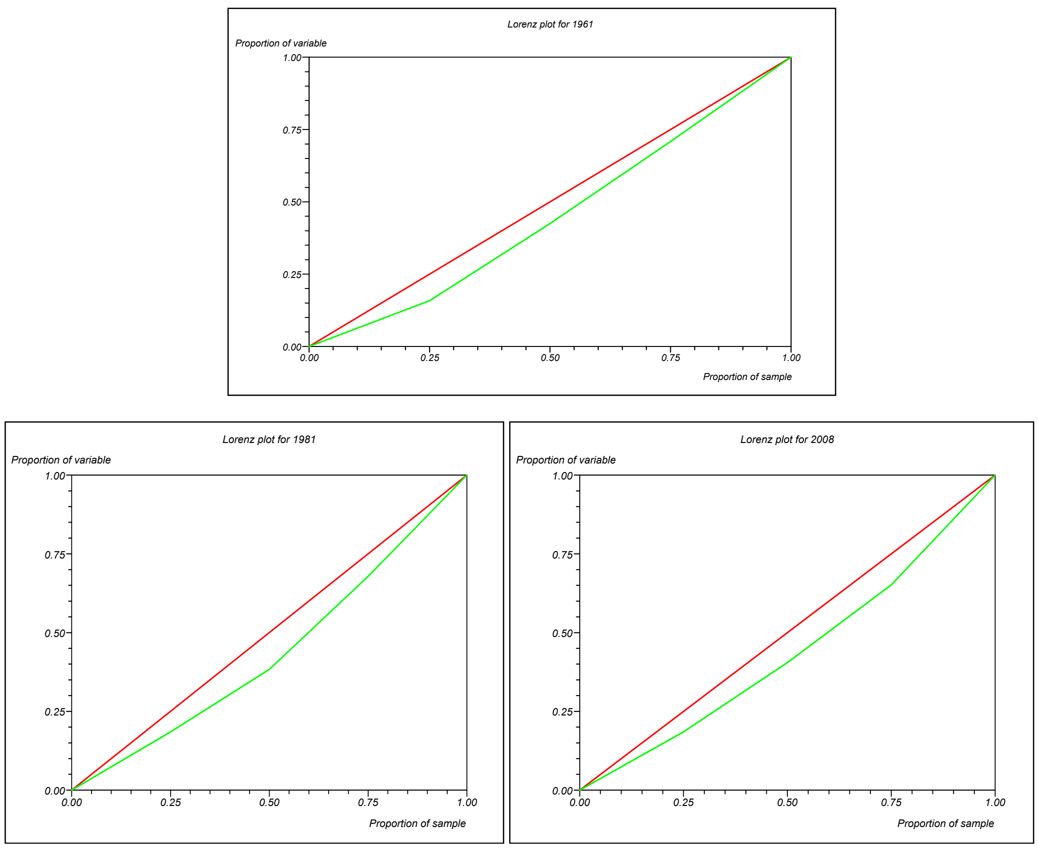


If we compare cross-regional population the weighted and unweighted σ convergence of regional per capita personal income and disposable income for the period 1961-2008, they converge for the whole period, but there has been a significant divergence in 1981 due to the economic challenges faced by Canada and there has been a slight divergence in both indicators since 2000 (Figure 5.8). The changes in the cross-regional σ convergence and Gini coefficients (Figures 5.9 and 5.10) is consistent with the overall trend of the Canadian economy. During the whole period, the regional economies have maintained a steady trend. However, the figures highlight the three economic slowdowns in Canada which were associated with divergence at the beginning of the 1970s and again with the economic depressions in 1981 and in 2007. From the Gini coefficient of inequality index on Figures 5.9 and 5.10, it can be concluded that regional disparity in Canada has not changed much since 1981.

The provincial per capita GDP disparity in the northern region is significantly the largest in Canada ($91,270 for NW while it was $36,198 for Nunawut and $44,833 for Yukon in 2008); however, it does not affect the overall Canadian regional disparity results very much due to its small population. Newfoundland in eastern Canada has seen an increase in its per capita GDP since 2001, surpassing other provinces due to the development of mining and oil industry. The regional Gini coefficient in Figure 5.11 shows that the provincial disparity in the Atlantic region and in the Northern Region have increased while the other major regions' (Central Canada and Western

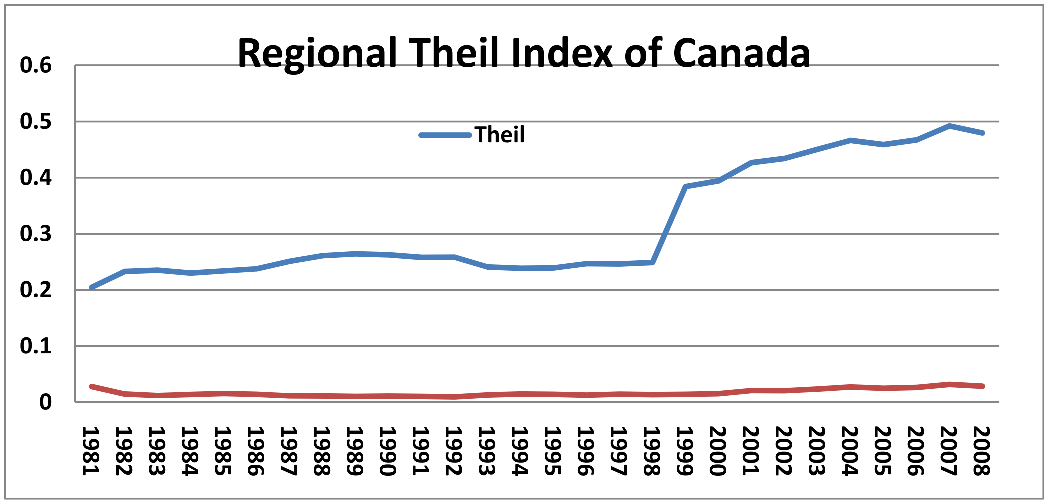
Canada) disparities between the provinces in each region have not changed much. Regional inequality decreased from 1981 until 1990, but since then it increased slightly until 2000 when it began to increase with more speed. If we compare the regional Lorenz curves of 1961, 1981 and 2007 (Figure 5.12), the differences can be very clearly seen. The curve point of the Lorenz curve line (green) between line of perfect equality (red) and the line of perfect inequality has approached the line of perfect equality slightly. This shows there is a weak convergence between Canadian regions for this period.

Figure 5.12 Lorenz Plots of Gini Coefficients: Canada



The regional Theil index of Canada was steady for the period 1981-1998, and then there was a divergence trend since 1999 caused by the significant increase of average per capita GDP in the Northern region due to the territorial division of Nunavut, the increasing amount of Federal transfer payments and the high income mining industries. The Theil index indicates this trend more clearly than the Theil1 index (Figure 5.13). This result is consistent with the results of the other above mentioned indicators such as the σ and Gini coefficients.

Figure 5.13 Regional Theil Index of Canada



Note: $Theil = \sum x_i \log\left({x_i}/{\bar{x}} \right) \Big/ n\,\bar{x}$, $Theil1 = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{x_i}{\bar{x}} . \ln\left(\frac{x_i}{\bar{x}} \right) \right)$ where x_i, is the value of the variable of interest for the ith region, if there are n regions, $\bar{x}$ is the sample mean for x,

$$\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \ .$$

Based on the absolute beta-convergence model 4.10 presented in Chapter 4, the regional beta convergence can be calculated as below:

by regressing the average growth rate of per Capita GDP between time t_{beg} = 1981 and time t_{end} = 2008 on initial income at time t_{beg} = 1961 where:

$$(\ln Y_{it(end)} - \ln Y_{it(beg)}) = \alpha + \beta \ln Y_{it(beg)} + \mu_i \quad (5.1)$$

Here, i is the index for each region where i = 1 to 4 in Canada. Time is indexed by t where t(beg) = 1961 and t(end) = 2008. The sample period is indexed by T where T = 48 years for the whole period.

lnY = natural log of real per capital income.

α = constant term and μ_i = a random error term.

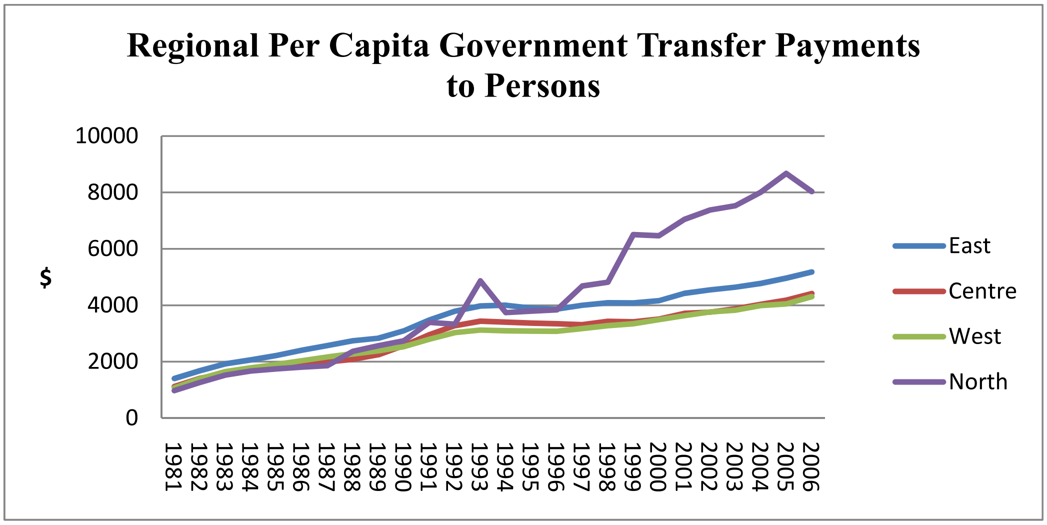
Table 5.2 Regional Beta Convergence for Canada

Country	Year	β	R	Annual rate
Canada (4 region)	1961-2007	-0.296722	(r) = -0.405265 (r^2 = 0.16424)	-0.005413324
	1961-1980	0.243358	(r) = 0.436556 (r^2 = 0.190581)	0.013943
	1961-1970	-0.030376	(r) = -0.18467 (r^2 =0 .034103)	-0.00299
	1970-1981	0.364271	(r) = 0.619869 (r^2 = 0.384237)	0.045298
	1981-2007	-1.265408	(r) = -0.806343 (r^2 =0 .650188)	-0.029205531
	1981-1990	-0.425017	(r) = -0.861188 (r^2 = 0.741644)	-0.035418374
	1991-2000	-0.512939	(r) = -0.409115 (r^2 =0 .167375)	-0.041405412
	2001-2008	0.1055	(r) =0.413699 (r^2 = 0.171147)	0.013936297

Model (5.1) is estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1961-2007, (ii) the first sub-period 1961-1980, (iii) the second sub-period 1981-2007, and (iv) the short periods of 1961-1970, 1971-1980, 1981-1990, 1991-2000 and 2001-2007. From Table 5.2 it can be clearly seen that the beta coefficient β<0, and is not very significant in Canada during the whole period 1961-2007. It shows there is a weak convergence rate of 0.005 for the whole period 1961-2007, and divergence during the first sub-period 1961-1980 while there is convergence during the second sub-period 1981-2007. There were convergences indicated since 1980 for the sub-periods 1981-1990 and 1991-2000, but there is strong divergence for the sub-short period 1971-1980 while there is a tendency of regional divergence since 2000.

The issue of equity across regions is one of the most basic debates in Canadian regional development programs. Canada started the Canadian equalization program which transfers income form the 'have' provinces to 'have-not' provinces so that roughly similar standards of public services could be provided across provinces (Milne 1994). The per capita equalization payments has sharply increased to the northern regions since 1996, and shows there is an enlarged disparity between the Northern First Nation economies and the other regions. This has played a key role in reducing regional disparity to some degree and in avoiding further divergence.

Figure 5.14 Regional Per Capita Government Transfer Payments to Persons



Source: Calculated based on the data Statistics Canada, *Provincial and Territorial Economic Accounts: Data tables*, catalogue number 13-018-X.

However, the North only accounted for 0.58% of total transfer payments in 2006. It has however received the highest per Capita Government Transfer Payments to Persons since 1997 (Figure 5.14). The East Region has always had a high share of equalization payments (8.33% in 2006), while the Central Region and the Western Region accounted for 61.86% and 29.2% respectively in 2006. As a result, the equalization transfers might have actually helped encourage convergence.

In order to better interpret regional differences, the industrial make-up of the four regions are compared by industrial share in GDP from 1984 to 2008 (Table 5.3). All the obvious changes occurred in the Centre and West regions. These regions together account for 93% of the industrial contribution to national GDP for the whole period. There is not much change in the East and North. The Centre has dominated the goods producing industries and service producing industries except for Mining, Quarrying and Oil Well industries for the whole period while the West has increased gradually. The industrial production of the West increased sharply from 26.53% to 34.12% while in the Centre's share declined from 68.81% to 58.84%. Agricultural and Related Service industries, Mining, Quarrying and Oil Well industries, Manufacturing, and Construction industries have continuously increased their shares in the West, while they decreased in the Centre. The difference is clear in the agricultural and mining industries[2] .

Table 5.3 Regional Comparison by Industry Share of GDP, 1984-2008 (%)

Industry	Year	East	Centre	West	North
Goods producing industries	1984	5.62	64.36	29.47	0.55
	2008	5.89	56.54	36.67	0.58
Services producing industries	1984	7.09	61.59	30.51	0.47
	2008	5.65	61.69	32.13	0.36
Industrial production	1984	4.55	68.81	26.53	0.49
	2008	5.76	58.84	34.12	0.56
Agricultural & Related service industries	1984	5.44	55.24	43.04	0.01
	2008	8.07	34.96	58.09	0.08
Mining, quarrying & oil well industries	1984	4.93	17.84	75.59	2.74
	2008	11.69	6.93	78.88	2.48
Manufacturing industries	1984	3.94	80.32	15.93	0.01
	2008	3.83	74.44	21.89	0.01
Construction industries	1984	7.38	54.86	36.39	1.04
	2008	5.51	54.27	38.98	0.90
Transportation & storage ind.	1984	7.49	52.73	39.52	0.77
	1999	6.47	50.30	42.60	0.62
Communication industries	1984	6.63	60.98	31.89	0.42
	1999	7.46	62.82	29.41	0.31
Wholesale trade industries	1984	5.17	63.20	31.61	0.15
	2008	4.23	62.94	32.79	0.19
Retail trade industries	1984	7.89	61.87	29.91	0.30
	2008	6.23	60.23	33.21	0.26

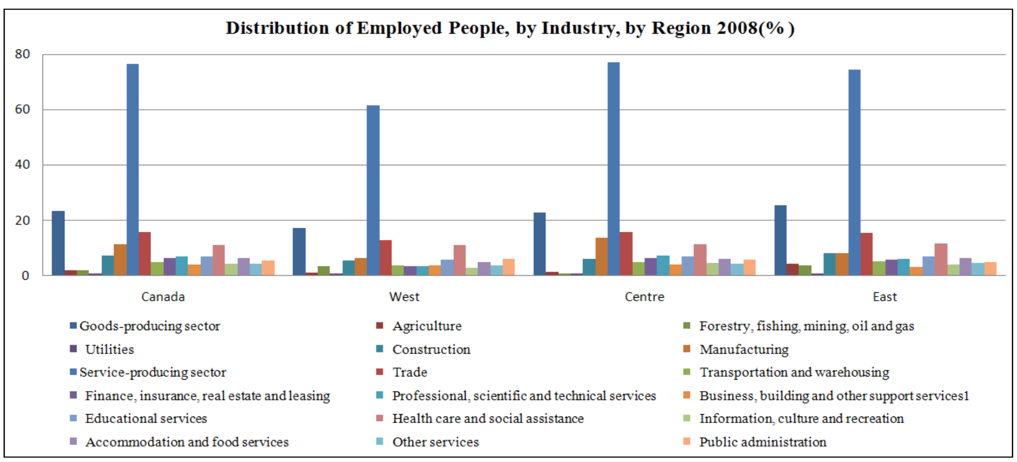
Source: Calculated based on the data of Statistics Canada provincial economic accounts CANSIM tables: 380-0001, 380-0004, 380-0002 and 051-0005 and Statistics Canada, CANSIM, table (for fee) 379-0027 and Catalogue no. 15-001-X.

In summary, Central Canada dominates the national economy by almost any indicator and is regarded as the core region of the Canadian economy based on the Toronto and Montreal-based economic centres, while the other regions could be described described as peripheral regions, albeit with some important changes in the

[2] Note: The regional industrial trends from 1984-2008 are omitted because of the very large amount of data that would have to be presented.

last several decades. The economy of Western Canada used to be dominated by renewable resource based industries (wheat, cattle, forest production). Since the early 1970s, the oil and gas industry, overwhelmingly concentrated in Alberta, has become a vastly greater source of wealth, attracting population and supporting economic diversification in underlying the expansion of the economy of the western region. Moreover, BC has been the principal beneficiary of the expansion of Pacific Rim trade, and an influx of affluent immigrants contributes its economy. Farming and mining are the major sectors in Saskatchewan and Manitoba. The continuing resource boom has shifted economic growth from east to west. Since 2003, Alberta and British Colombia in the Western region have outpaced the nation. In fact, this has helped provincial and regional convergence in Canada.

Figure 5.15 Distribution of Employed People, by Industry, by Region 2008 (%)



Source: Calculated based on the data of Statistics Canada, CANSIM, table (for fee) 282-0008 and Catalogue no 71F0004XCB.

Table 5.4 Share of GDP and Employment by Sectors, 1966-2008

Year	1966		1976		1986		1996		2008	
Indicators	GDP	EMP	GDP	EMP	GDP	EMP	GDP	EMP	GDP	EMP
Goods	45.30	42.60	40.30	35.00	36.30	29.60	34.80	26.20	29.34	23.50
Services	54.70	57.40	59.70	65.00	63.70	70.40	65.20	73.80	70.66	76.50

Source: Statistics Canada (2000c: Tables 4.2.1 and 4.2.2 and CANSIM, table (for fee) 282-0008 and Catalogue no 71F0004XCB. Last modified: 2009-01-08. EMP-employment.

The sluggish economic performance that has characterized the Atlantic

Provinces for many decades reflects deep-seated problems both within the region and in it its relationship to the wider world. The regional economy remains heavily dependent on natural resources, in the form of fishing, forestry, agriculture and tourism (Wallace 2002) and now oil for Newfoundland. This region is far from the most dynamic regional markets of North America, the Pacific Rim and domestic economic centres. A low urbanization rate and slow growth below the national average are the main characteristics of Eastern Region's recent economic performance.

The northern economy is characterized by high costs and a narrowly based market economy. Long distances from manufacturing centres, a sparse population on a vast land area, limited transportation and climatic restriction severely limit its economic development. In recent years, high wage resource industries of diamond, gold and copper production surges in the North have improved the situation in the Northwest Territories.

Employment in the service sector of the Canadian economy surpassed that in the goods producing sectors as long ago as the late 1950s (Wallace 2002). By 2008, 76.5% of all jobs and 70.65% of national GDP were generated by service sector activity (Table 5.4). If the employment structure is compared by industry and by region, the East and Central regions have a higher proportion of employment in goods producing sectors than the West; forestry, fishing, mining, oil and gas employment is concentrated in the West and East regions while manufacturing is stronger in the Central region. In 2008, employment in the service producing sector was much stronger in the East and Central Regions than in the West (Figure 5.15).

5.1.3 Regional Case of China

Regional disparity has been an important concern in China, as it indicates the uneven development among regions and may threaten national harmony, unity and social stability. Thus, it has attracted attention by scholars and policy makers and reports on this topic have appeared continuously in the literature. It is true that with three decades of reforms and subsequent economic growth, the Chinese economy has improved significantly since 1980. However, has the economic growth been equal across its regions? More importantly, has it led to a reduction in regional disparities? These issues have become the major focus of the recent convergence and divergence debate on regional disparities in China.

The regional distribution of national GDP and per capita GDP is very different in China when compared to the distribution of population and territorial size. Its huge 1.32 billion population is distributed unequally across its regions; 39.2% of the population lives in the eastern coastal region that only accounts for 13.8% of the country's areal size. This same region produces 59.3% of the national GDP. Twenty-seven percent (27.5%) of the population lives in the western region with a territorial national share of 56.8% but only producing 17.3% of the national GDP. The coastal region is regarded as a core region of the Chinese economy with its favoured geographic location, abundant human capital resources, a great concentration of industry, and the advantages of international economic relationships in attracting FDI (Foreign Direct Investment). On the other hand, the west is considered a peripheral region with its disadvantages of a landlocked geographic location, the difficulties and costs of engaging in international economic activities even though some of its provinces border with other countries, poor natural conditions (generally mountainous) and lacking adequate water; it does however possess rich mineral and energy resources, and mostly consists of minority ethnic people. Between them, lies the central region which occupies 29.4% of the national area with a national population share of 31.7%, contributing 23.4% of national GDP (Table 5.5).

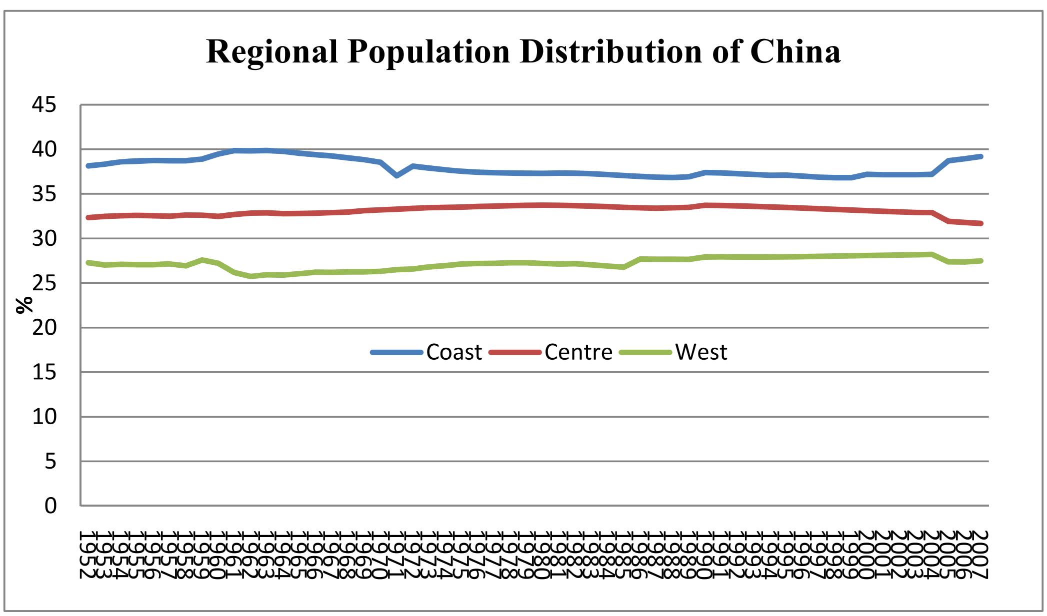
Table 5.5 Area, Output, Population and Investment by the Three Regions of China, 2007 (% of total)

Region	Area	GDP	Population	Non-agricultural Population	Total investment in fixed assets
Coastal	13.8	59.3	39.2	48.98	50.78
Central	29.4	23.4	31.2	32.07	26.3
Western	56.8	17.3	27.5	26.83	20.8

Note: Hongkong and Macao are not included in the table

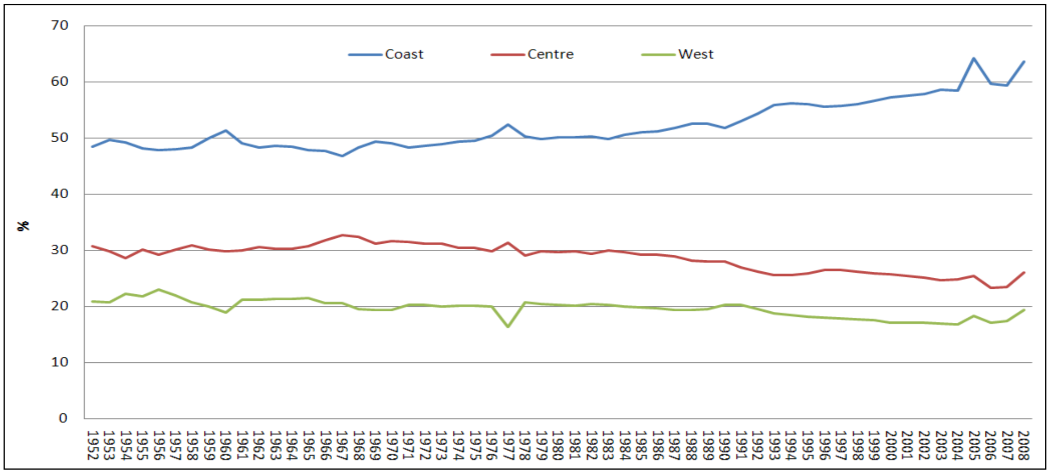
If we compare the distribution of population change for the period 1952-2007 (Figure 5.16), the regional proportions of population has not changed much for the period; the Western region has almost kept the same percentage with slight change, but the population of Coastal region has increased from 36.9 % in 1989 to 39.2% in 2007 while it has decreased in the Central region from 33.5% in 1990 to 31.77% in 2007. This can be explained by interprovincial migration since the economic reform of China. With the economic boom of the Eastern coastal region after 1990, more and more people began to move into the Eastern coastal region. Fan (2005) undertook a statistical study of interprovincial migration patterns in China within and among regions; he concluded that the proportions of total flows were 56.95%, 26.15% and 16,90% for the Eastern, Central and Western Regions respectively for the period 1985-1990 while it increased 78.41%, 10.20% and 11.38% for the three regions respectively for the period 1995-2000. This trend has become very clear since 2003.

Figure 5.16 Regional Population Distribution of China



Note: Hongkong and Macao are not included in the table

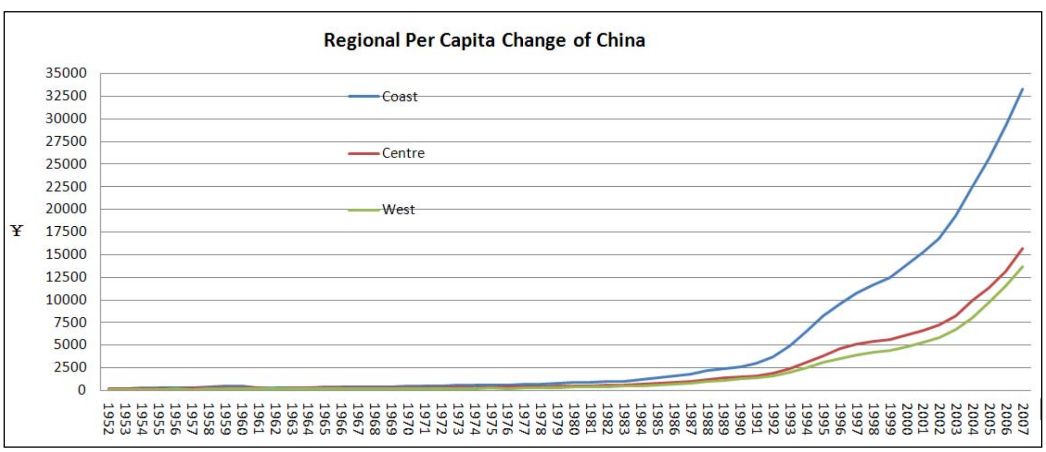
Figure 5.17 Change in the Regional GDP Share for China, 1952-2008



Note: Hongkong and Macao are not included in the table

Figure 5.17 compares the regional total GDP trend over the period 1952-2008; it shows that the Coastal Region has dominated in terms of its proportion of total GDP. It has increased gradually from 48.4% in 1952 to 59.3% in 2007, while the Central and Western Regions saw their total regional GDP share decrease from 30.7% and 20.8% to 23.4% and 17.4% respectively. Particularly since the economic reform in 1978, the Central Region has declined faster than the Western region, while the Coastal Region has diverged from the other two regions significantly (Figure 5.17).

Figure 5.18 Regional per Capita GDP Trend of China

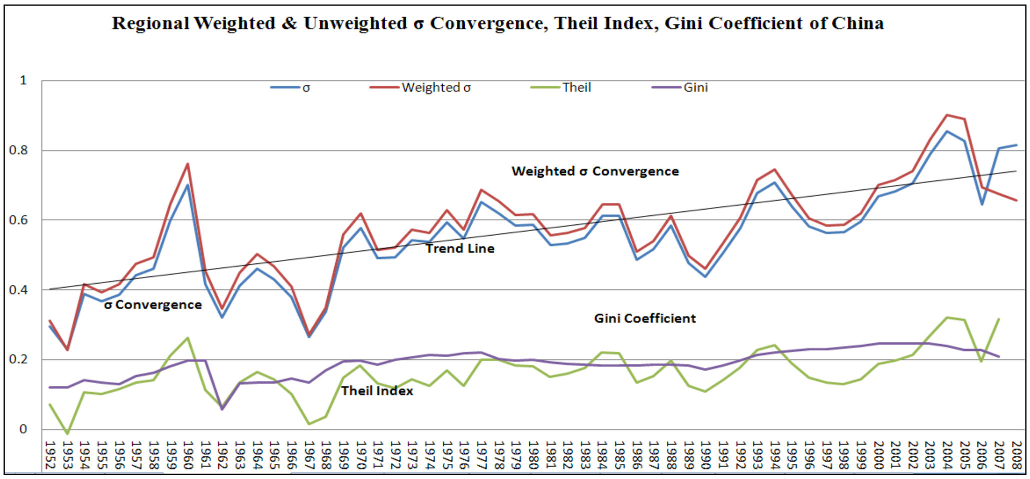


Note: Hongkong and Macao are not included in the table.

There were slight interregional income disparities in China in the 1950s due to the post-war recovery. The ratios of per capita GDP of the Coastal, Central and

Western Regions were only 1: 1.48: 1.7. This did not change much during Mao's centralization and equalization policy period.

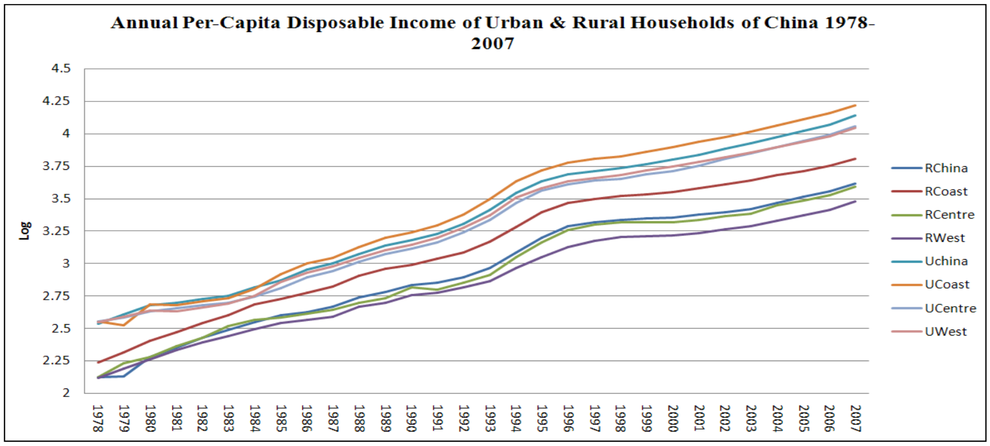
Figure 5.19 Regional Weighted & Unweighted σ Convergence, Theil Index, Gini Coefficient of China



However, substantial changes occurred after the opening and economic reform of China in the 1980s. This can be seen clearly from Figure 5.18 which shows that the Coastal Region has diverged significantly from the other two regions since 1980. The regional disparity ratios of the Coastal, Central and Western Regions on this indicator reached a significant level of 1: 2.03: 2.31 in 2008.

If we compare regional population weighted and unweighted σ convergence of regional per capita GDP for the period 1952-2008 (Figure 5.19), the trend line of convergence indicates that they diverged for the whole period, but that there is a significant divergence in 1950s due to the post-war difficulties in China; this is followed by a short-lived convergence from 1960 to 1967, then again there is a divergence because of the cultural revolution from 1967 to 1977. With the period of new reform and opening up policy since 1978, the three regions converged for the period 1978-1990, but again diverged owing to the favoured development policy and the advantage of FDI of the Eastern coastal region until the beginning of the 2000s.

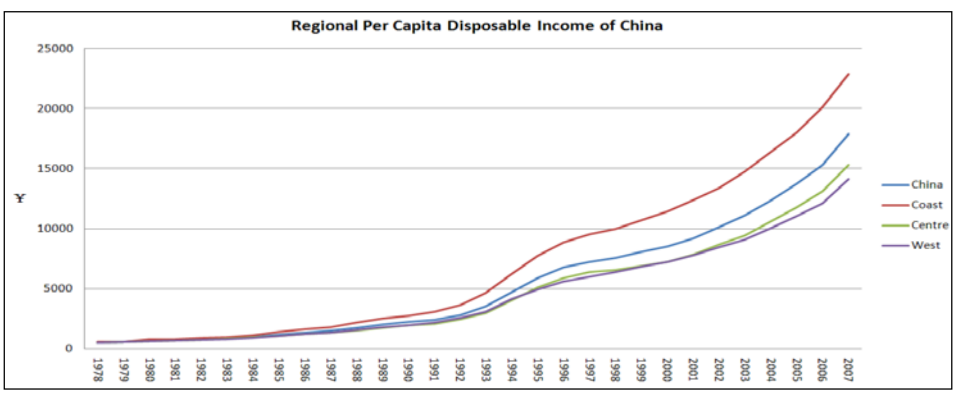
Figure 5.20 Per-Capita Annual Disposable Income of Urban &Rural Households of China, 1978-2007



Note: R- indicates Rural, U-indicates Urban in the figure. Source: Author's calculation based on the Chinese Statistical Yearbook data.

All these government sponsored development programmes such as the 'Western Development Strategy' in 1998 and the 'Northeast Revival Strategy' that followed in 2003 to reduce disparity have had little effect, and since 2003, the regions have begun to converge again (Figure 5.20). The trend lines of Regional Weighted & Unweighted σ Convergence, Theil Index, Gini Coefficient of China, have the same trajectory (curve line) in Figure 5.19, show the consistency of the divergence for the whole period with the whole economy.

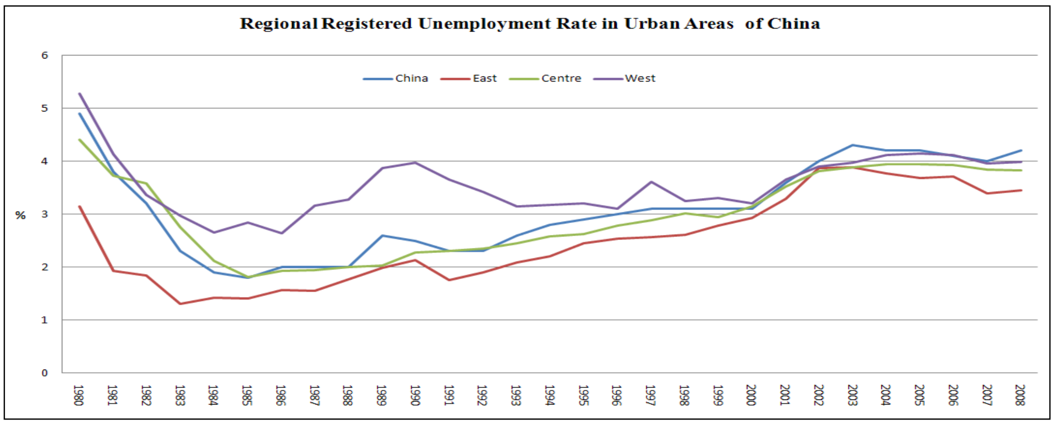
Figure 5.21 Regional per Capita Disposable Income of China, 1978-2007



Because of the differences in the statistical systems of China and Canada, disposable income in China is often calculated by urban and rural disposable income.

The per Capita Annual Disposable Income of Urban and Rural Households in the Coastal Region has increased faster than the other regions while the West has been left behind since 1978 (Figure 5.21). In order to obtain per capita disposable income of China, the per Capita Annual Disposable Income of Urban and Rural Households for each region have been added together. This shows that the Eastern Coastal Region has always been above the national level while the others are not (Figure 5.21).

Figure 5.22 Regional Registered Unemployment Rate in Urban Areas of China

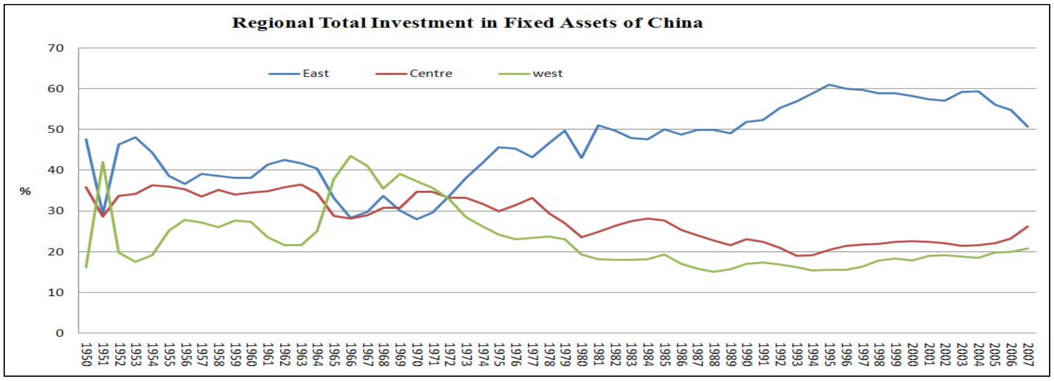


Note: Tibet is not included in the Western Region due to data shortage.

In China, the registered unemployment is obtained for urban areas. For rural areas, there are no such data. It is certain that the unemployment levels shown are lower than the actual unemployment levels. There may be an unregistered unemployed population in both urban and rural areas in China. So these data in Figure 5.22 cannot fully capture the unemployment rate in China. The unemployment rate has increased since 1990 in all regions. The unemployment rate in the Western Region has been above the national average for most of the period 1980-2008.

China established its investment system in the early 1950s to take control over the economy and to promote the nation's industrial and spatial development (Figure 5.23). This investment system was highly centralized through centralized planning, centralized administration and state-controlled banks. The control of the state over investment has been declining during the reform period, and the influence of local factors and foreign direct investment in capital formation has risen (Yehua Dennis Wei 2000).

Figure 5.23 Regional Total Investment in Fixed Assets of China



The Eastern Region was allocated a higher percentage of fixed investment for the first decade of new China, while the Central and Western Regions, especially the old industrial bases in northeast china, were also given more attention. Because of the "third front construction" to avoid any foreign attack, more investment was put into the interior provinces with the traditionally poor southwestern provinces of Yunnan, Guizhou including Gansu, Qinghai, and Ningxia during the period 1964-1971. In the early 1970s, China abandoned the Third Front program, and investment began to shift to eastern regions. The fixed investment has increased in the Eastern Coastal Region since the new economic reform in the 1980s, while the investment shares in the Central and Western Regions have declined. The Chinese Government has tried to control the investment rates since the end of 1990s in order to reduce regional disparities, but owing to the local investment and market forces' induced foreign direct investment, regional disparities in terms of investment have become further enlarged (Figure 5.23).

In 2007, the national average wage[3] of staff and workers was 24,932 Yuan, while it was 29,660 Yuan, 20,536 Yuan and 24,294 Yuan for the East, Centre and

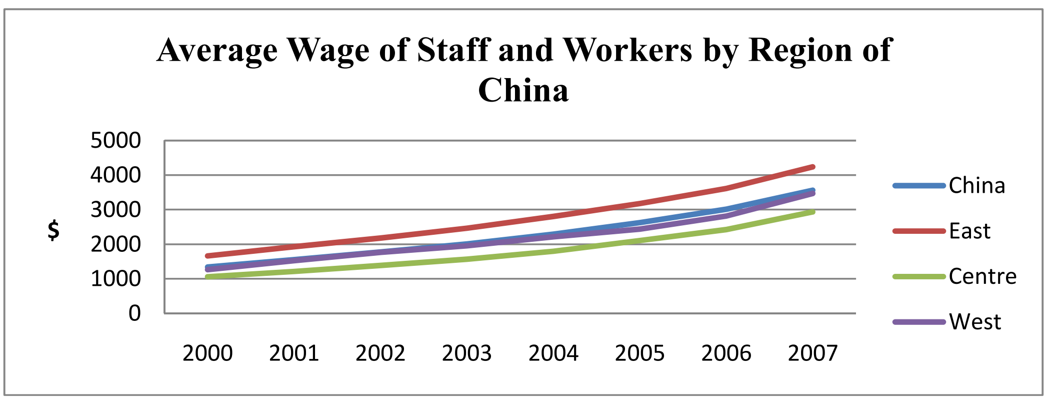
[3] **Average Wage** refers to the average wage in money terms per person during a certain period of time for staff and workers in enterprises, institutions, and government agencies, which reflects the general level of wage income during a certain period of time and is calculated as follows:

$$\text{Average Wage} = \frac{\text{Total Wage Bill of Staff and Workers at Reference Time}}{\text{Average Number of Staff and Workers at Reference Time}}$$

Source http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm

West Regions respectively. If it is estimated in Canadian dollars by hours, with a 40 hour week excluding 104 weekend days and 21 festival days, this yields $1.86C for the national average hourly wage of staff and workers, and $2.21C, $1.53C and $1.81C for the East, Centre and West Regions respectively. If the regional average wage of staff and workers are compared (Figure 5.24), it has increased in all regions since 2000. However, the speed of increase is faster in the Eastern Coastal Region than in the other regions. The salary level in the Western and Central Regions are below the national level, especially in the Central Region. This is one of the reasons underlying labour migration from the Central Region to the Eastern Region or even to the West in China. However, these data do not include the wage of rural farmers. Annual per-capita net income[4] of rural households was $591.48 C (4140.36Yuan) in 2007[5], If it is estimated in Canadian dollars by hours, it was only $0.31C.

Figure 5.24 Average Annual Wage of Staff and Workers by Region of China, 2000-2007



Note: 7Yuan=1 C$ based on the 2002 price. Data source:

Fan (2005) compared interprovincial migration of China between 1985-1990 and 1995-2000. If the total number of interprovincial migrants (net-migration (persons)) from 1985-1990 and 1995-2000 is compared, the total number is 1,955,000 and 17,138,000 during these two periods respectively for the East region, -876,000 and -12,344,000 for the Central Region and -1,078,000 and -4,794,000 respectively for the

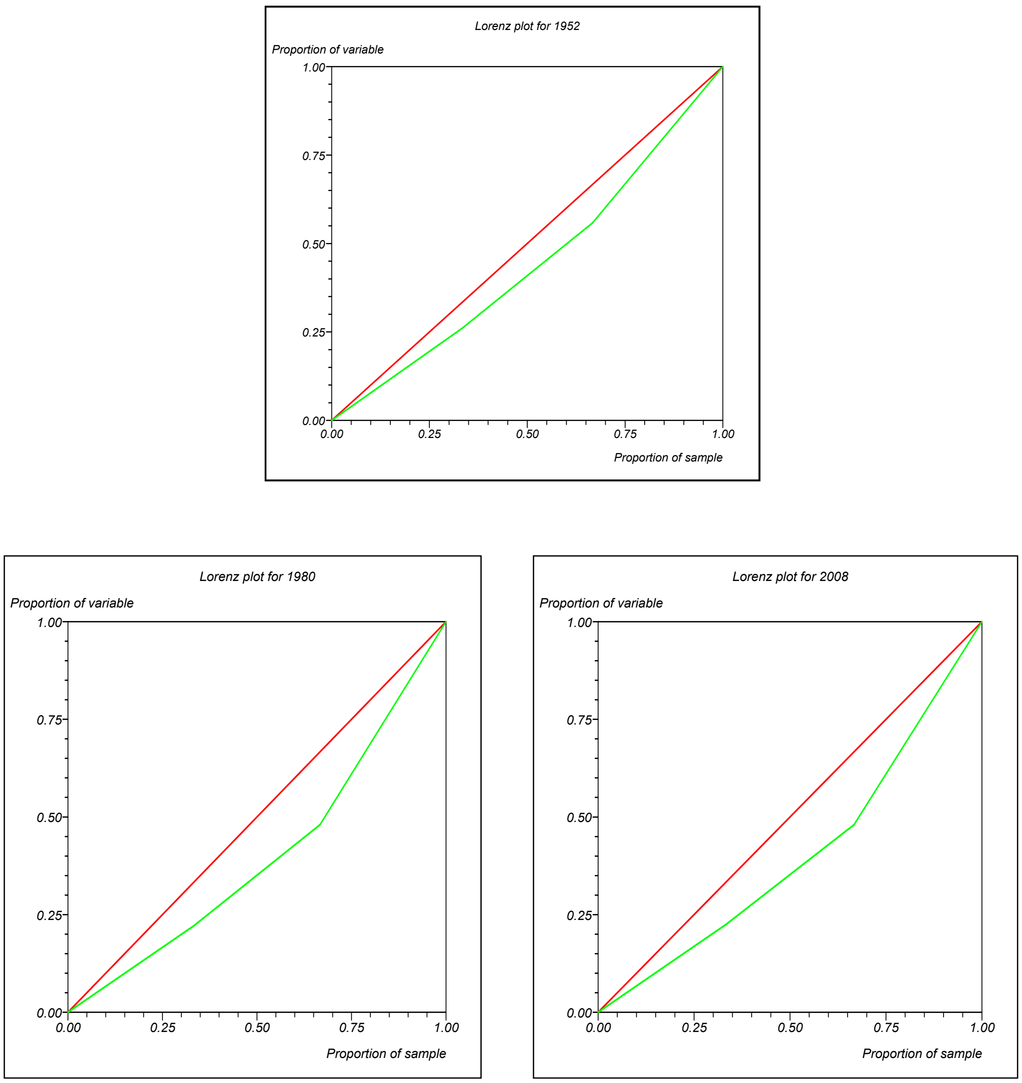
[4] **Net Income-** refers to the total income of rural households from all sources minus all corresponding expenses. The formula for calculation is as follows: Net income = total income - taxes and fees paid - household operation expenses - taxes and fees depreciation of fixed assets for production - gifts to non-rural relatives. http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm.

[5] http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm

Western Region. It can be concluded that more population is flowing out from the Central and Western provinces to the Eastern Coastal provinces.

The curve point of Lorenz curve line (green) between line of perfect equality (red) and the line of perfect inequality has deviated from the line of perfect equality gradually if we compare the Lorenz curves for 1952, 1980 and 2008 (Figure 5.25). This means there is a divergence among Chinese regions for this period.

Figure 5.25 Lorenz Plot for 1952, 1980 and 2008: China



Based on the absolute beta-convergence model 4.10 presented in Chapter 4, the regional beta convergence can be calculated as below:

by regressing the average growth rate of per Capita GDP between time t_{beg} = 1981 and time t_{end} = 2007 on initial income at time t_{beg} = 1981 where:

$$(\ln Y_{it(end)} - \ln Y_{it(beg)}) = \alpha + \beta \ln Y_{it(beg)} + \mu_i \quad (5.2)$$

Here, i is the index for each region where i = 1 to 3 in China. Time is indexed by t where t(beg) = 1961 and t(end) = 2007. The whole sample period is indexed by T where T = 47 years for the whole period.

lnY = natural log of real per capital income.

α = constant term and μ_i = random error term.

Table 5.6 Regional Beta Convergence of China

Country	Year	β	R	Annual rate
China (3 region)	1961-2007	0.35205	(r) =0 .954599 (r^2 =0 .91126)	0.009233
	1961-1980	0.276148	(r) =0 .90019 (r^2 =0 .810341)	0.016158
	1961-1970	0.234144	(r) =0 .724284 (r^2 =0 .524587)	0.026676
	1970-1981	0.072008	(r) =0 .934794 (r^2 =0 .873839)	0.007473
	1981-2007	0.097886	(r) =0 .898377 (r^2 = 0.807081)	0.003815347
	1981-1990	-0.10232	(r) = -0.983259 (r^2 = 0.966798)	-0.00974
	1991-2000	0.319451	(r) =0 .940534 (r^2 = 0.884604)	0.038486
	2001-2007	-0.141738	(r) = -0.947103 (r^2 =0 .897004)	-0.01894

Model (5.2) is estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1961-2007, (ii) the first sub-period 1961-1980, (iii) the second sub-period 1981-2007, and (iv) the short sub-periods 1961-1970, 1971-1980, 1981-1990, 1991-2000 and 2001-2007. From Table 5.6, it can be clearly seen that the beta coefficient β>0, and significant in China during the whole period 1961-2007. It shows there is a weak divergence rate of 0.009 for the whole period 1961-2007, and strong divergence during the first sub-period 1961-1980 at a rate of 0.016 while there is weak divergence during the second sub-period 1981-2007 at a rate of 0.0038. The result for the whole period is consistent with most other scholars' conclusion that absolute β convergence did not exist in China for the whole period. There were convergences for the short sub-periods 1981-1990 and 2001-2007 at different rates of 0.00974, and 0.01894, but there was a strong tendency of divergence for the short sub-period 1991-2000. This result is consistent with the results from most other studies that confirm these processes of divergence and convergence in China's regional economy.

5.1.4 Summary of Regional Cases

The empirical results showed that the regional economy of Canada has undergone significant change since 1950. But in terms of population and economic activities, there are important differences from region to region. The issue of equity across regions has been one of the most basic debates in Canadian regional development programs. The Canadian equalization program has played a key role in reducing regional disparity to some degree and has undoubtedly helped avoid greater divergence. Central Canada has been the economic core of Canada. Western Canada has gained both in terms of population and its regional share of GDP since 1981 with the rapid growth in trade with Asia which has enriched British Columbia and the oil wealth which has provided a major boost to Alberta and Saskatchewan. In Canada, almost 94.3% of government investment income has been centred in the Central and Western region since 1961 while it has increased in the Western region since 1980. The Centre and West regions contribute 93% of the industrial contribution to national GDP since 1960. The Centre has dominated the goods producing industries and service producing industries except for mining, quarrying and oil well industries for the whole period while the West has increased gradually.

Central Canada dominates the national economy on the basis of almost any indicator and is regarded as the core region of the Canadian economy based on the Toronto and Montreal-based economic centres, while the other regions have been described as 'peripheral' regions (certainly a debatable category!). The economy of Western Canada used to be dominated by renewable resource-based industries (wheat, cattle and forest production). Mining and oil and gas extraction constitute the principal factors in recent years for the expansion of the economy of the West. Moreover, BC has been the principal beneficiary of the expansion of Pacific Rim trade and an influx of affluent immigrants has contributed to its economy. Farming and mining are the major sectors in Saskatchewan and Manitoba.

A sluggish economic performance has characterized the Atlantic Provinces for many decades. This region is far from the most dynamic regional markets of North America, the Pacific Rim and the main domestic economic centres. A low urbanization rate and slow growth below the national average are the main characteristics of the Eastern Region's recent economic performance. The Northern economy has been characterized by high costs and a narrowly based market economy. Long distances from manufacturing centres, sparse population spread over a vast territory, and limited transportation and climatic restrictions severely limit its economic development. In recent years, diamond, gold and copper production surges have nonetheless improved the economy of the Northwest Territories.

The regional economy has maintained a relatively steady trend in Canada since 1980. Regional per capita personal income and disposable income converged for the period 1961-2008, but there was a significant divergence in 1981 due to the economic challenges of Canada and there has been a slight divergence in both indicators since 2000. The change of cross-regional σ convergence and Gini coefficients is consistent with the trends in the Canadian economy. The Gini coefficient analysis and the Lorenz curves for 1961, 1981 and 2007 showed there is a weak convergence between Canadian regions for this period. The regional Theil index is consistent with the results of the other above mentioned indicators. The beta coefficient is $\beta<0$, and not very significant in Canada during the whole period 1961-2007. It shows there is a weak convergence rate of 0.005 for the whole period, and divergence during the first sub-period 1961-1980 while there is convergence during the second sub-period 1981-2007. There were convergences for the sub-periods 1981-1990 and 1991-2000 since 1980, but there is a strong divergence for the short sub-period 1971-1980 while there has been a tendency for regional divergence since 2000.

In the case of China, the Eastern Coastal Region is regarded as a core region of the Chinese economy (39.2% of its population and 59.3% of national GDP on only 13.8% of the national territory) with its advantages of a better geographic location, abundant human capital resources, concentrated industry and the advantages of international economic relations that have helped attract FDI. On the other hand, the Western region is considered as a peripheral region (27.5 % of the population, producing only 17.3% of national GDP on 56.8% of the national territory) with the disadvantages of its landlocked geographic location, the difficulties and costs of engaging in international economic activities although some of its provinces border on other countries, and poor natural conditions which are generally mountainous and lacking in adequate water supplies, even though it has rich mineral and energy resources and mostly consists of minority ethnic peoples. Between these regions lies the Central region which occupies 29.4% of the national territorial area with a national population share of 31.7%, contributing 23.4% of national GDP. The Coastal region has diverged significantly with the other two regions since 1980. The trend lines of the Regional Weighted and Unweighted σ Convergence, the Theil Index and the Gini Coefficient of China share the same trajectory and show the consistency of the divergence for the whole period for the whole economy. Investment was highly centralized through centralized planning, centralized administration and state-controlled banks. The control of the state over investment has been declining during the reform period, and the influence of local factors and foreign direct investment in capital formation has risen. The Chinese Government has attempted to control the investment rates since the end of the 1990s to reduce regional disparities, but owing to local investment and market force-induced foreign direct investment, the regional disparity in terms of investment has been further enlarged. So China has quickly promoted the "Western Development" program and "Northeast Industry Base Strategy" program to reduce ever-increasing regional disparities. It seems these programs have played a role in reducing disparities to some degree, but the absolute disparity between regions is moving towards divergence. Per Capita Annual Disposable Income of Urban and Rural households shows that the Eastern Coastal region has always been above the national average in contrast to the other regions. The salary level in the Western and Central regions is below the national average, especially in the Central region. This is one of the main reasons causing labour migration from the Central region to the Eastern region or to the West in China.

The Lorenz curve analysis showed that there was divergence among Chinese regions for this period. The beta coefficient is $\beta>0$, and significant in China during the whole period 1961-2007. It shows there was a weak divergence rate of 0.009 for the whole period 1961-2007, and strong divergence during the first sub-period 1961-1980 at the rate of 0.016 while there was weak divergence during the second sub-period 1981-2007 at the rate of 0.0038. There were convergences for the sub-short periods 1981-1990 and 2001-2007 at the different rates of 0.00974 and 0.01894 respectively, but there was a strong tendency for divergence for the sub-short period 1991-2000. This result is consistent with the results of most other studies that have confirmed these patterns of divergence and convergence in China's regional economy.

5.2 Provincial Case

Because statistical data are collected at the provincial level in each country, it is often convenient to define individual provinces as regions. For the provincial case studies, all the provinces of both countries are selected. Some of the comparisons of per capita GDP in terms of convergence analysis have already been undertaken in Chapter 4. Therefore, they are not repeated here. Several indicators are used in this section to show provincial disparity. By looking at the evolution of each indicator's distribution, it is possible to suggest the different factors that have contributed to increases or decreases in the variability of the per capita income distribution in each province.

5.2.1 Provincial Case of Canada

There have been many studies on per capita gross domestic product (GDP), per capita income, and labour productivity provincial disparities in Canada. In recent years, many studies have performed on different factors on growth convergence. Gunderson (1996) discusses the factors that foster regional convergence such as migration, spatial convergence, interjurisdictional competition for jobs and investment and equalization from a theoretical perspective, while other researchers have tried to estimate this from the empirical analysis of convergence as already noted in previous chapters. In the first section of this Chapter, broad regional disparities and differences in Canada were analyzed using various statistical methods. In this section, updated long term statistical data are utilized to show further evidence of provincial disparity.

In Canada, provincial disparities in per capita gross domestic product (GDP), per capita income and productivity have diminished since World War II (Chalifoux et al. 2004). In 1999, Colombo (1999) stated that the current level of provincial disparities had reached a steady state in Canada. Based on the long term data, provincial disparities decreased significantly in terms of several indicators in Canada after 1960. But unevenness remains across the country.

The contributions to the total GDP of the provinces are also uneven most of the time. Significant changes have occurred in Ontario, Quebec, Alberta and British Colombia. Ontario has almost kept the same 40% level of total national GDP with only a slight change for the whole period 1961-2008, while Alberta and British Colombia have increased their national GDP contribution from 7.94% and 9.95% in 1961 to 14.4% and 12.48% in 2008 while Quebec has decreased its total GDP contribution from 26.13% to 20.37% in 2008. There is not much change in the total GDP percentage, except for a slight decrease, in Saskatchewan and Manitoba (Figure 5.26).

Figure 5.26 Provincial GDP as a Proportion of Canada's GDP, 1961-2008

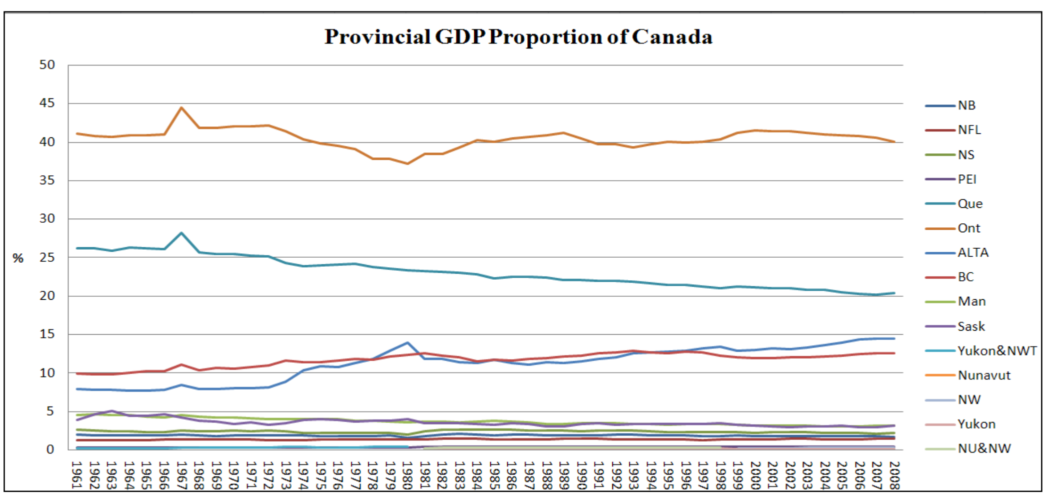
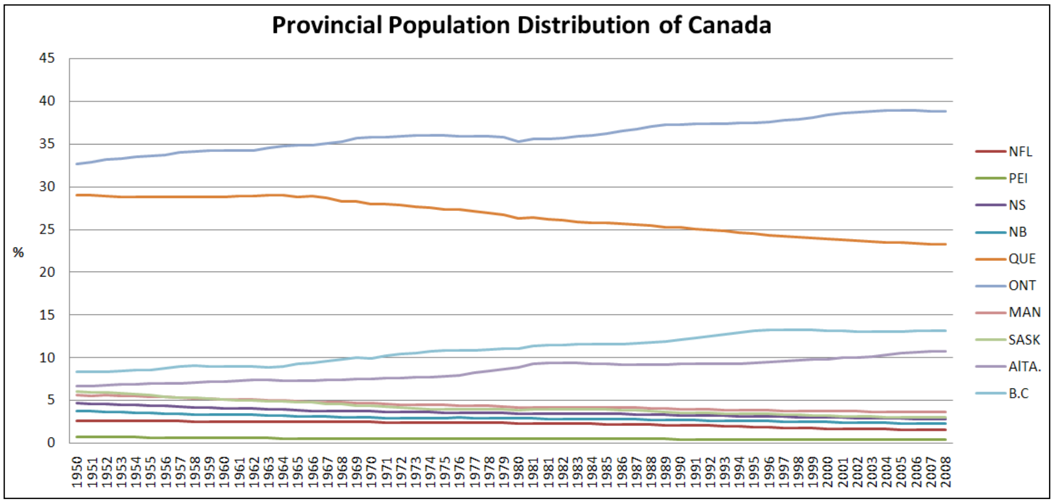


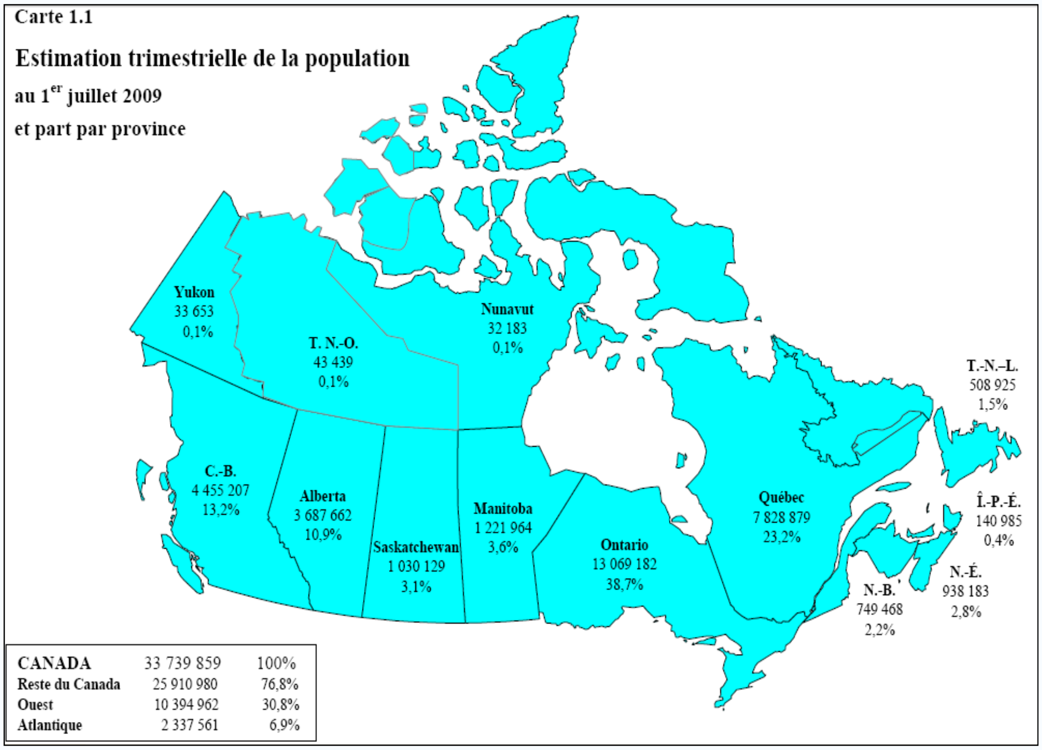
Figure 5.27 Provincial Population Distribution, Canada



The distribution of population is very uneven among Canadian provinces (Figure 5.27); 86% of the population concentrated in the four provinces of Ontario, Quebec Alberta and British Colombia, while the other provinces only account for 14% of the total population (Map 5.3, Figure 5.27). The share has increased in Ontario, Alberta and British Colombia gradually while it has decreased in Quebec faster than that of the other provinces. The 13 million Ontarians alone account for nearly 38.7% of Canadians. The Northern provinces account for only 0.3% of the total population. In Canada, the provincial distribution of population is consistent with a number of other indicators, including the provincial share of GDP, investment and income.

Interregional trade and capital and labour flows were sufficiently responsive to offset provincial differences in economic opportunity. Ontario, Alberta, and British Colombia grew faster in these years, but they did not noticeably get relatively richer. The Atlantic Provinces grew more slowly, but managed to retain their relative living standards (Wallace 2002).

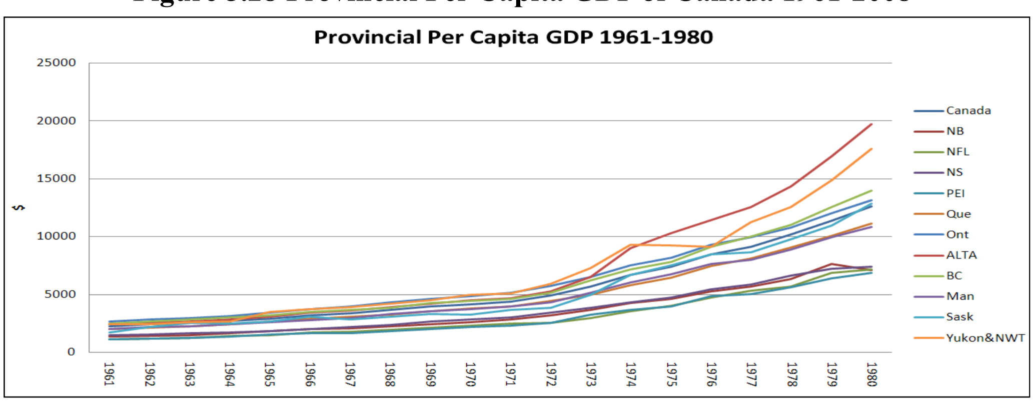
Map 5.3 Provincial Population Distribution



Source : Statistique Canada, Division de la démographie, Section des estimations démographiques, 2009

Per capita GDP, the most often used indicator of standard of living, remains uneven across country. Because of the different data sources with different prices, per capita GDP is shown here for two periods 1961-1980 and 1981-2008 (Figures 5.28 and 5.29). The resource boom in the early 1950s, the stubborn recession that followed and the boom of the 1960s did not alter the per capita GDP trend line very much from 1961-1970 among Canadian provinces.

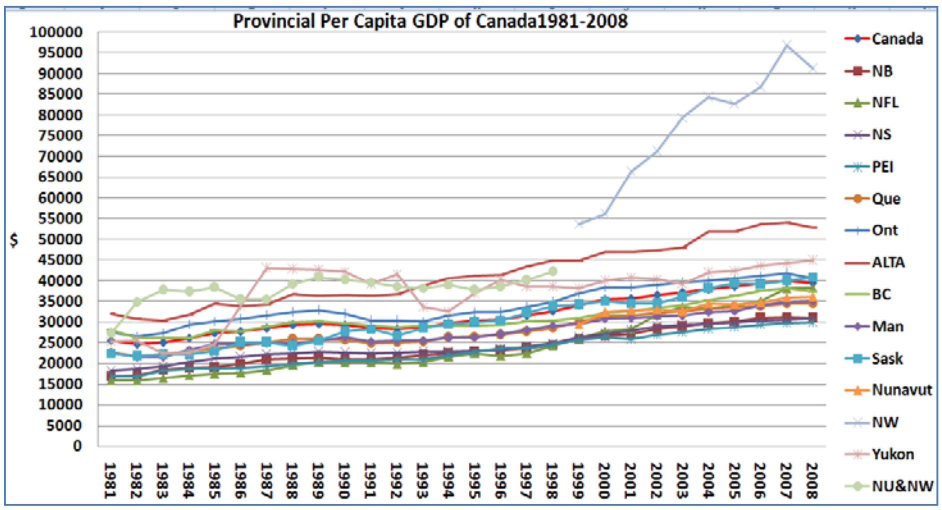
Figure 5.28 Provincial Per Capita GDP of Canada 1961-2008



Source: Calculated based on Provincial Economic Accounts: Historical issues 1961-1986, Catalogue: 13-213S.

In 1973, Canada experienced one of the most difficult times in its political and economic history due to the international economic growth slowdown. Small changes among provinces have occurred since 1974. Alberta has led the provinces in per capita GDP (Figure 5.28).

Figure 5.29 Provincial Per Capita GDP of Canada, 1981-2008



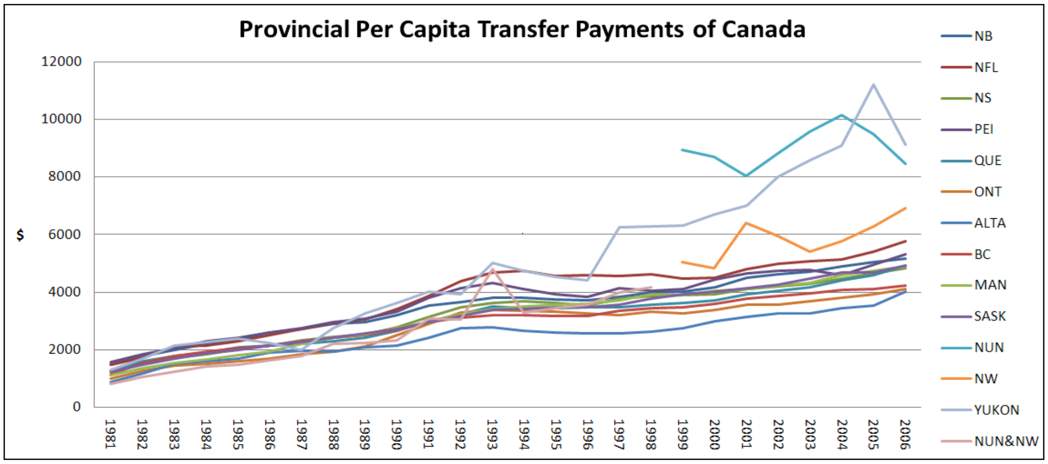
Source:Calculated based on Statcan cansim tables of provincial GDP account Table 3, Gross Domestic Product at 2002 Price.

Alberta and Ontario have kept the level above the national average with Yukon since 1980, while the other provinces increased slowly. The Northwest Territory ranks first with a per capita GDP of $91,270 in 2008, Yukon, Alberta, Ontario, Saskatchewan are above the national level of per capita GDP while the other provinces are below the national level. For the periods, Alberta has demonstrated the best performance; the Northern territories have a higher per capita GDP due to equalization payments (Figure 5.29). Kaufman et al (2003) and Chalifoux (et al 2004) stated that equalization payments reduce fiscal and income disparities among provinces.

It is also consistent with the patterns of provincial per capita Transfer Payments and Investment Income of Canada. In 2008, the Northern, Atlantic and Western provinces received higher per capita equalization payments above the national level of $4451: Yukon $9102 Nunavut $8468, Northwest Territory $6921, New Brunswick $5169, Newfounland $5773, PEI $5322, NS $4843, Manitoba $4885 and

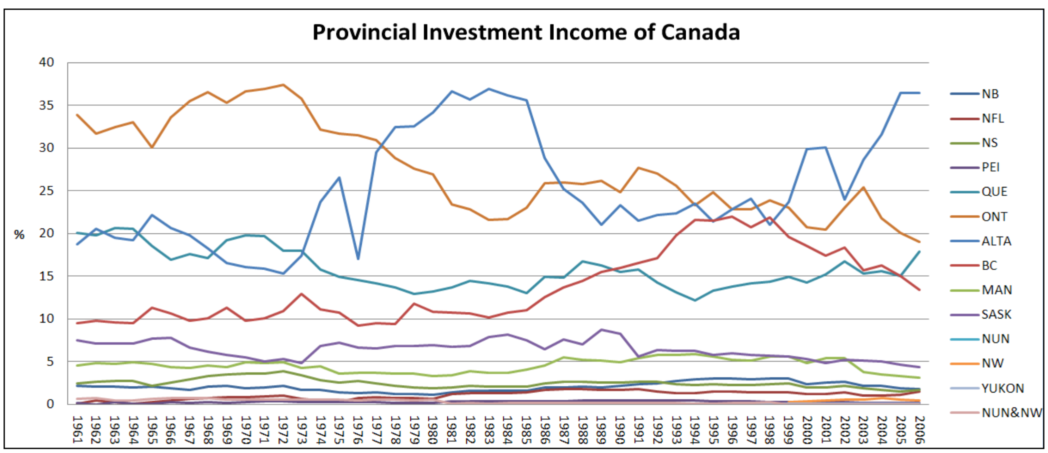
Saskatchewan $4925. Alberta received the lowest per capita equalization payments of $4012 in 2008 (Figure 5.30).

Figure 5.30 Provincial per Capita Transfer Payments for Canada, 1981-2006



Source:Calculated based on Statistics Canada, *Provincial and Territorial Economic Accounts: Data tables*, catalogue number 13-018-X.

Figure 5.31 Provincial Investment Income of Canada

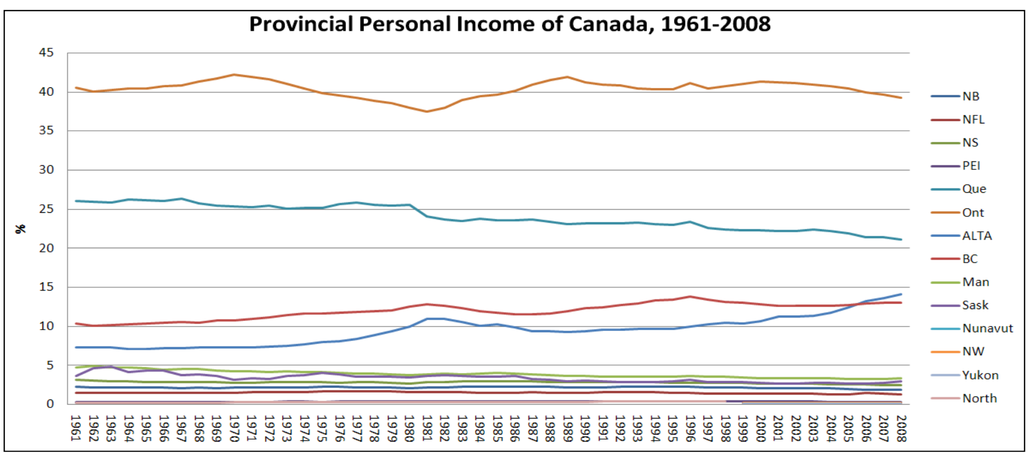


Data Source: Calculated based on Statistics Canada, *Provincial and Territorial Economic Accounts: Data Tables*, catalogue number 13-018-X.

In terms of government investment income in Canada, the largest changes have occurred in the most populated provinces of Alberta, Ontario, Quebec and British Colombia since 1961. The investment amount has increased rapidly since 1974 in Alberta because of the sharp increase in provincial investment for the oil-gas industry, while there were decreases in other provinces until the beginning of the 1980s. Then, the trend towards decrease continued in the provinces of Alberta, Ontario and Quebec, while it increased in British Colombia until the 2000s (Figure 5.31). There has been a rise and fall in investment income in these provinces since 2000. There were not many changes in the other provinces for the whole of this period. Various economic indicators – e.g. per capita income, earned income, personal income and personal disposable income – have grown faster in the poor provinces than in the rich ones since 1961 even though they have had high unemployment rates.

If the total amount of Provincial Personal Income of Canada for the period 1961-2008 is compared, it is consistent with the total amount of GDP income change and the data of provincial population distribution. Ontario (39.28%) and Québec (21.08%) account for 60% of the national total amount of personal income in Canada, while Alberta and British Colombia account for 13% and 14% respectively in 2008. The other provinces only account for 12.57% of the national total amount of personal income (Figure 5.32).

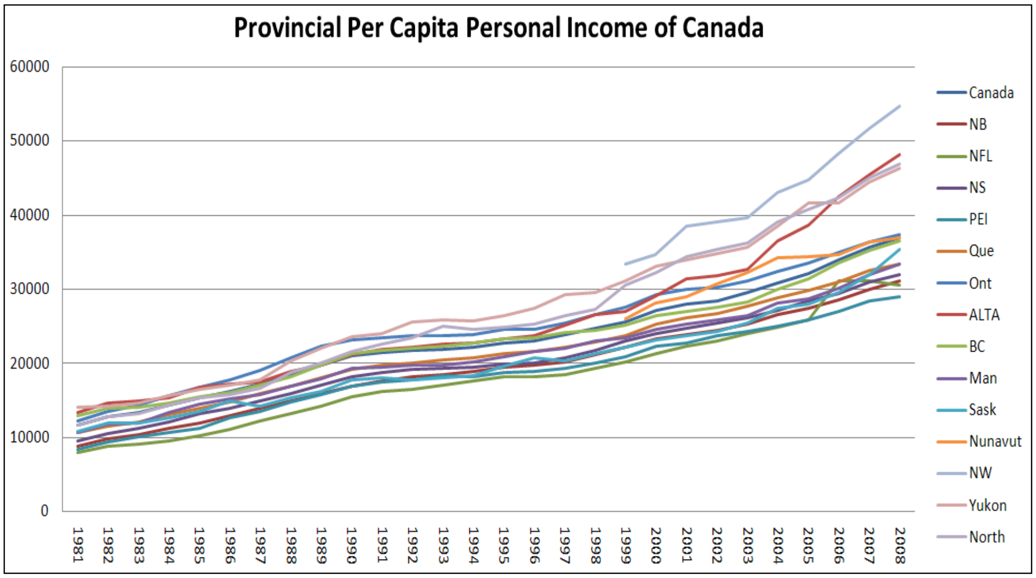
Figure 5.32 Provincial Personal Income of Canada, 1961-2008



Data Source: Calculated based on Statistics Canada, *Provincial and Territorial Economic Accounts: Data Tables*, catalogue number 13-018-X.

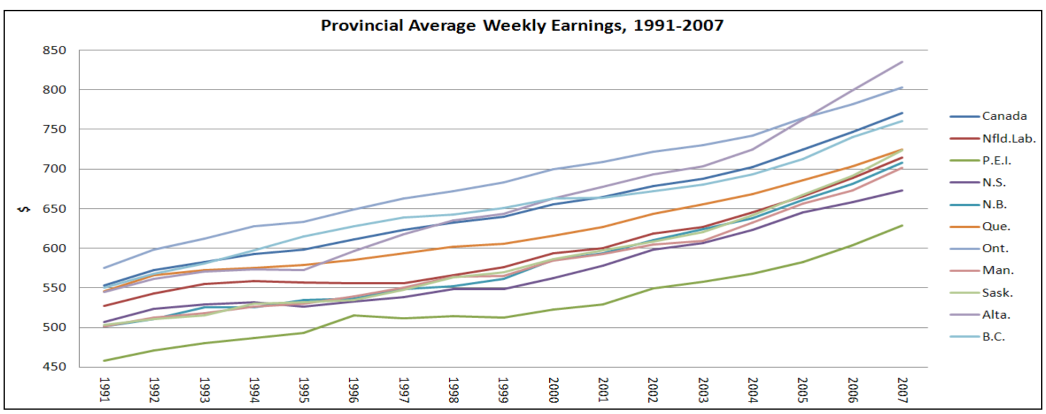
In terms of per Capita Provincial Personal Income in Canada, per capita personal income has increased steadily in all provinces since 1981. The Northern provinces and Alberta and Ontario remained above national level, while the others have not. The Atlantic Provinces have the lowest personal income level almost throughout the whole period (Figure 5.33).

Figure 5.33 Provincial Per Capita Personal Income in Canada, 1981-2008



Source: Calculated based on Statistics Canada, Provincial and Territorial Economic Accounts: Data Tables, catalogue number 13-018-X.

Figure 5.34 Provincial Average Weekly Earnings of Canada, 1991-2007



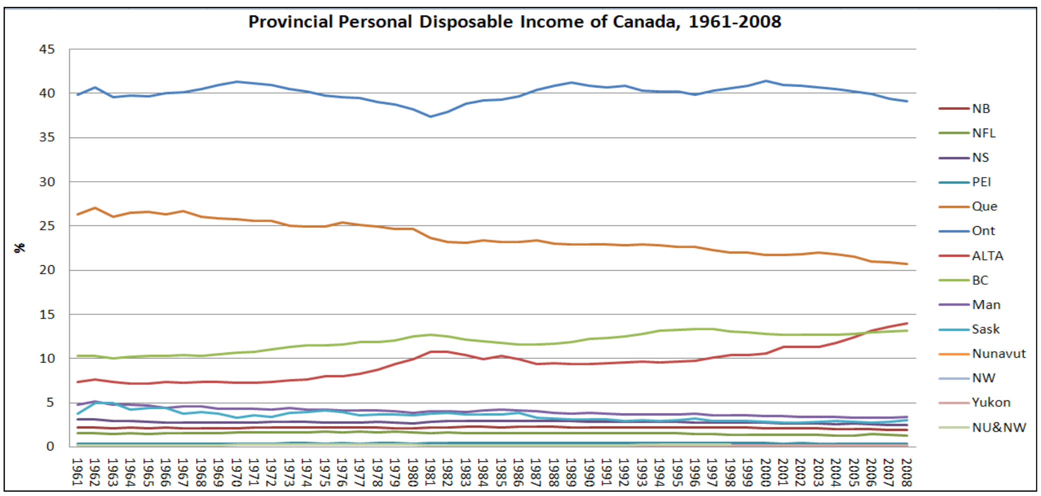
Source: Calculated based on CANSIM tables: 281-0024, 281-0027, 281-0039 and 382-0006.

Ontario and Alberta have had the highest Provincial Average Weekly Earnings always above the national level since 1991, and Alberta surpassed Ontario in 2005 and reached $835.52 in 2008. B.C has been below the national level but has kept close to it since 2000 while Quebec has diverged from the national level of Average Weekly Earnings since 1991.The other provinces are below the national level of $778.32. PEI has the lowest Average Weekly Earnings of $457.95 in 1991 and $628.9 in 2007

(Figure 5.34).

Eighty-seven percent of personal disposable income of Canada comes from four provinces - Quebec 20.74%, Ontario 39.16%, Alberta 14% and British Colombia 13.16% in 2008. Manitoba and Saskatchewan made up 4.77% and 3.7% of the total amount respectively in 1961. However, their proportion decreased to 3.347% and 3.016% respectively in 2008. The provincial share of personal income has remained at the same level in Ontario since 1961, while it has increased in B.C. and Alta, and has declined in Quebec from 26.34% in 1961 to 20.75% in 2008. This is consistent with the trends in the shares of total GDP, personal income and population. The Atlantic Provinces account for 6.1% of the total amount of personal disposable income of Canada, while the Northern territories only accounts for 0.43% (Figure 5.35).

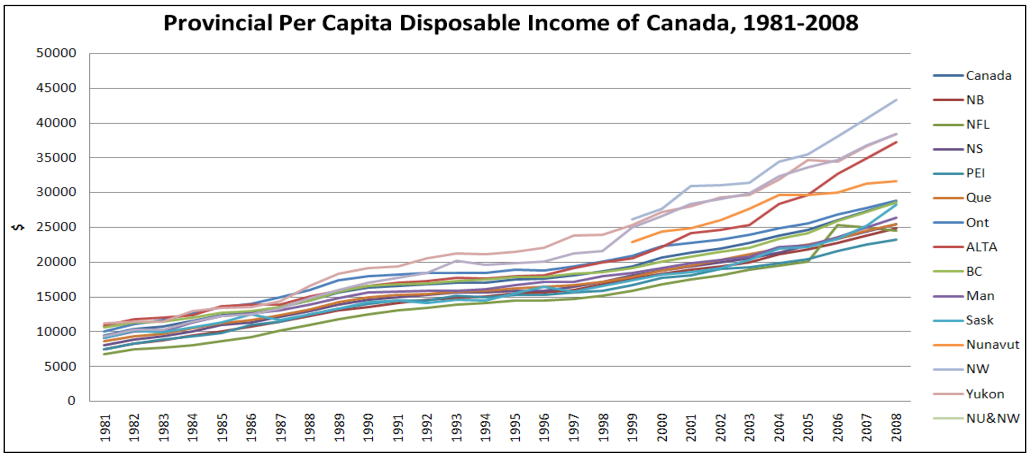
Figure 5.35 Provincial Personal Disposable Income of Canada, 1961-2008



Source: Calculated based on the data of Statistic Canada: Canadian Economic Observer Catalogue Number: 11-210-X.

Since 1980, provincial per capita disposable income has increased steadily in Canada. The Northern territories and Alberta and Ontario were above the national average level during this period. The Northwest Territories has the highest level at $43,348 in 2008, with Yukon and Nunavut with $38,429 and $31,661 respectively while Alberta ranked third with $37,189. The reason for the Northern Territories having the higher personal disposable income is the increase of investment and federal transfer payments mentioned earlier. Ontario has almost remained at the same level as national level while Quebec has dropped below the national level since 1985 (Figure 5.36).

Figure 5.36 Provincial Per Capita Personal Disposable Income of Canada, 1981-2008

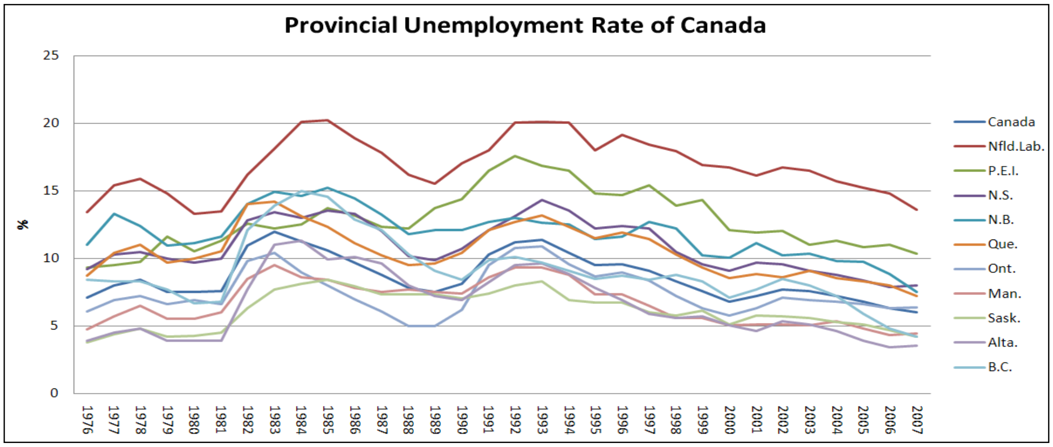


Source: Calculated based on the data of Statistic Canada: Canadian Economic Observer Catalogue Number: 11-210-X

Changes in GDP and personal income are closely related with provincial employment, unemployment rates, participation rates and provincial migration in Canada. It seems disparities in unemployment rates in 2007 have not diminished when compared with the level of 1971 (Figure 5.37). But there are several ups and downs and clear differences among provinces during the whole period from 1976 to 2007 which follow the pattern of economic slowdowns at different times.

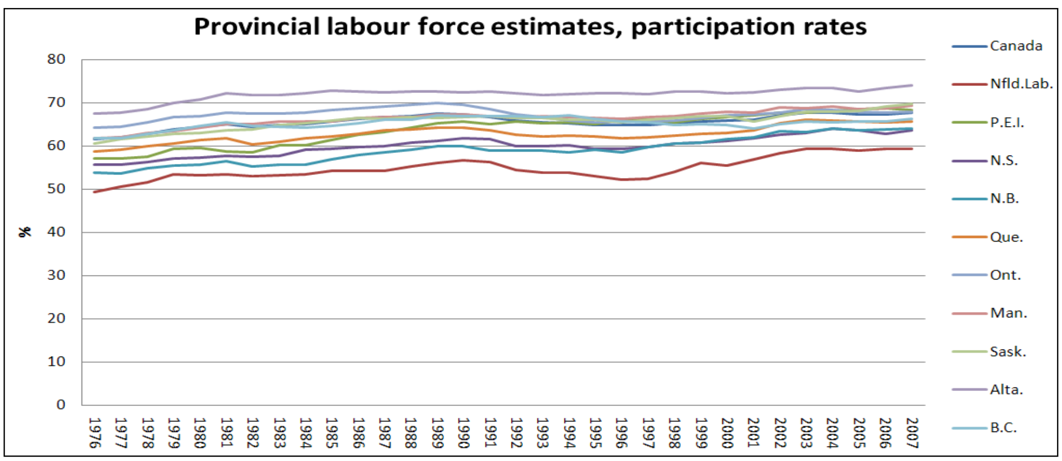
The unemployment rates increased in 1983-1984 and 1992-1994. But they decreased since 1995 until 2007, ending up with the same level as 1971. The Atlantic Provinces have higher unemployment rates – Newfoundland 13.6%, Prince-Edward Island 10.3%, Nova Scotia 8% and New Brunswick 7.5% while the western provinces have lower unemployment rates – Manitoba 4.4%, Alberta 3.5%, Saskatchewan 4.2% and British Colombia 4.2% in 2008. Ontario and Quebec had medium unemployment rates of 6.4% and 7.2%, higher than the national level of 6%. It is obvious that Alberta has had the lowest rates since 1997.

Figure 5.37 Provincial Unemployment Rates of Canada, 1976-2007



Source: Calculated based on the data of Statistic Canada: Canadian Economic Observer Catalogue Number: 11-210-X.

Figure 5.38 Provincial Labour Force Estimates, Participation Rates, 1976-2007



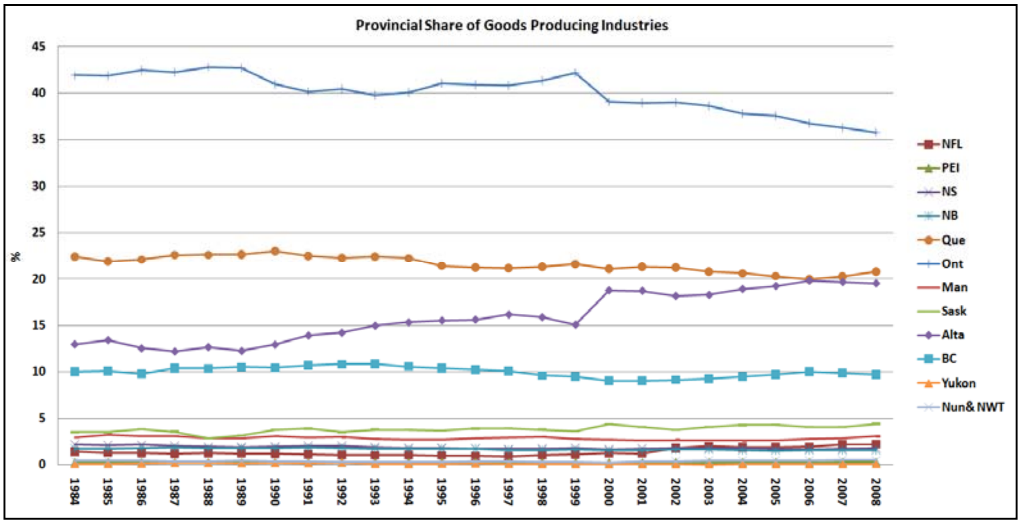
Source: Calculated based on the data of Statistic Canada: Canadian Economic Observer Catalogue Number: 11-210-X.

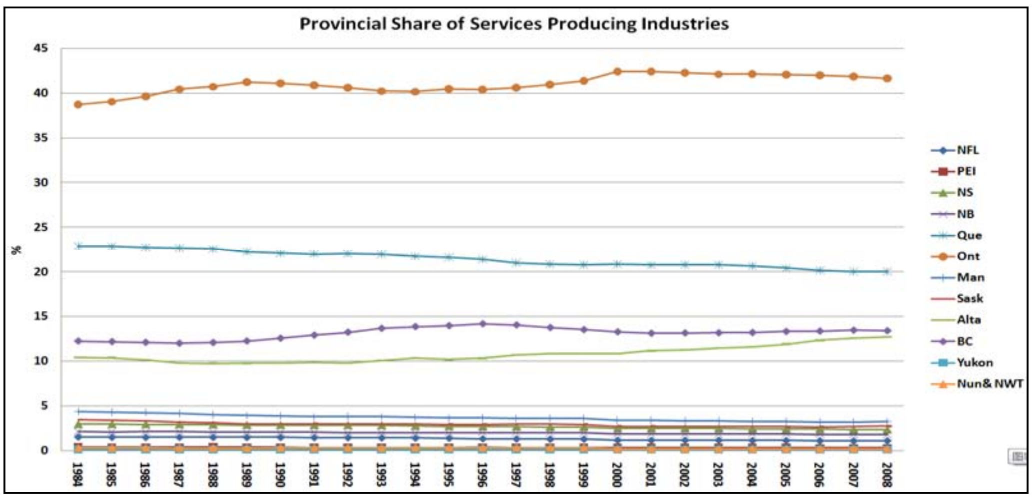
The labour force in Canada is distributed very unevenly; 61.9% of Canada's labour force is concentrated in Ontario and Quebec. If the percentage of Alberta and British Colombia are included, these four provinces account for 86.9% of the national labour force. The provincial share of the national labour force has increased in Ontario, Alberta and British Colombia from 38.38%, 8.7% and 10.88% in 1976 to 39.1%, 11.62% and 13.44% respectively in 2008. However, it has declined in other provinces. The largest decline occurred in Quebec, from 26.1% in 1976 to 22.8% in

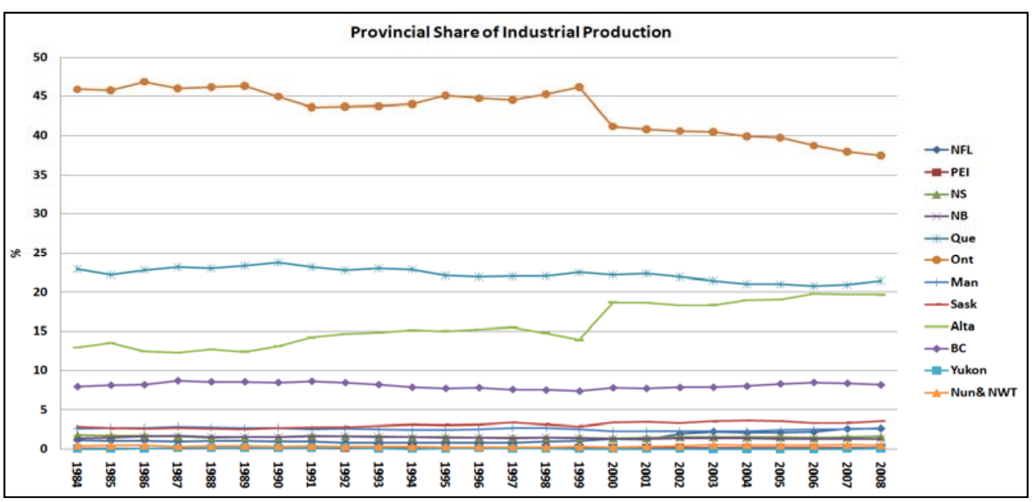
2007. Provincial labour force participation rates have increased gradually since 1976 with some slight declines in some provinces between 1991 and 1997. Alberta has the highest labour force participation rate of 74.1%, while Newfoundland has the lowest labour force participation rate at 59.2% (Figure 5.38).

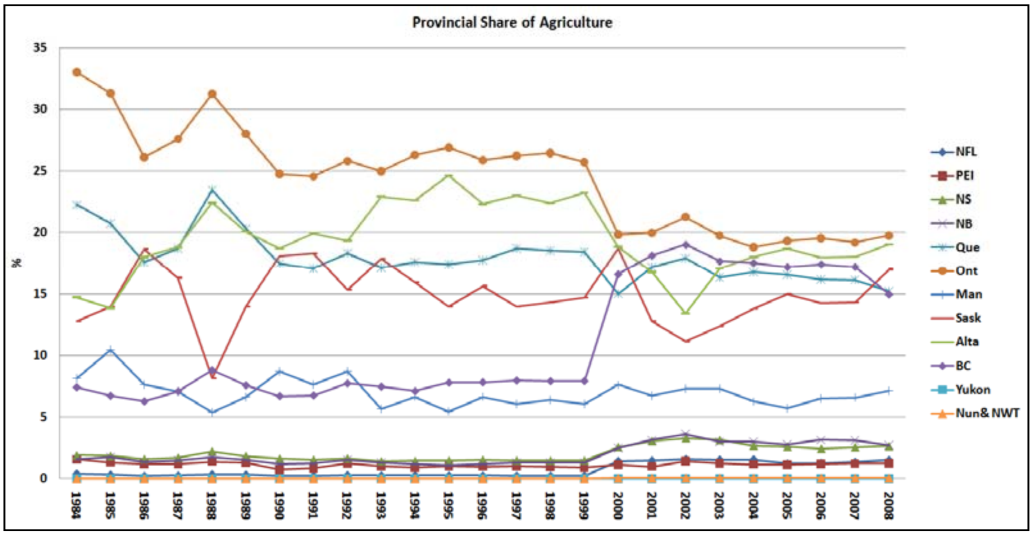
Provincial industrial composition differs greatly in Canada. The most significant changes have occurred in the four most populated provinces. The changes in other provinces do not make any substantial difference to the national total GDP account (Figure 5.39); 64.36% of goods-producing industries and 56.54% of services producing industries were concentrated together in Ontario (Ontario: 41.91%, 38.72%) and Quebec (Quebec: 22.45%, 22.87%) in 1984. In 2008, their proportion changed to 61.59% and 61.59% for goods-producing industries and services producing industries respectively. The greatest decreases occurred in goods-producing industries in Ontario and Quebec while the greatest increase appeared in Alberta. The goods-producing industries in Alberta rose to 19.51% in 2008 from 12.97% in 1984. British Colombia has kept the same level for the whole period. The services producing industries in Ontario, British Colombia and Alberta have increased gradually while it has decreased in Quebec. In terms of the provincial share of industrial production, this has decreased in Ontario from 45.89% in 1984 to 37.41% in 2008, while it has increased in Alberta from 12.97% in 1984 to 19.67% in 2008. Quebec and British Colombia have more or less kept similar levels for this period. Newfoundland has raised its industrial production from 1.17% in 1984 to 2.64% in 2008. Most provinces have reduced significantly the agricultural share of GDP for this period, although it increased in Alberta, British Colombia, Saskatchewan, New Brunswick, Novo Scotia and Newfoundland since 2000. Mining, quarrying and oil well industries are extremely strong in Alberta due to the boom of the oil industry and gas extraction. Its GDP share has increased from 53.94% in 1984 to 59.88 in 2008. It has also increased in Newfoundland rapidly from 2.01% in 1984 to 9.79% in 2008. British Colombia has kept the same level while it has diminished in Ontario, Quebec, Manitoba and Saskatchewan in recent decades.

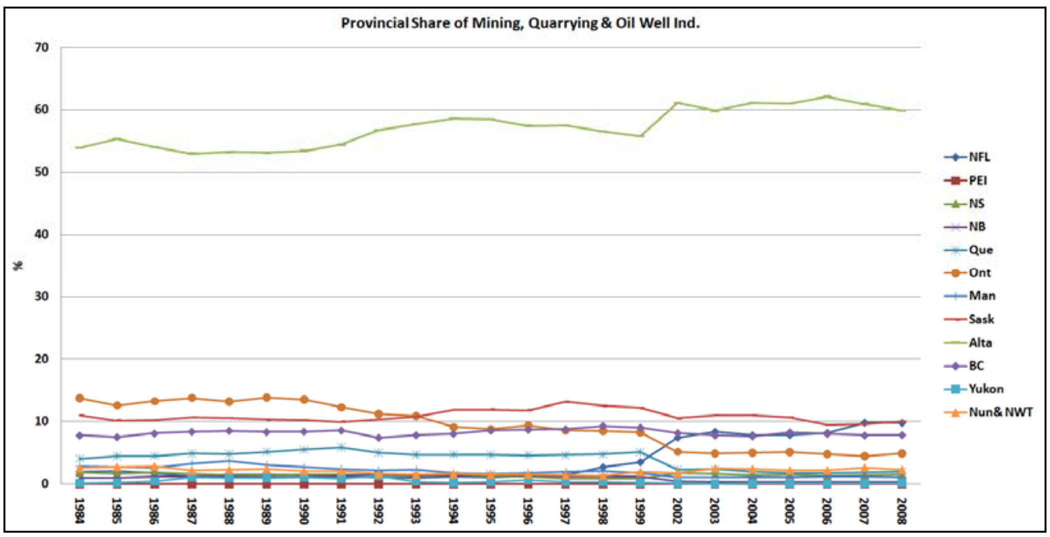
Figure 5.39 Provincial Comparisons by Industry

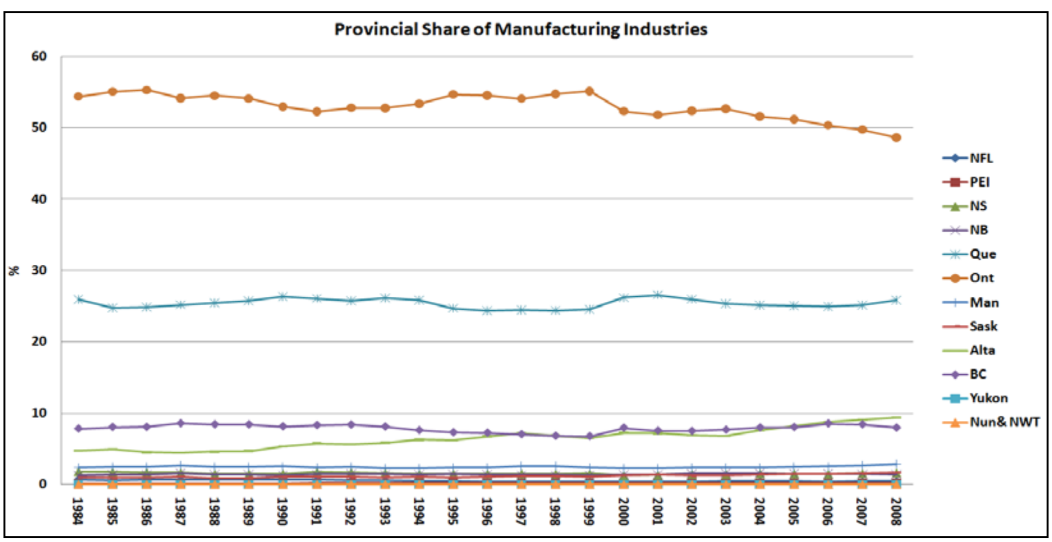


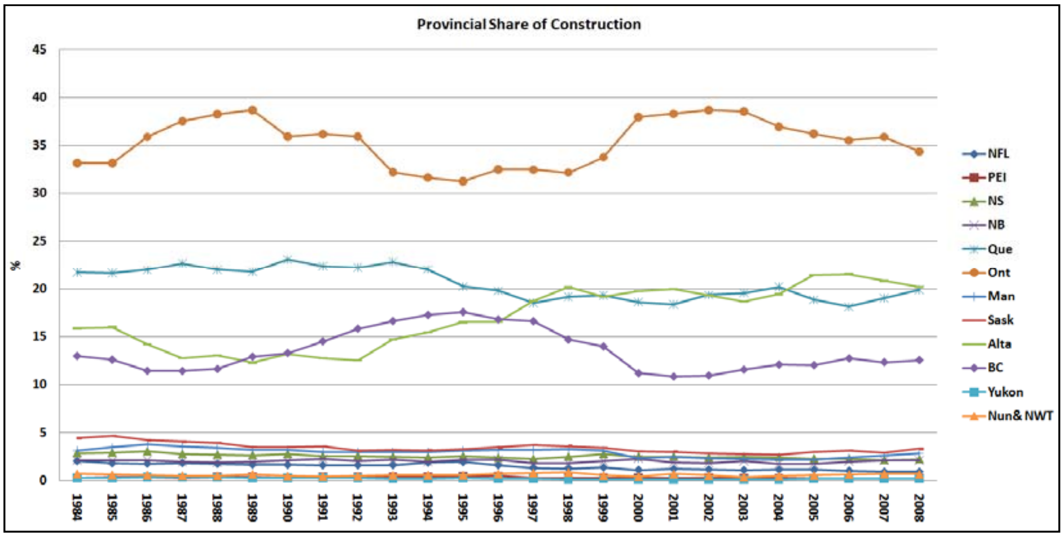


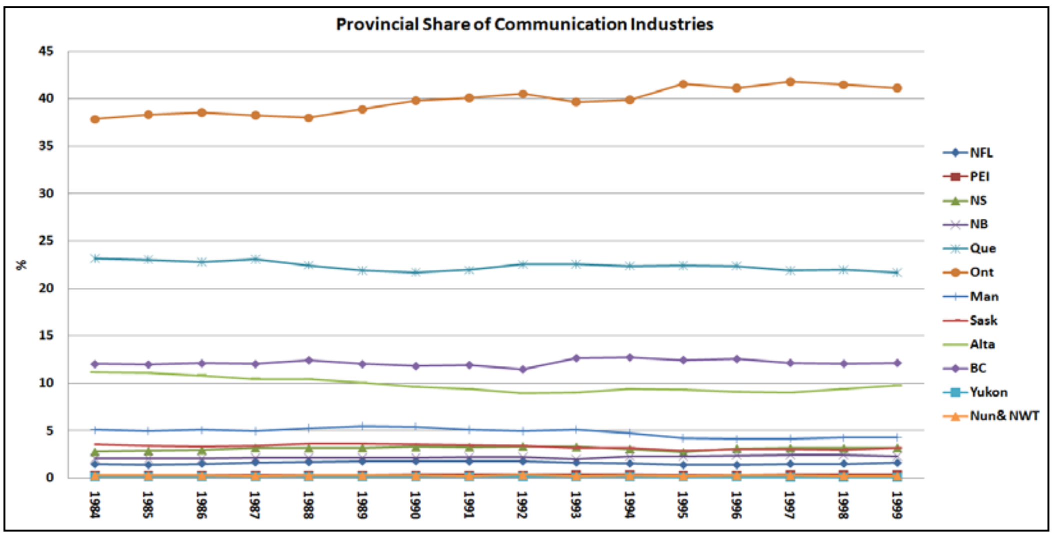


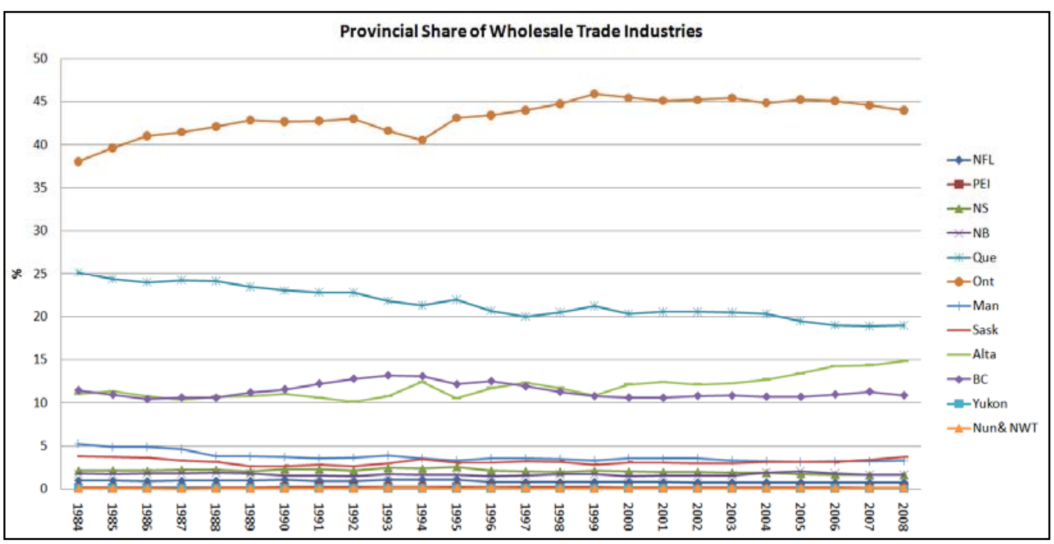

Provincial Share of Agriculture
%
NFL
PEI
NS
NB
Que
Ont
Man
Sask
Alta
BC
Yukon
Nun& NWT

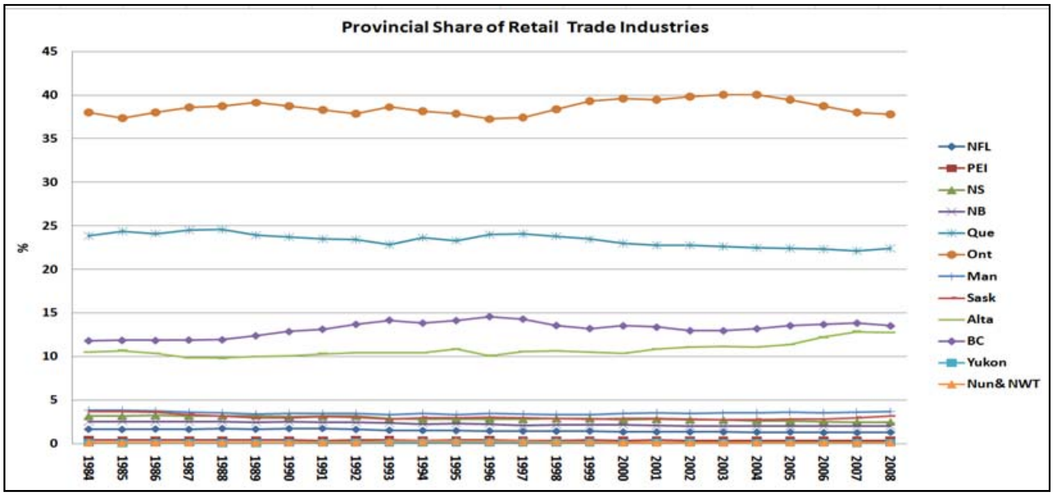

Provincial Share of Mining, Quarrying & Oil Well Ind.
%
NFL
PEI
NS
NB
Que
Ont
Man
Sask
Alta
BC
Yukon
Nun& NWT


Provincial Share of Manufacturing Industries
%
NFL
PEI
NS
NB
Que
Ont
Man
Sask
Alta
BC
Yukon
Nun& NWT


Provincial Share of Construction
%
NFL
PEI
NS
NB
Que
Ont
Man
Sask
Alta
BC
Yukon
Nun& NWT


Provincial Share of Communication Industries
%
NFL
PEI
NS
NB
Que
Ont
Man
Sask
Alta
BC
Yukon
Nun& NWT

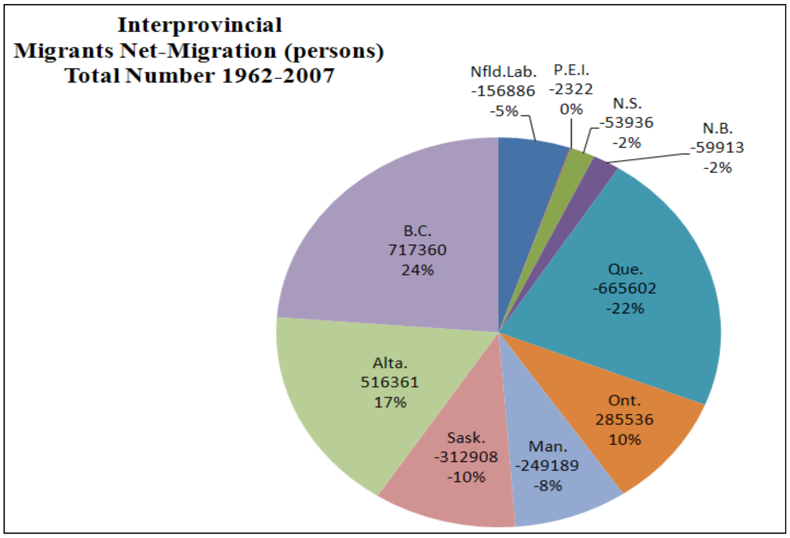

Provincial Share of Wholesale Trade Industries
%
NFL
PEI
NS
NB
Que
Ont
Man
Sask
Alta
BC
Yukon
Nun& NWT



Source: Calculated based on the Provincial and Territorial Economic Accounts Review, 2008 Preliminary Estimates, Catalogue no. 13-016-X, Provincial Gross Domestic Product by Industry, 1984-1999, Catalogue no. 15-203-XIB.

Manufacturing industries have remained without change in Quebec (about 26%) while it has diminished in Ontario. These two provinces accounted for 80.3% of national manufacturing industries in 1984, but their combined share dropped to 74.4% in 2008. The reason is that Alberta increased its share sharply from 4.73% in 1984 to 9.38% in 2008. Saskatchewan has also increased its share from 0.98% to 1.71% for this period. There is not much change in the other provinces. If we take the construction industries for example, the obvious increase has occurred in Alberta, where it has risen from 15.86% in 1984 to 20.21% in 2008. There are no major changes in the other provinces for this period although there were some slight ups and downs in provincial shares. The four provinces of Ontario, Quebec, Alberta and British Colombia have a strong showing in transportation and storage, communications, wholesale and retail trade industries for this period. The share of these four provinces in these four sectors changed from 81.96%, 84.21%, 85.71%, and 84.21% in 1984 respectively to 83.17% in 1999, 84.75% in 1999, and to 88.68% and 86.52% in 2008 respectively. From this statistical analysis, we can draw the conclusion that the four provinces contribute 93% of national GDP for the whole period.

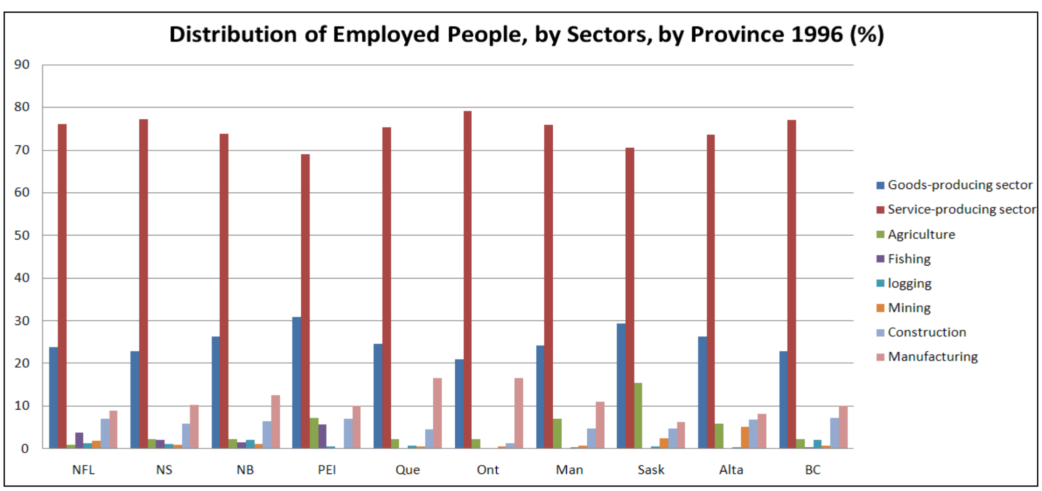
Figure 5.40 Interprovincial Net Migration (Persons), 1962-2007



Source: CANSIM tables: 51-0017, 276-0001, 276-0004, 276-0011, 276-0015, 276-0016, 278- 0007 and 278-0009, Statistic Canada, Canadian Economic Observer 2007-2008 Catalogue Number: 11-210-X

In Canada, the increase of international immigrants and interprovincial migrants (Figure 5.40) has a high correlation with the increase in total GDP by province. Based on the data of Statistic Canada (Division de la démographie 2008), the majority of immigrants settled in Ontario. In 2006, more than four immigrants out of five (85%) choose to settle in Quebec, Ontario or British Columbia. Ontario alone received half of Canada's newcomers in 2006, whereas the demographic weight of that province was less than 40%.

Figure 5.41 Distribution of Employed People, by Sectors, by Province 1996 (%)

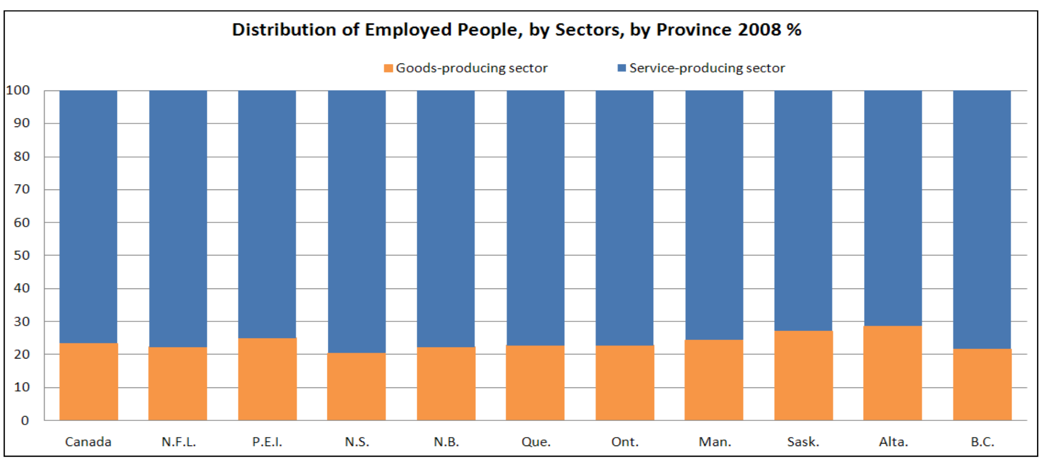


Source: Based on the data of Wallace (2002), Statistics Canada, Cat. no. 93F002XDB96008

Over the last three decades, Ontario, Alberta and British Colombia have attracted more international and interprovincial migrants than Quebec and the other provinces. In terms of the long term data on interprovincial net migration, this has increased 24% in British Columbia, 17% in Alberta and 10% in Ontario while it has diminished 22% in Quebec, 10% in Saskatchewan, 8% in Manitoba and 5% in Newfoundland for the whole period 1962 -2007 (Figure 5.40).

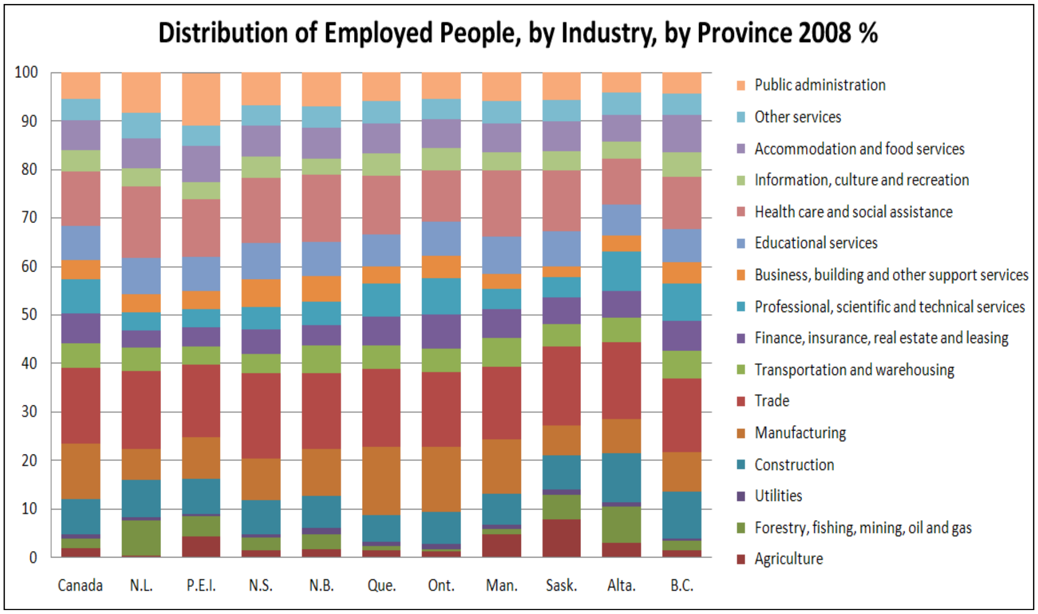
The provincial differences in the distribution of employed people by goods producing sectors and service producing sectors were not very significant in 1996 and 2008 (Figures 5.41 and 5.42). Employment in the goods producing sectors has decreased a little in all provinces except Alberta. In 1996, 73.8% of those employed worked for service producing industries, producing 63.70% of Canada's GDP. There was 76.52% of employment in goods producing industries while 23.48% employment in service producing industries in Canada in 2008. However, the distribution of employed people by industry obviously differs between provinces. Employment numbers in manufacturing was higher in Ontario and Quebec, while Saskatchewan, Prince Edward Island, Manitoba and Alberta had high employment numbers in agriculture and Alberta dominated mining employment in 1996.

Figure 5.42 Distribution of Employed People, by Sectors, by Province 2008 (%)



Source: Statistics Canada CANSIM, table (for fee) 282-0008 and Catalogue no 71F0004XCB. Last modified: 2009-01-08.

Figure 5.43 Distribution of Employed People, by Industry, by Province, 2008 (%)



Source: Based on Statistics Canada, CANSIM, table (for fee) 282-0008 and Catalogue no 71F0004XCB.

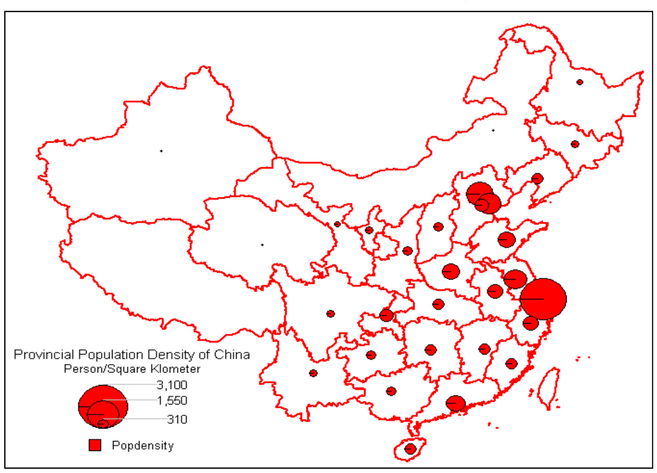
The distribution of employed people, by industry, by province in 2008 (Figure 5.43) reflects different economic industrial profiles between provinces. The proportion of agricultural employment is high in Saskatchewan, Manitoba and Prince Edward Islands at 7.99%, 4.76% and 4.42% respectively, while it is about 1% to 2% in the other provinces. Forestry, fishing, mining, oil and gas employment numbers make up a higher proportion of employment in Alberta, Newfoundland and Prince Edward Island at 7.4%, 7.2%, and 4.13% respectively. The share of manufacturing employment is high in Quebec and Ontario while share of construction employment is high in Alberta and British Colombia. Employment in professional, scientific and technical services is highly concentrated in Ontario, Quebec and Alberta. There are not many differences in the other sectors.

5.2.2 Provincial Case of China

In section 5.1.3, regional disparities and differences of China were analyzed from a different point of view. In this section, updated long term provincial statistical data are used to reveal provincial disparities in China. In China, provincial disparity has been a major focus of national regional development and policy. Provincial disparity in China is larger than regional disparity. National income and population are distributed unevenly between provinces. Economic growth differs greatly between provinces. The national average population density of China in 2008 was 138 persons/km^2. Most of the population in China is concentrated in the coastal and adjacent eastern provinces.

The four municipalities directly under central government, Shanghai (3029 persons/km^2), Beijing (1039 persons/km^2), Tianjin (1010 persons/km^2)Chongqing （349 persons/km^2) and Jiangsu (762 persons/km^2), Shandong (610 persons/km^2), Henan (570 persons/km^2), Guangdong (538 persons/km$^{2)}$ and Zhejiang (505 persons/km^2) provinces have a high population density of over 500 persons/km^2. The western provinces and ethnic autonomous regions, have lower population densities (Map 5.4) which are below national average while most of the provinces' population densities are above 100 persons/km level (for example: Inner Mongolia (21 persons/km^2), Xinjiang Uyghur Autonomous Region (13 persons/km^2), Tibet Autonomous Region (2.38 persons/km^2) and Qinghai (7.69 persons/km^2)).

Map 5.4 Provincial Population Density of China, 2008.



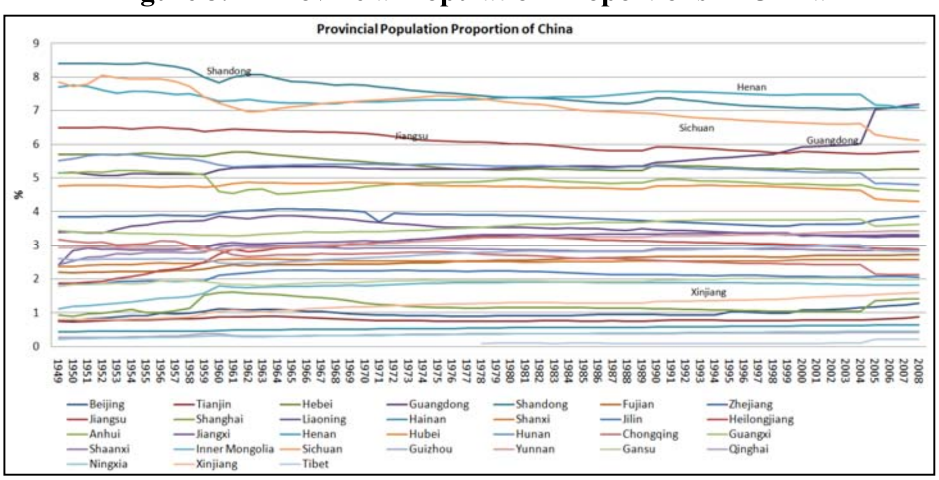
Source: Calculated based on the China Statistical Yearbook 2008

There is not much change in the population distribution for the period 1949-2008 except for some slight decreases which occurred mostly in some populated provinces if the provincial population is compared with the provincial population share in national population (Figure 5.44). Henan, Shandong, Sichuan, Guangdong and Jiangsu have decreased their share, but still have a higher population proportion of 7.1%, 7.09%, 6.12%, 7.18% and 5.78% respectively.

In 2008, 53.8% of the GDP was produced by China's eastern provinces. The highest contributors are Guangdong, Shandong and Jiangsu which had 10.9%, 9.49% and 9.26% respectively (Figure 5.45). Provincial disparity has clearly emerged since the 1980s as Guangdong, Shandong, Jiangsu and Zhejiang provinces have developed faster than the others. Some provinces such as Liaoning, Jilin, Heilongjiang and most of the western provinces could not retain their 1950s provincial levels due to regional development policy change and different favoured investment.

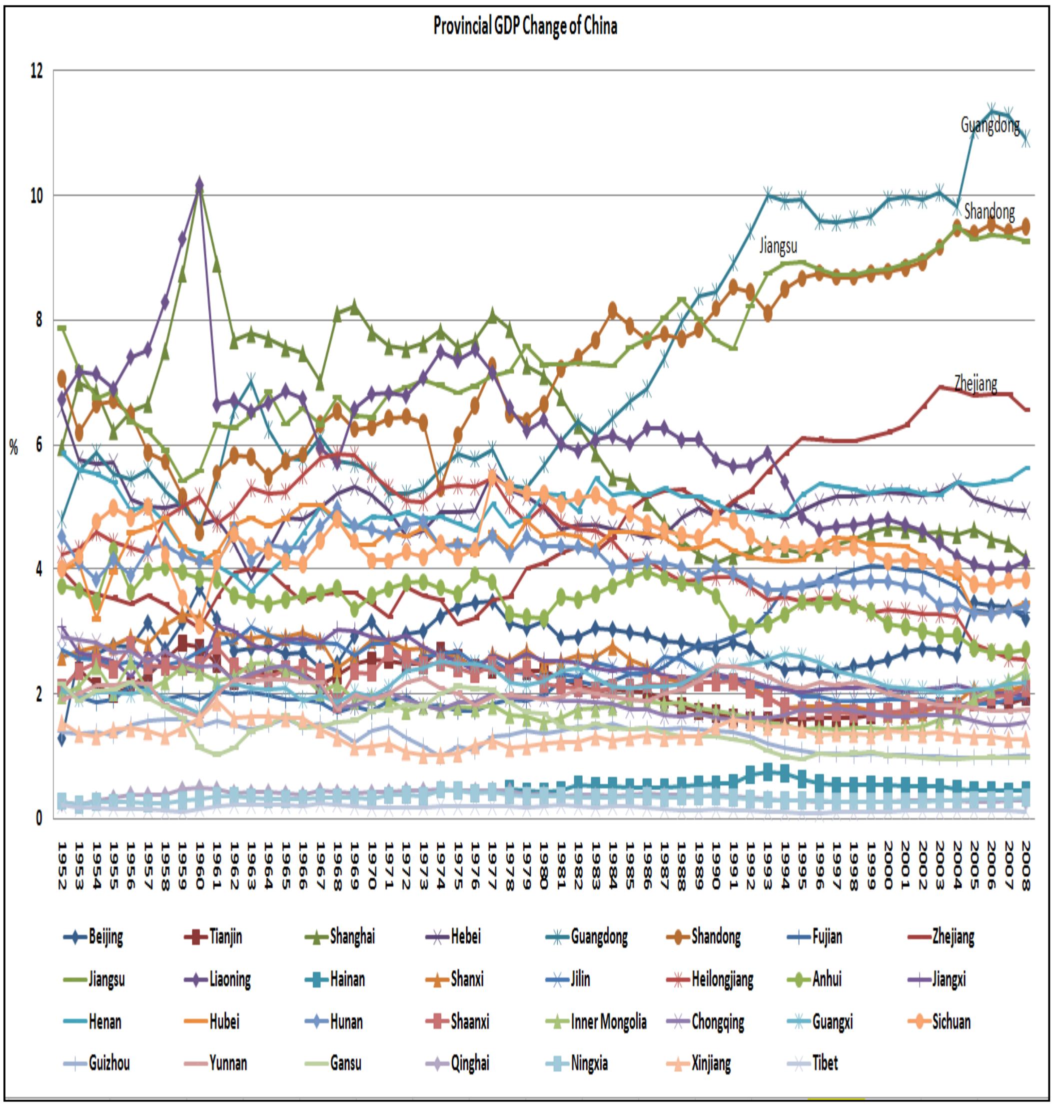
In 1952, there were large interprovincial income disparities — the richest "city-province" (Shanghai) had a per capita income of more than 10 times that of the poorest one (Guizhou); even if the "city-provinces" are excluded, the richest province of Heilongjiang had a per capita income of almost 4 times that of Guizhou, a large disparity by any standards. High income was generally associated with industrialization and was concentrated in the coastal cities of Beijing, Shanghai and Tianjin and in the north-eastern provinces of Heilongjiang, Jilin and Liaoning, the former Manchuria (Rongxingguo 2007).

Figure 5.44 Provincial Population Proportions in China



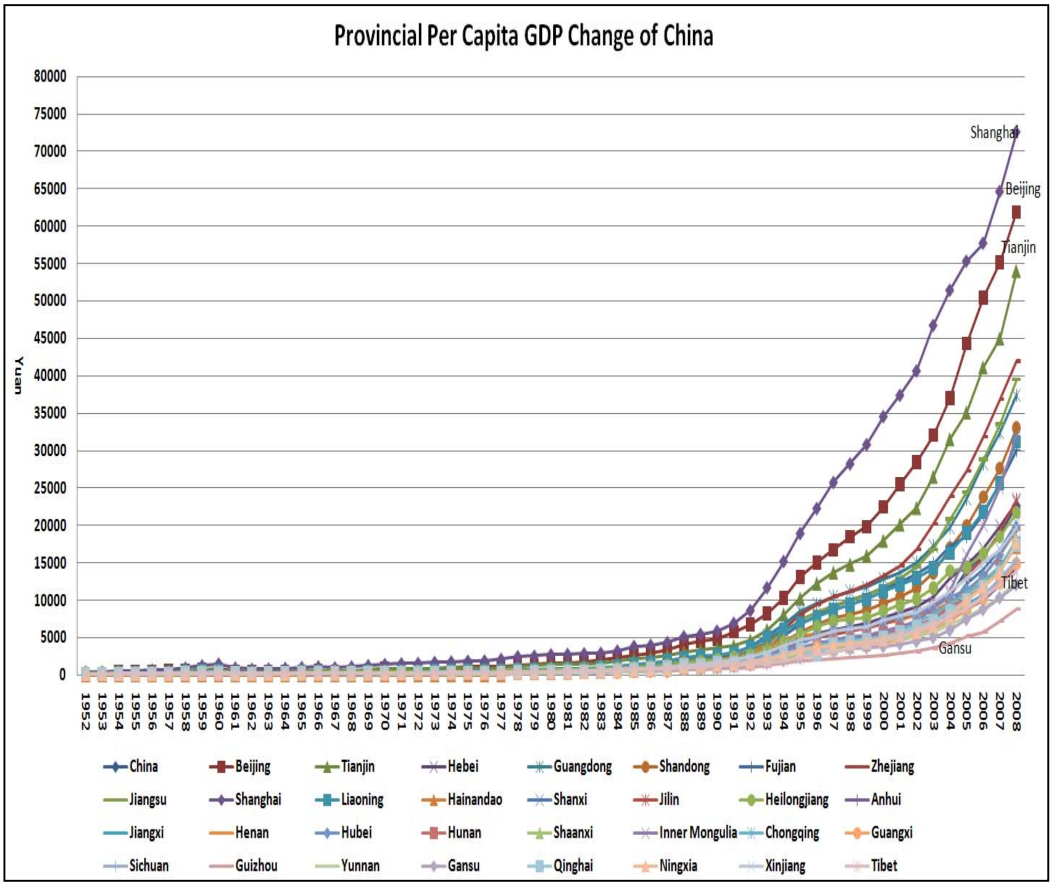
In 2008, the ratio of interprovincial income disparities between the richest province (Shanghai) and the poorest (Guizhou) had decreased by a factor of 7.04. But the absolute difference was 372 Yuan in 1952, while it increased to 53,088 Yuan in 2008. In terms of provincial per capita income, there has been no clear change in disparity between provinces from 1950 to 1980s. Shanghai, Beijing, Tianjin dominated the per capita GDP for the period 1950-1980. Liaoning, Heilongjiang and Jiangsu provinces also had high per capita GDP for the same period. However, the sharp divergence has occurred since 1990 (Figure 5.46).

Figure 5.45 Provincial GDP Change of China, 1952-2008



Shanghai, Beijing and Tianjin had high per capita GDP of 72,554Yuan, 61,876Yuan, and 54,034Yuan respectively while Guizhou, Gansu, Qinghai and Tibet have the lowest per capita GDP at 8,788Yuan, 12,547Yuan, 12,085Yuan and 13,794Yuan respectively in 2008. Chongqing had only a per capita GDP of 17,952 Yuan (Figure 5.46) . Living standards are actually improving in Central and Western China, but at **a much slower rate** than in the east as a result of large regional disparities. It is quite apparent that the rich get richer, and the poor get poorer in this case.

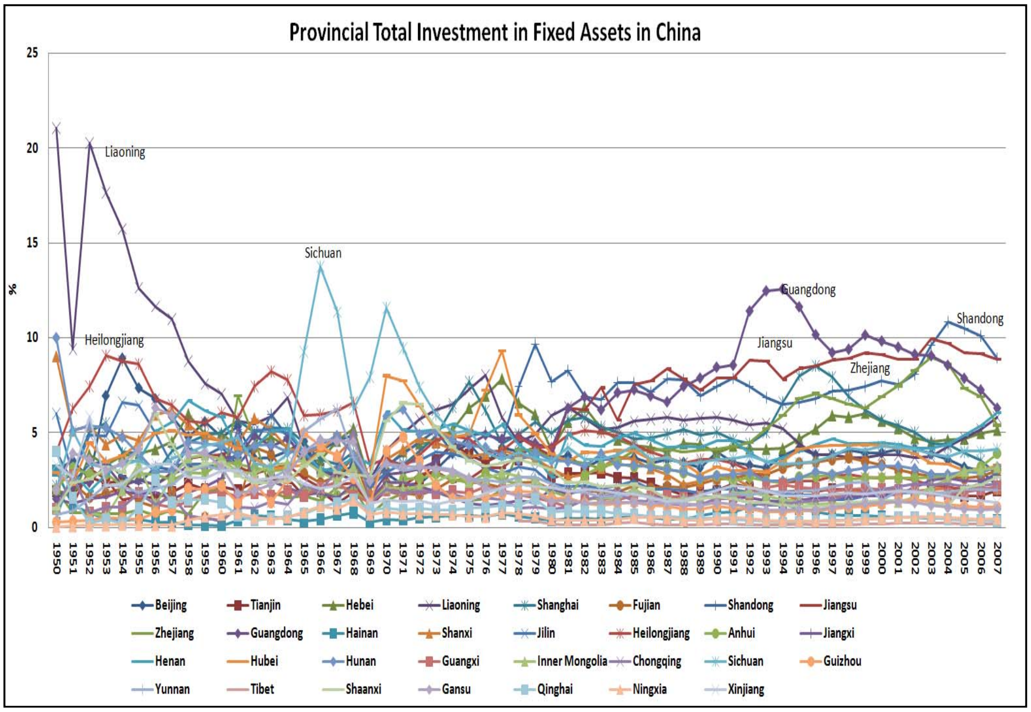
Figure 5.46 Provincial Per Capita GDP Change of China, 1952-2008



Source: Calculated based on China Statistical Yearbooks

The change in the provincial share of total GDP and per capita GDP change is highly correlated with the provincial total investment in fixed assets in China. As a result of provincial differences in the central government's selective, coastal provinces-based investment policy, local conditions and the attractive power of FDI, investment disparity between provinces has been growing since the 1980s (Figure 5.47). In the 1950s, the northeast provinces Liaoning, Heilongjiang and Jilin except Shanghai, Beijing and Tianjin, the so-called old-industrial base of China received high levels of investment income. This is a major factor in their higher GDP value at that time.

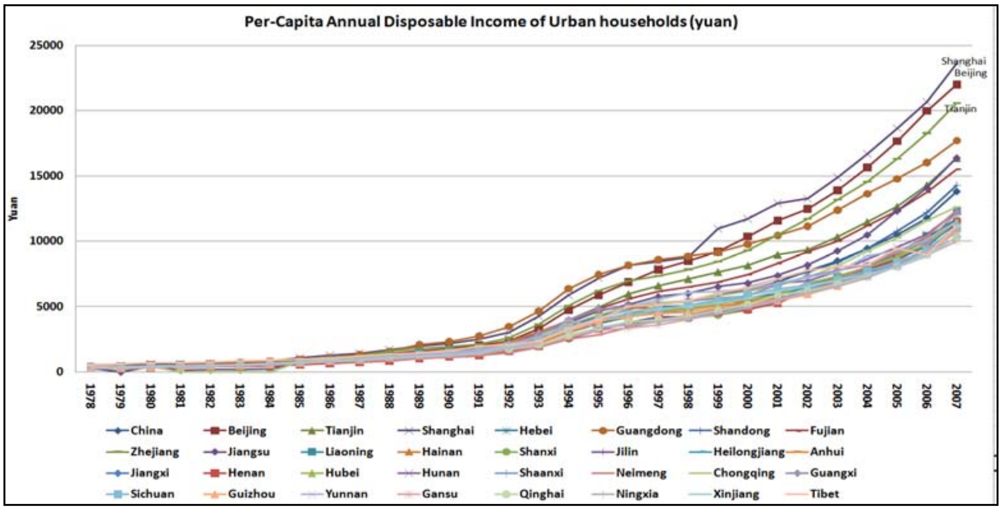
Figure 5.47 Provincial Total Investments in Fixed Assets in China, 1950-2007



Source: Calculated based on China Statistical Yearbooks. Note: it is difficult to show clearly the changing trend of all the regions in one graph due to the long period 1950-2007and the large number of regions in China. The graph is nonetheless given simply to provide an overview of the patterns of change.

In the 1960s, Sichuan province received high investment rate to strengthen its industrial base. However, the focus of investment then turned to the eastern coastal provinces since 1980. Meanwhile, the eastern coastal provinces have attracted more than 85% of FDI by because of their favorable opening policies, investment and cheap labor forces with so-called geographical advantages while the western provinces only received 1% of total FDI under unfavourable development policies since 1980. Even the control of the state over investment has been declining in the reform period, and the influence of local factors and FDI has risen, this has not been able to change the disparity in provincial investment levels. Guangdong, Shandong, Jiangsu and Zhejiang are the four provinces with the fastest investment growth in total fixed investment although they have experienced some declining trend since 2004 while Qinghai, Ningxia and Tibet have always exhibited the lowest levels of investment.

Figure 5.48 Provincial Annual per Capita Disposable Income in China, 1982-2007



Source: Calculated based on China Statistical Yearbooks.

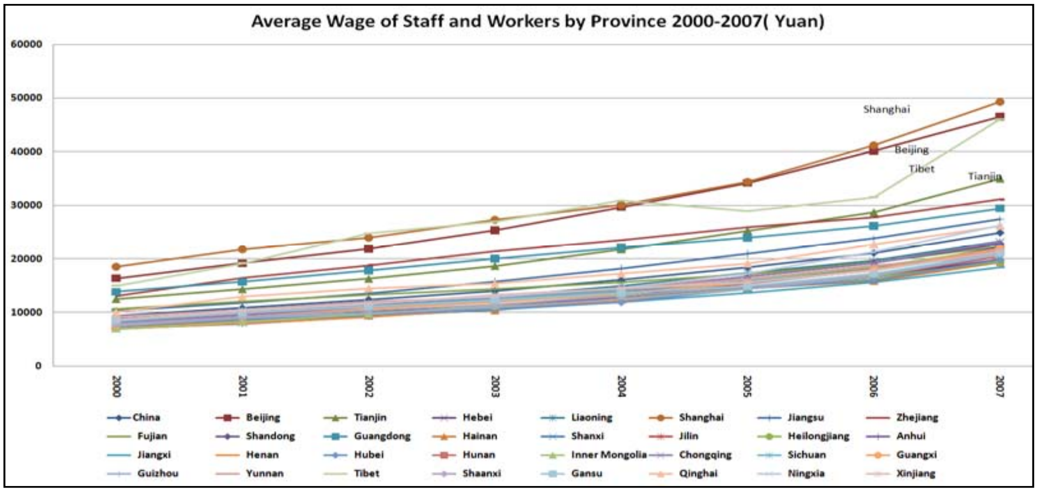
Provincial disposable income[6] is calculated through the per capita urban and rural disposable income statistics of China (Figure 5.48). Provincial disposable income has increased in all provinces gradually since 1980 but at different speeds. The highest disparity in per capita disposable income proportion is 3.36 (between Shanghai and Qinghai) in 1980 while it is decreased to 2.74 (between Shanghai and Gansu) by 2007. Shanghai, Beijing, Zhejiang have diverged from other provinces more clearly while Guangdong, Tianjin, Jiangsu, Fujian, Shandong have deviated the other provinces slowly. Qinghai, Gansu, Xinjiang, Tibet, and Shaanxi have the lowest value of provincial disposable income.

[6] **Disposable Income of Urban Households-** refers to the actual income at the disposal of members of the households which can be used for final consumption, other non-compulsory expenditure and savings. This equals to total income minus income tax, personal contribution to social security and subsidy for keeping diaries in being sample household. The following formula is used:

Disposable income = total household income - income tax - personal contribution to social security - subsidy for keeping diaries for a sampled household.

http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm

Figure 5.49 Average Wage of Staff and Workers by Province, 2000-2007



Source: Calculated based on China Statistical Yearbooks.

The average wage of staff and workers by province is an important indicator with which to compare provincial per capita income because it is mostly controlled by the state. It can be seen from Figure 5.49 that the average wage of staff and workers has increased in all the provinces at a steady growth rate since 2000. Shanghai, Beijing, Tianjin, Zhejiang, Guangdong and Jiangsu exhibit the highest salaries while the central provinces have lower salaries and the western provinces the lowest. The ratio of the highest to the lowest salary is 2.54 between Shanghai and Hubei in 2008. Although Tibet has a high value for the average wage of staff salary, this is mainly due to government investment in this remote mountainous province and higher salaries of staff and workers of government in the energy production, transport, information, scientific and education fields. The data of Registered Unemployed Persons and Unemployment Rate of Tibet province are unavailable[7].

Based on the studies of Fan (2005), more and more population is flowing out from the central and western provinces to the eastern coastal provinces in the 1990s compared to the 1980s (Figure 5.50). Sichuan, Anhui, Hunan, Hubei, Henan, Jiangxi and Guizhou have lost more of their labour force while Guangdong, Shanghai, Beijing and Fujian have received more and more from interprovincial migration.

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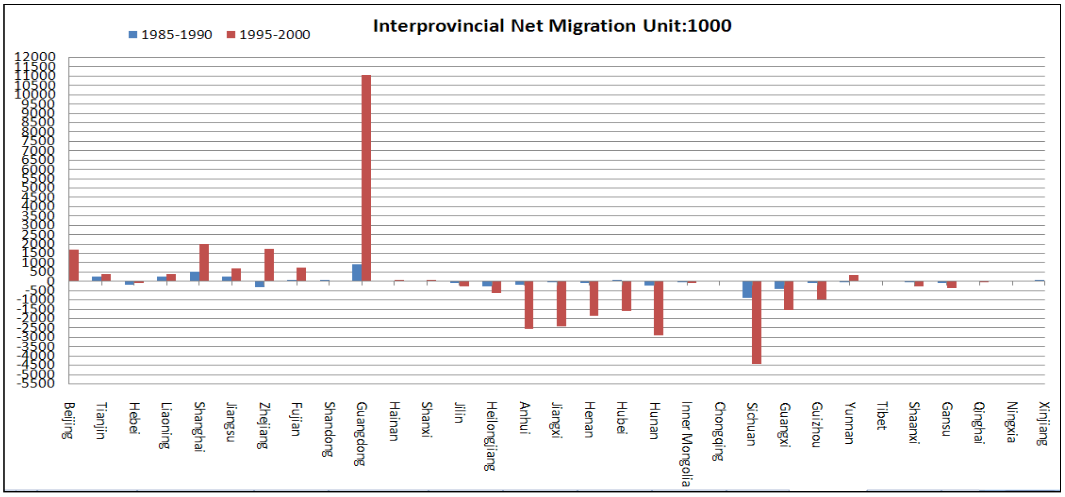
[7] http://www.stats.gov.cn/tjsj/ndsj/2009/indexeh.htm

Xinjiang is the only province that has received high positive interprovincial net migration among the western provinces for this period.

Figure 5.50 Interprovincial Net Migration, 1985-2000 (Unit: 1000)



Source: Calculated based on the data of Fan (2005).

In China, provincial unemployment had decreased at the beginning of the 1980s, but increased since 1990 with the increase in the large amount of the urban labour force coming from rural areas. In the 1990s, Ningxia, Qinghai, Guizhou, Gansu and Guangxi had the highest unemployment rates in China. But the unemployment rates in the eastern coastal provinces has increased due to large number of interprovincial migrants since 2000 (Figure 5.51), except for Beijing and Guangdong.

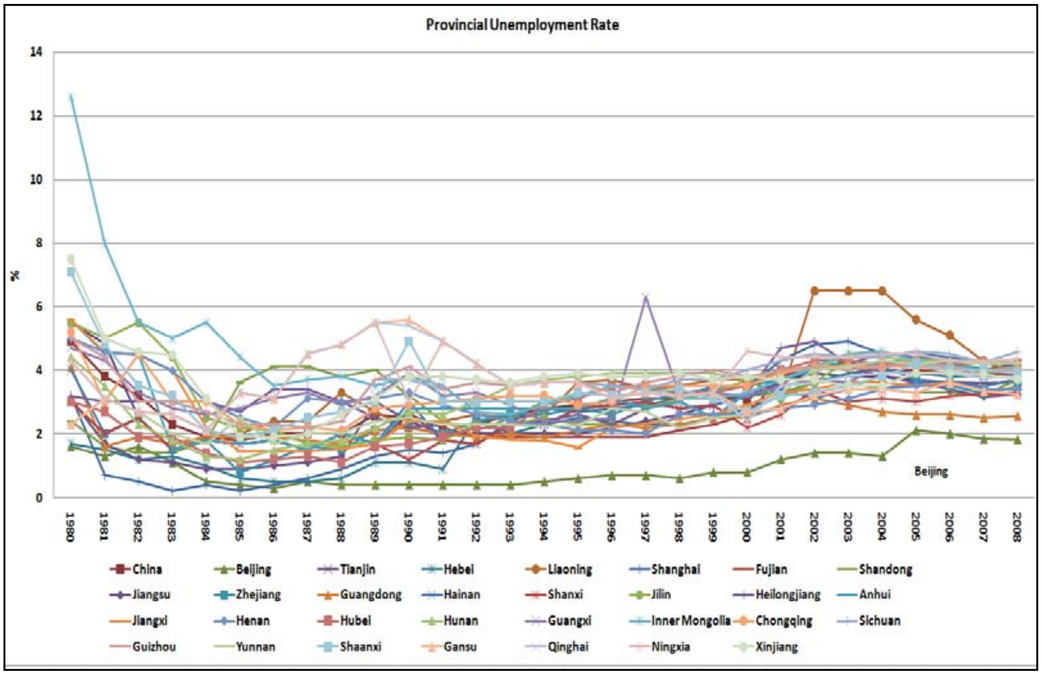
This unemployment rate refers to the registered unemployment rate[8] in urban areas in China. It is most likely underestimated due to the large numbers in the rural labour force, substantial "hidden" unemployment in rural areas and the existence of unregistered employment. Global Finance (2009) estimated that unemployment in China is officially 4% in urban areas, but by including migrants it may be as high as

[8] **Registered Urban Unemployment Rate** Registered unemployment rate in urban areas refers to the ratio of the number of the registered unemployed persons to the sum of the number of employed persons and the registered unemployed persons. The formula is as follows:

Registered urban unemployment rate = number of registered urban unemployed persons/(number of urban employed persons + number of registered urban unemployed persons) ×100%

9%. There is thus reason to believe that there is substantial unemployment and underemployment in rural areas (2008 estimate).

Figure 5.51 Provincial Unemployment Rate, 1980-2008

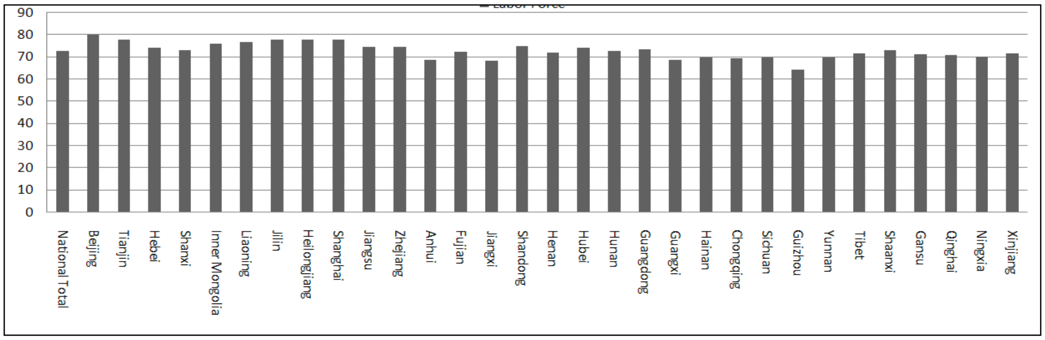


Source: Calculated based on China Statistical Yearbooks. Note: The data provincial of provincial unemployment rate are so close in each province so it is difficult to show clearly the data of each province in this figure. But it is the overall pattern that emerges from this graph that is most interesting.

If the provincial labour force is taken into consideration, there is not much difference between provinces due to the huge provincial populations. It is clear from Figure 5.52 that the eastern coastal provinces have a higher labour (participation) force than that of central and western provinces. The poorest province has the lowest labour (participation) force rate of 64.5% while Beijing has the highest labour (participation) force rate of 80.12%.

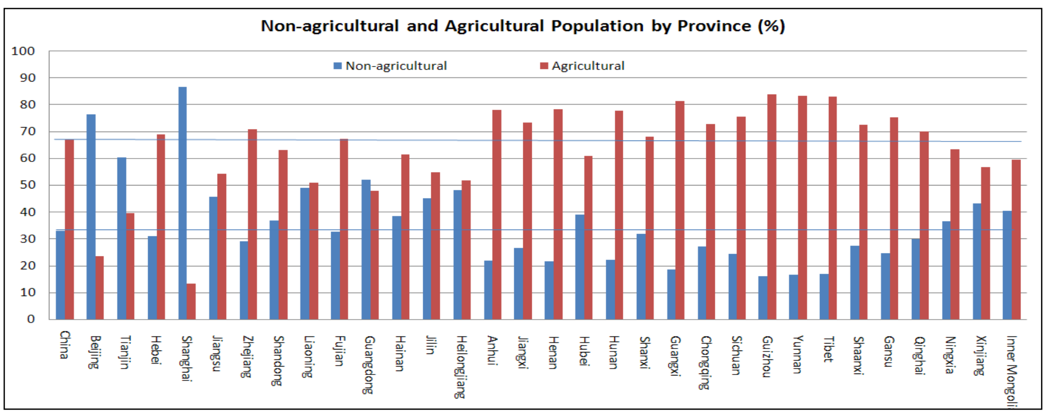
Beijing, Tianjin, Shanghai and Guangdong are the provinces with the highest non-agricultural population in China. This is consistent with the provincial GDP, per capita income, investment and salary data. The eastern coastal provinces have the highest non-agricultural population while the western provinces have the lowest non-agricultural population and the highest agricultural population. Shanghai has the highest non-agricultural population at 86.81% while Guizhou and Yunnan have the highest agricultural population of 83% (Figure 5.53).

Figure 5.52 Provincial Labour Force Participation Rate of China, 2008



Source: Calculated based on the population data of China Statistical Yearbook 2008.

Figure 5.53 Provincial Agricultural, Non-Agricultural Population of China, 2008



Source: Calculated based on China Statistical Yearbook 2008.

Another important indicator used to measure personal income in an under-developed country is Engel's Coefficient[9] which measures the change in consumption patterns. This coefficient can be calculated in China by means of Engel's Coefficient for rural households and Engel's Coefficient for urban households (Figure 5.54-A, B). Engel's Coefficient for rural households and Engel's Coefficient for urban households have declined in all provinces since 1978 (Figure 5.54-A).

[9] Engel’s Coefficient refers to the percentage of expenditure on food in the total consumption expenditure, using the following formula: Engel’s Coefficient = expenditure on food/Total Consumption expenditure×100%. http://www.stats.gov.cn/tjsj/ndsj/2009/indexeh.htm

Figure 5.54-A: Engel's Coefficient for Urban Households, 1978-2004[10]

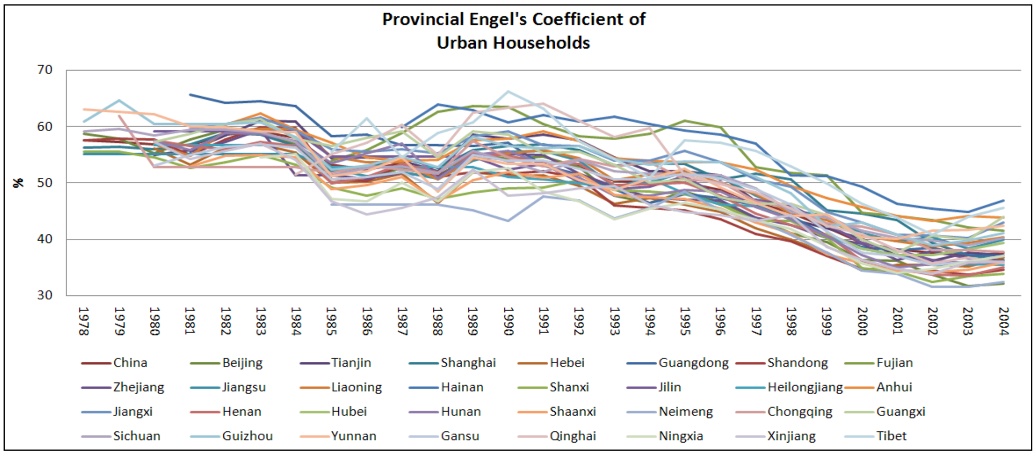
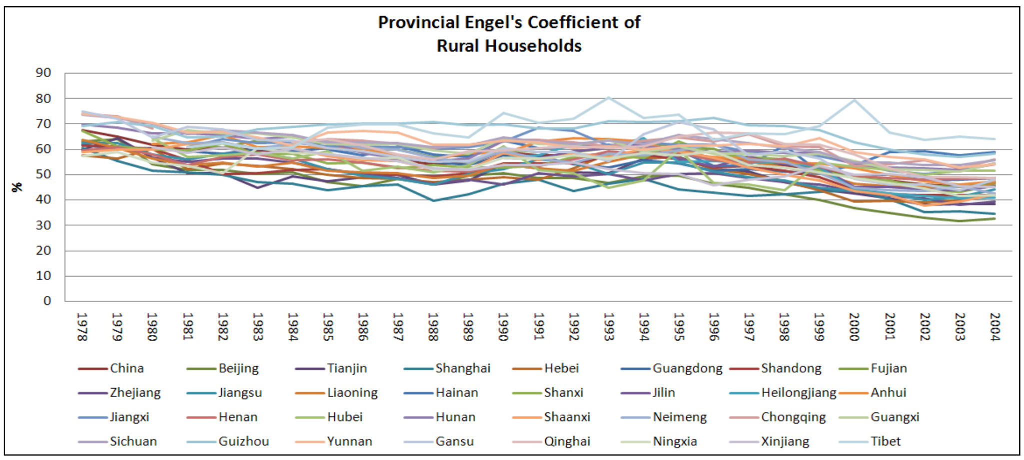


Figure 54-B Engel's Coefficient for Rural Households, 1978-2004



Source: China Statistical Yearbooks

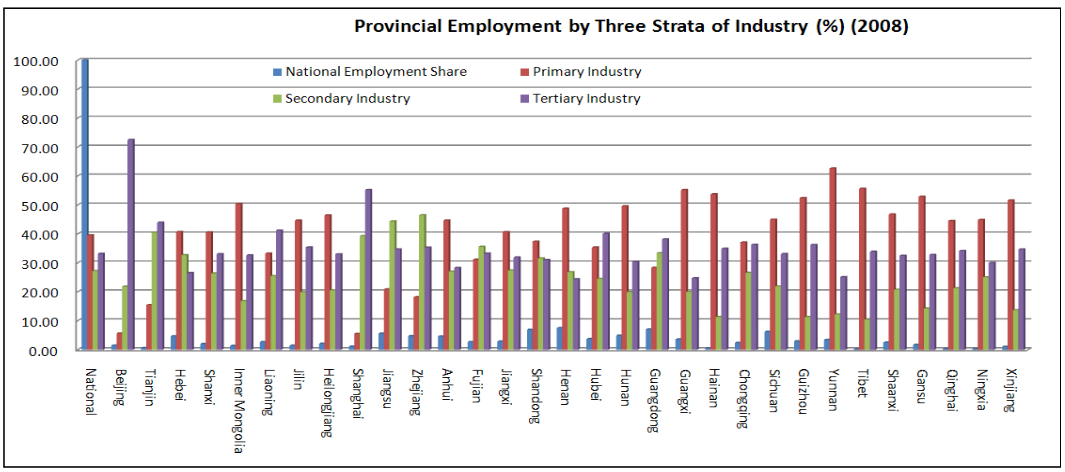
The data in Figure 5.54-B indicate that the western provinces have the highest Engel's Coefficient for rural households; in contrast, the eastern provinces Beijing, Shanghai and Zhejiang have the lowest Engel's Coefficient for Rural households while the central provinces occupy a middle-of-the-road position.

From the above data analysis, it can be concluded that the distribution of labour force, agricultural and non-agricultural population is highly consistent with provincial per capita income distribution. This is also closely related with industrial employment and provincial GDP by industry. In China, most employment is concentrated in

[10] Note: This Figure 5.54 shows only the overall change (trend) of provincial Engel's Coefficient for Urban and Rural Households. It is really quite difficult to show each province individually due to data similarities.

primary industry, mainly in agriculture. Employment in service sectors has increased since 1980. In 2008, 39.6% of employees worked in the primary industry while 27.2% and 33.2% of employment were engaged in secondary and tertiary industries respectively nationally. In China's statistics, tertiary industries include all the service sectors. The employment by industry thus greatly differs by province (Figure 5.55). Beijing (72.5%), Shanghai (55.2%) and Tianjin (44%) ranked consecutively first, second and third in terms of the share of employment in the tertiary industry followed by Liaoning (41.2%). In the primary industry, all of the western provinces have the highest relative levels of employment such as Yunnan (62.6%), Tibet (55.7%), Gansu (52.9%), Xinjiang (51.6%) and Guangci (55.2%).

Figure 5.55 Provincial Employment by Three Broad Sectors of Industry (%) (2008)

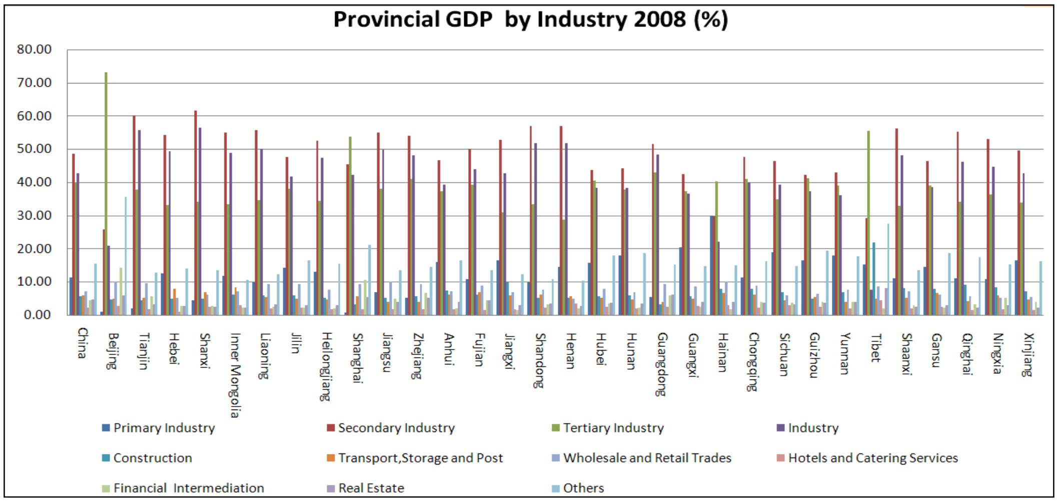


Source: Calculated based on China Statistical Yearbook 2008.

There is an obvious disparity in the importance of employment in secondary industry by province. Shanghai (39.3%), Tianjin (44%), Jiangsu (44.4%), Guangdong (33.4%), Zhejiang (46.5%) and Fujian (35.6%) in the eastern coastal provinces and Sichuan, Shanxi, Chongqing, Qinghai, Ningxia and Xinjiang in the western provinces have higher employment in secondary industry.

The provincial GDP is decomposed into primary industry, secondary and tertiary industries in Chinese statistical data. Secondary industry consists of industry and construction while tertiary industry is further divided into transport, storage and post, wholesale and retail trades, hotels and catering services, financial intermediaries, real estate and others (Figure 5.56). In China, the proportion of tertiary industry has increased while the proportion of primary industry has decreased.

Figure 5.56 Provincial GDP by Industry 2008 (%)



Note: All the industrial data indicate the percentage of total GDP by region. Source: Calculated based on China Statistical Yearbook 2008.

The national average GDP share by industry is 11.3%, 48.6% and 40.1% for the three major industrial groups respectively in 2008. For secondary industry, industry accounts for 42.6% while construction accounts for 5.6% of national total GDP. In tertiary industries, transport, storage and post, wholesale and retail trades, hotels and catering services, financial intermediaries, real estate and others account for 5.81%, 7.22%, 2.27%, 4.40%, 4.71% and 15.37% respectively. In terms of primary industry, Shanghai (0.8%), Beijing (1.1%) and Tianjin (1.9%) have the lowest value of GDP in this major sector, not surprisingly, while Hainan (30%), Sichuan (18.9%) and Hunan (18%) have the highest value of GDP in this major sector. Most of the provinces in the eastern coastal provinces have a value of GDP below 10%, while the western provinces have a value of GDP above 10% in the primary sector. In terms of secondary industry, the share of these industries is high in almost all provinces except Beijing (25.7%), Tibet (29.2%) and Hainan (29.8%) which have the lowest value of GDP in this major sector. Tianjin (60.1%), Shanxi (61.5%) and Shaanxi (56.1%) have the highest industry value of GDP. In construction, the western provinces have higher shares of GDP, for example, Tibet (21.74%) and Qinghai (9%). For the tertiary industry, Beijing (73.2%), Shanghai (53.7%) and Tibet (55.5%) have the highest values of GDP while Henan has the lowest value at 28% of total GDP. The reason for Tibet having a high value of GDP in tertiary industries is that agriculture and industry in Tibet are very weak due to natural conditions. It is totally the opposite of Beijing and Shanghai. The other provinces lie between the 30%-40% level in terms of tertiary industries.

5.2.3 The Case of Quebec

Quebec is the largest province in Canada with a territorial size of 1,667,441 km^2. It is one of the key players in the Canadian economy. It is bordered to the west by the province of Ontario, James Bay and Hudson Bay, to the north by Hudson Strait and Ungava Bay, and to the east by the Gulf of Saint Lawrence and the provinces of Newfoundland and Labrador and New Brunswick. It is bordered on the south by the American states of Maine, New Hampshire, Vermont, and New York. It also shares maritime borders with the Territory of Nunavut, the Province of Prince Edward Island and the Province of Nova Scotia.

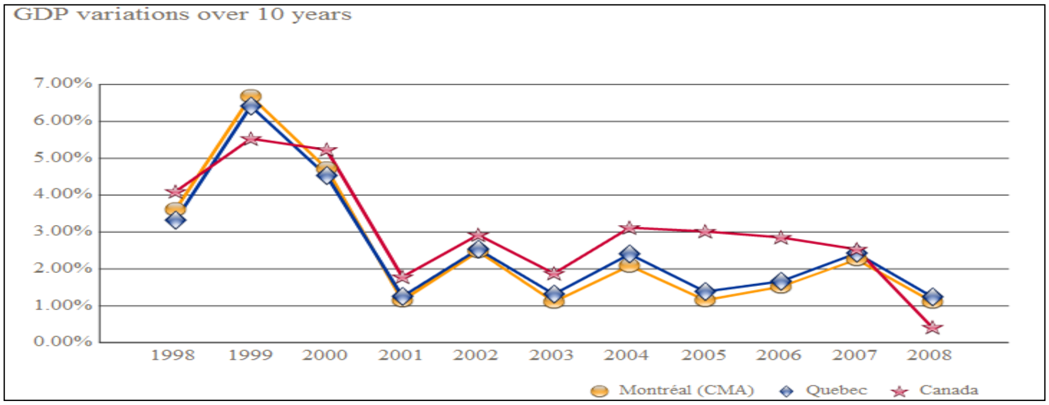
In Canada, Ontario and Quebec which constitute central Canada both have strongly developed core-periphery structures, and while there is substantial interprovincial interaction within the Windsor-Quebec corridor, the two provincial hinterlands are relatively discrete, each primarily linked to its respective provincial core. It has been emphasized that the Quebec economy has a pronounced core-periphery spatial structure (Wallace 2002).

From the provincial analysis in 5.2.1, it can be seen that Quebec constitutes almost a fifth of the Canadian economy. Quebec is the second most populated province in Canada, after Ontario. Québec has more than 7.75 million inhabitants (23.2% of national population), who form a mainly French-speaking society. Most inhabitants live in urban areas near the Saint Lawrence River between Montreal, the largest city, and Quebec City, the capital. Over the last decade, Quebec has had a strong economic performance but with gradual shrinkage of national share. But it has experienced a slight decrease in its provincial share of total national GDP from 26% in 1961 to 20% in 2008. Its provincial population share of national population has also witnessed a decline from 28.9% in 1950 to 23.26% in 2008 due to interprovincial emigration and the decrease in natural increase, even though its population has increased from 3.969 million in 1950 to 7.75 million in 2008.

In Quebec, the distribution of population is highly uneven. Most of the population lives in the south of province. Montreal has the highest population density at 3,769.1 km^2 in 2008, and ranks first with a population of 1,877,693. Laval and Montérégie rank second and third with population densities of 1562 km^2 and 127.4 km^2 respectively. Almost 48% of Quebec's population is concentrated in the Montreal metropolitan area. Altogether, 67.3% of the population lived in the six metropolitan areas of Montréal, Québec, Gatineau, Sherbrooke, Saguenay, Trois-Rivières in 2007. If the population distribution is analyzed by the 17 administrative regions in Quebec, 51.26% of the population is concentrated in three regions - Montréal, Montérégie and the National Capital region. The largest Canadian province in terms of area, Quebec has a GDP (the basic price in 2008) of about $248 billion Canadian, 69.6% of which was derived from the service sector in 2008.

Figure 5.57A GDP per Capita

Figure 5.57B GDP Growth Rate



Source: Statistic Canada, Board of Trade of Metropolitan Montreal, 2009. www.tableaudeboardmontreal.com.

However, for many indicators, such as per capita GDP, personal income, provincial average weekly earnings, per capita disposable income, Quebec has stayed close but below the national levels (Section 5.2.1and Figure 5.57). It accounts for 22.87% of national employment. Quebec ranks 5th in terms of average weekly earnings, 10th in per capita GDP, 9th in per capita personal income and 10th in per capita disposable income.

Quebec's abundance of natural resources gives it a favourable position in the national global economy. It also stands out with its notable development of forestry resources. Currently, 60% of the newsprint consumed in the north-eastern United States originates in Québec[11]. Québec's territory is one of the largest reservoirs of drinking water on the planet. Its water table covers 10% of its total surface. This resource allows it to produce electricity at low cost and under ecologically safe conditions[12]. While the province's substantial natural resources, tourism and transportation have long been the mainstay of its economy, sectors of the knowledge economy such as aerospace, agri-food, automotive and ground transportation equipment, information technologies and software, life sciences, light metals,

[11] http://www.gouv.qc.ca/portail/quebec/pgs/commun/portrait/economie/resourcesnaturelles/?lang=en

[12] http://www.gouv.qc.ca/portail/quebec/pgs/commun/portrait/economie/?lang=en

microelectronics, multimedia and telecommunications also play leading roles[13].

Quebec's international relations focus primarily on North America and Europe, two key areas (Table 5.7). Moreover, it maintains significant relations with various Asian nations. Quebec shares vital interests with the rest of North America, especially the United States. It also maintains diversified relations with several Latin American countries. Quebec’s trade relations with other countries in recent decades have given a boost to its economy. Quebec accounts for 20.5% of national trade (includes exports 20.1% and imports 20.9%). In 2008, Quebec imported $178.0 billion (CAD) worth of goods and services, representing 58.6% of its GDP. International imports account for 62.9% of the total as compared to 37.1% for interprovincial imports[14]. Meanwhile, the share of imports of goods stands at 75.5% as compared to 24.5% for services. Exports totaled $157.3 billion (CAD) in 2008, representing 51.8% of Québec’s Gross Domestic Product (GDP). Of this total, the share of international exports is 60.4%, whereas that of interprovincial exports stands at 39.6%. Moreover, goods account for 75.7% of this trade while services represent 24.3%. These international exchanges underscore the strength of Québec's economy, particularly in terms of employment[15].

Table 5.7 Québec’s International Merchandise Exports and Imports for 2008

Region	Export	%	Import	%
United States	$51.3 billion CAD	72.2%	$27.3 billion CAD	31.1%
Europe	$10.2 billion CAD	14.4%	$25.1 billion CAD	28.7%
Asia	$3.6 billion CAD	5.1%	$15.0 billion CAD	17.1%
Middle East	$1.9 billion CAD	2.7%	$10.3 billion CAD	11.7%
Central America	$1.7 billion CAD	2.3%	$3.3 billion CAD	3.7%
South America	$1.3 billion CAD	1.9%	$3.9 billion CAD	4.5%
Africa	$0.5 billion CAD	0.8%	$1.1 billion CAD	1.3%
Oceania	$0.5 billion CAD	0.7%	$0.6 billion CAD	0.7%

(Source : Institut de la statistique du Québec, Comptes économiques du Québec).

[13] http://www.gouv.qc.ca/portail/Quebec/

[14] http://www.gouv.qc.ca/portail/quebec/pgs/commun/portrait/economie/importexport/?lang=en

[15] Institut de la statistique du Québec, Direction des statistiques économiques et du développement durable. Statistics Canada, International Merchandise Trade

Owing to Quebec's aging population in recent and coming decades, immigration is one of the key factors in its economy and a key driver of population increase and labour force growth. However, based on the data of Statistic Canada (Division de la démographie 2008), Quebec has lost more than 665,602 interprovincial migrants over the period 1962-2007. From 1986-2008, Quebec gained about 678,237 international immigrants from other countries. But Quebec has had negative interprovincial migration since 1986, having lost 210,556 interprovincial migrants (Table 5.8). In total, Quebec accepted only 467,681 immigrants over this 25 year period.

Table 5.8 International and Interprovincial Migration of Quebec, 1986-2008

Migrations internationales et interprovinciales, Québec, 1986-2008

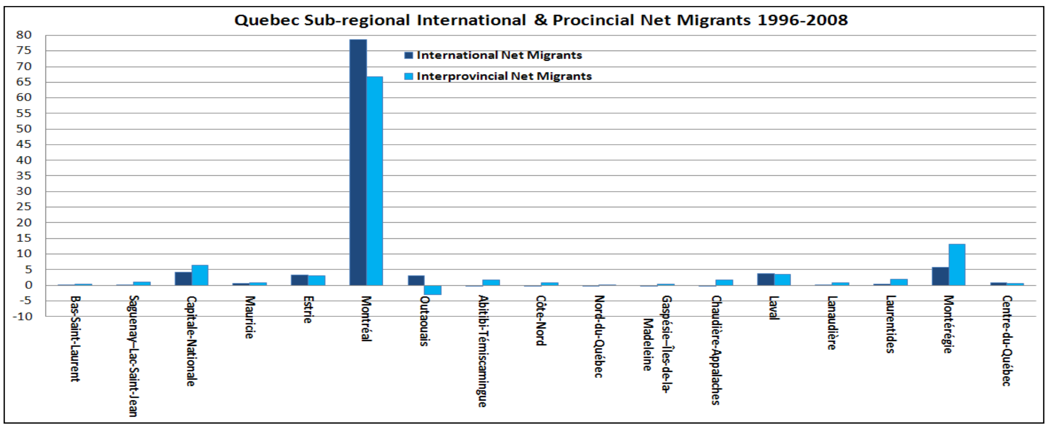
Année	Migrations internationales			Migrations interprovinciales[2]			Solde migratoire total[3]	Résidents non permanents, solde[4]
	Immigrants	Émigrants totaux[1]	Solde	Entrants	Sortants	Solde		
	n							
1986	19 476	4 298	15 178	26 432	28 643	−2 211	12 967	13 949
1987	26 846	4 010	22 836	25 950	32 398	−6 448	16 388	7 090
1988	25 588	3 506	22 082	27 797	34 675	−6 878	15 204	22 904
1989	33 946	3 909	30 037	28 849	38 058	−9 209	20 828	7 172
1990	41 043	3 593	37 450	26 882	35 911	−9 029	28 421	−7 377
1991	51 947	6 667	45 280	24 428	36 728	−12 300	32 980	−13 374
1992	48 838	7 799	41 039	25 480	35 265	−9 785	31 254	−3 617
1993	44 977	7 983	36 994	24 545	31 971	−7 426	29 568	−9 803
1994	28 094	9 527	18 567	22 718	32 970	−10 252	8 315	−342
1995	27 228	9 028	18 200	23 115	33 363	−10 248	7 952	5 279
1996	29 806	8 871	20 935	20 848	36 206	−15 358	5 577	−1 142
1997	27 934	11 166	16 768	20 354	37 913	−17 559	−791	−1 566
1998	26 626	10 299	16 327	20 156	34 668	−14 512	1 815	694
1999	29 179	9 176	20 003	19 977	31 689	−11 712	8 291	2 692
2000	32 502	9 306	23 196	22 051	33 284	−11 233	11 963	2 885
2001	37 604	7 388	30 216	21 720	28 809	−7 089	23 127	5 178
2002	37 581	5 469	32 112	24 529	27 624	−3 095	29 017	2 058
2003	39 560	4 614	34 946	23 659	23 880	−221	34 725	644
2004	44 245	5 801	38 444	23 352	26 324	−2 972	35 472	717
2005	43 315	5 999	37 316	21 853	29 009	−7 156	30 160	−1 125
2006[r]	44 689	5 346	39 343	20 549	32 377	−11 828	27 515	603
2007[r]	45 213	4 745	40 468	18 786	31 461	−12 675	27 793	4 905
2008[p]	45 209	4 709	40 500	24 332	35 692	−11 360	29 140	10 018

Source: Le bilan démographique du Québec ,2009 Institut de la statistique du Québec, Site Web : www.stat.gouv.qc.ca.

Quebec gained 354,370 net international immigrants from 1996 to 2008, during which time it lost a net 115,686 interprovincial migrants. If the data are analyzed sub-regionally in Quebec by its 17 administrative regions for the period 1996-2008, 92% of net international migrants and 90% of net interprovincial migrants are concentrated in Montreal, Montérégie, Quebec city and Laval. Montreal attracted 78.59% of net international migrants and 66.58% of net interprovincial migrants during this period.

At the same time, the Montérégie received 5.67% of net international migrants and 13.12% of net interprovincial migrants, Quebec City received 4.07% of net international migrants and 6.37% of net interprovincial migrants and Laval received 3.66% of net internationalmigrants and 3.46% of net interprovincial migrants for this period. Abitibi-Témiscamingue, Côte-Nord, Nord-du-Québec, Chaudière-Appalaches, and Gaspésie–Îles-de-la-Madeleine are the principal losers in terms of international migrants. Meanwhile, the Outaouais lost 2.89% in terms of net interprovincial migrants (Figure 5.58).

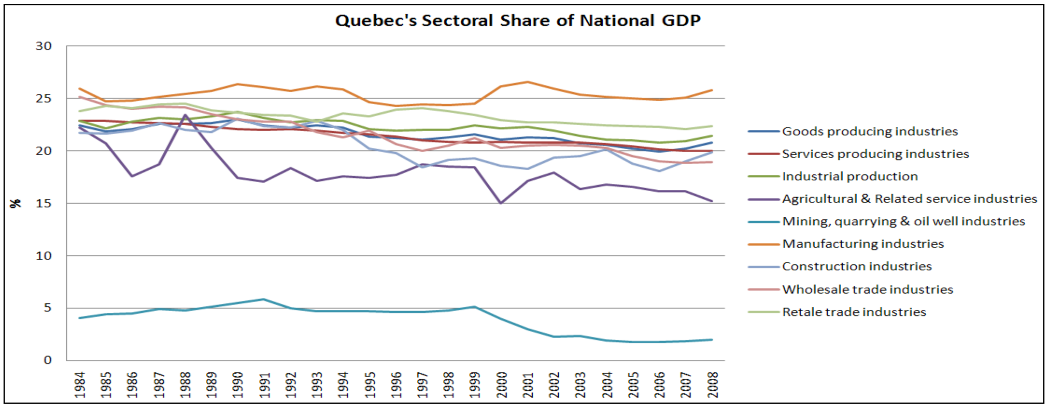
Figure 5.58 Quebec Sub-regional International and Provincial Net Migrants 1996-2008



Source: 2009 Institut de la statistique du Québec, Site Web : www.stat.gouv.qc.ca.

In terms of sectoral share of national GDP, the goods producing industries of Quebec account for 20.79%, while the service producing industries take up 20.03%. The agricultural and related service industries occupy 15.2%, and the other industries account for almost a fifth of national GDP except for mining, and quarrying and oil well industries which only account for 1.99% of national GDP in 2008. If the sectors are analyzed for trends for the period 1984-2008, the manufacturing sector is the only sector that has maintained the same level while the other industries have undergone a gradual decline for the period. The fast decline has occurred in agriculture from 22% in 1984 to 15.2% in 2008. In economic activity by sector in Quebec, manufacturing is still a strong sector, accounting for 19% of Quebec's total GDP. Finance and insurance, real estate and renting, and management of companies and enterprises account for 17.1% while the construction and wholesale and retail trade have increased to 5.7%, 5.4%, and 6.5% respectively by 2007 (Figure 5.59).

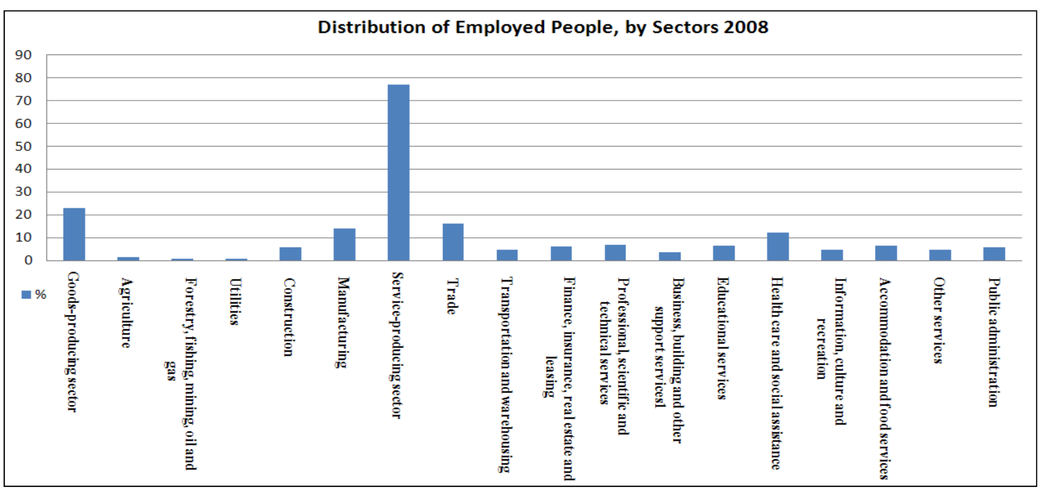
Figure 5.59 Quebec's Sectoral Share of National GDP, 1984-2008



Source: Calculated based on the Provincial and Territorial Economic Accounts Review, 2008 Preliminary Estimates, Catalogue no. 13-016-X, Provincial Gross Domestic Product by Industry, 1984-1999, Catalogue no. 15-203-XIB.

In Quebec, 77.16% of employment was concentrated in the service producing sector while 22.84% of employment was in the goods producing sectors in 2008 (Figure 5.60). In terms of specific sectors, the trade sector possesses the highest employment share at 16.09%, while the manufacturing and health care and social assistance rank second and third, accounting for 14% and 12.12% respectively. Agriculture only accounted for 1.58% of employment in 2008.

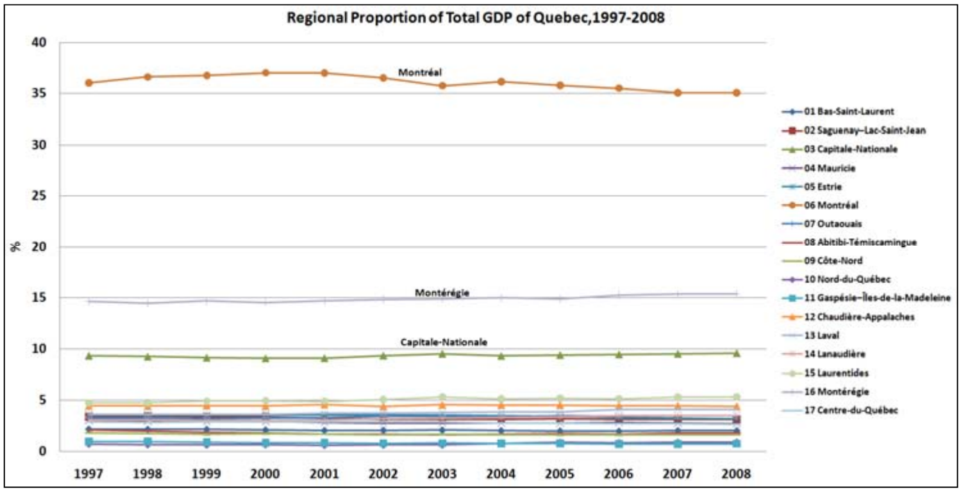
Figure 5.60 Distribution of Employed People, by Sectors, Québec 2008



Source: Statistics Canada, CANSIM, table (for fee) 282-0008 and Catalogue no 71F0004XCB.

The province of Québec which is divided into 17 administrative regions includes 6 metropolitans (namely Montréal, Québec, Gatineau, Sherbrook, Saguenay and Trois-Rivières), 104 RCM and equivalent territories and 1292 municipalities (Institut de la statistique du Québec (Québec Handy Numbers) 2009).

Figure 5.61 Regional Proportion of Total GDP of Quebec, 1997-2008

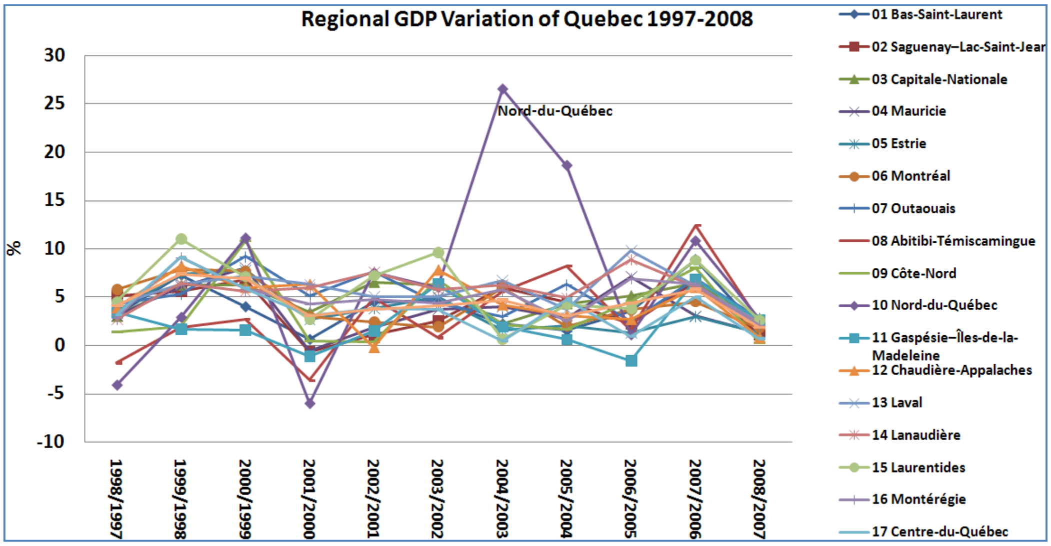


Source: Institut de la statistique du Québec. Direction des statistiques économiques et du développement durable, 2008.

Variations in per capita income and economic structure among the administrative regions of Quebec demonstrate clearly the province's core-periphery structure. Each administrative region differs from the others with regards to its geography, natural resources, inhabitable land, economy and industrial activities.

In terms of its regional share of total GDP in Quebec, the Montreal region has dominated Quebec's economy for the period 1997-2008 (but with a slight decrease), and accounted for 35.06% in 2008. The Montérégie, Quebec City and the Laurentides have seen a low increase in their shares, accounting for 15.38%, 9.59% and 5.36% respectively by 2008. The other 13 regions have not changed much in terms of regional GDP share, and together constituted 34.6% of Quebec's total GDP in 2008 (Figure 5.61). It can be seen that the change in regional total GDP has been steady in Quebec for the period.

Figure 5.62 Regional GDP Variation of Quebec, 1997-2008

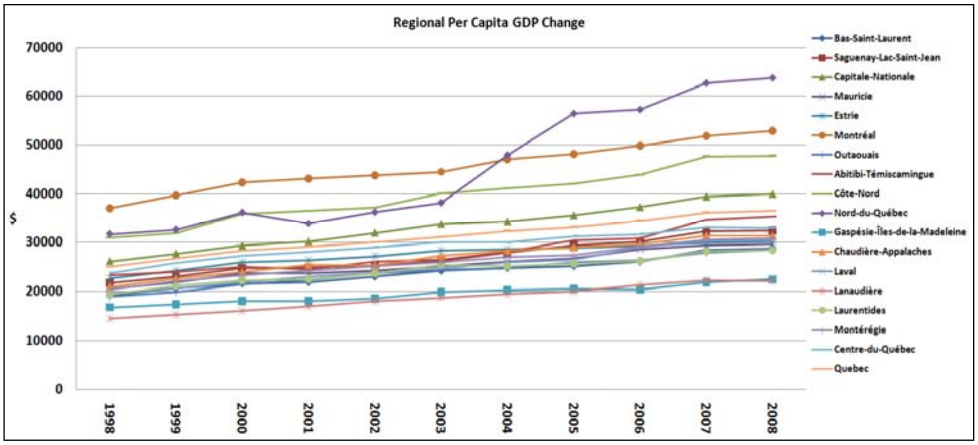


Source : Institut de la statistique du Québec, Site Web : www.stat.gouv.qc.ca

However, there are strong differences in terms of regional GDP variation in each year from 1997 to 2008 (Figure 5.62). There is a decline in 2001 and 2008 in all regions. Most changes have occurred in Nord-du-Québec. It reached a maximum change of 26.5% in 2004 due to a substantial expansion in the construction industry. Its annual rate of change in GDP averaged 7%, while the average growth rate was 5.7% in Laval and 5.68% and 5.64% in Lanaudière and the Laurentides respectively for this same period.

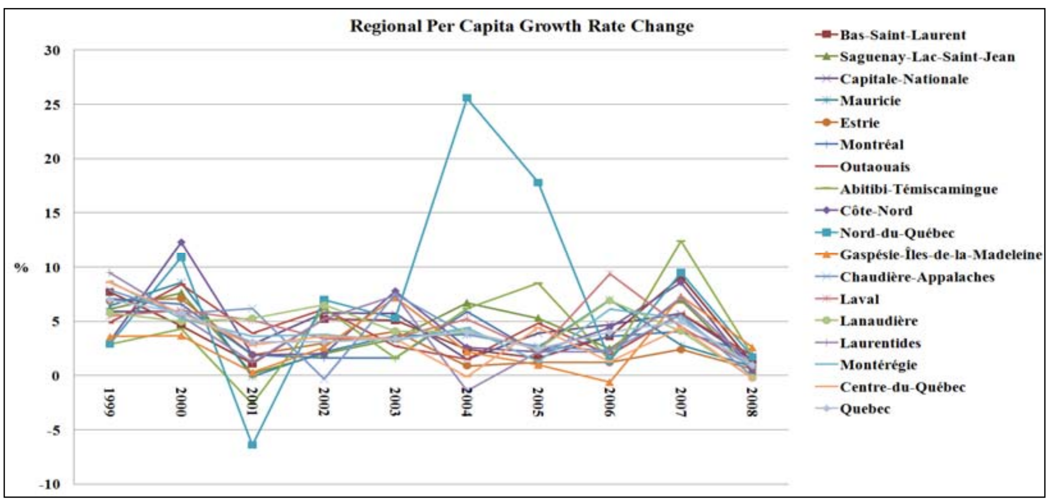
The regional disparity as a ratio between the highest and lowest per capita GDP in Quebec in 1997 was 2.56 between Montreal and Lanaudière. Montreal, Quebec city, Côte-Nord and Nord-du-Québec are the only regions above the average provincial level of per capita GDP of $24,980 in 1997 while the other regions are below the provincial level. The large change occurred in Nord-du-Québec since 2003. Since then it has stayed at the top in terms of per capita GDP. In 2008, Nord-du-Québec ranks first with a $63,754 per capita GDP while Montreal ranks second with a per capita GDP of $52,883. The largest disparity between Nord-du-Québec and Lanaudière reached a ratio of 2.88 in 2008 (Figure 5.63).

Figure 5.63 Regional Per Capita GDP Change, Quebec, 1998-2008



Source : Institut de la statistique du Québec, Site Web : www.stat.gouv.qc.ca

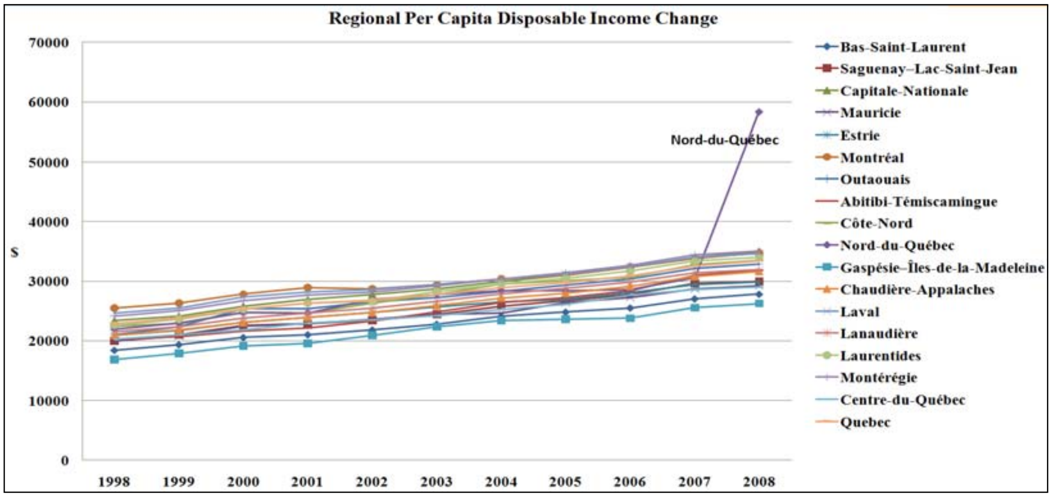
Figure 5.64 Regional Per Capita GDP Growth Rate Change, 1999-2008



Source : Institut de la statistique du Québec, Site Web : www.stat.gouv.qc.ca

All the regions have increased their per capita GDP gradually over the period 1997-2008 except for Nord-du-Québec (Figure 5.63). This is consistent with the regional GDP variation of Quebec for the period 1997-2008. Nord-du-Québec had a sharp increase of per capita GDP in 2004 then decreased to the average level in the following year. There was a substantial drop in growth rates in almost all regions in 2008 due to the economic recession (Figure 5.64).

Figure 5.65 Regional Per Capita Disposable Income Change, 1998-2008



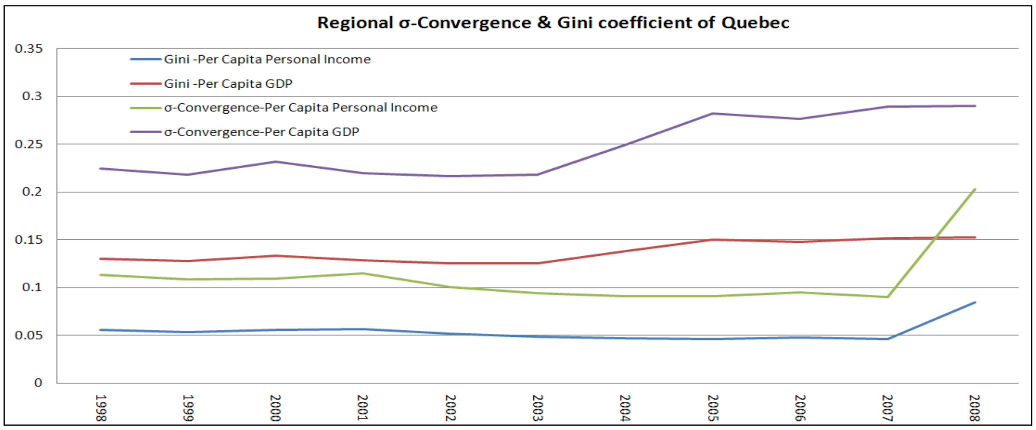
Source : Institut de la statistique du Québec, Site Web : www.stat.gouv.qc.ca

In terms of the total amount of regional disposable income, 60.58% of personal income comes from Montreal, Montérégie, Quebec City and the Laurentides. Montreal accounted for 25.22% in 2008, while the Montérégie, Quebec City and Laurentides accounted for 19.18%, 9.18% and 7% respectively. All regions have seen an increase in their per capita disposable income since 1997 except for the sharp jump in Nord-du-Québec due to the contribution of construction industries in 2008 (Figure 5.65). Nord-du-Québec raised its per capita disposable income from $30,608 in 2007 to $58,373 in 2008.

In order to explain the changing trend of regional per capita GDP and personal disposable income in Quebec, σ-Convergence and Gini coefficients are calculated for all 17 administrative regions based on the short-term data from 1997 to 2008 (Figure 5.66).

The σ-Convergence of regional per capita GDP of Quebec has converged slowly between 1998 and 2003; then it experienced a divergence from 2003 to 2008. The σ-Convergence of regional per capita disposable income of Quebec converged gradually from 1998 to 2007 at a very low speed, and then it began to diverge after 2007. The regional per capita GDP has a larger σ-convergence rate than that of per capita disposable income for this period. The Gini coefficient change of regional per capita GDP and personal disposable income of Quebec is consistent with the change in the σ-Convergence of regional per capita GDP and personal disposable income for this period. The Gini coefficient of regional per capita GDP has increased since 2003 and the Gini coefficient of per capita personal disposable income has increased only after 2007.

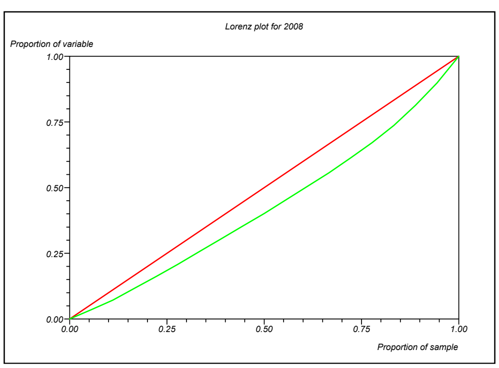
Figure 5.66 Regional σ-Convergence and Gini coefficient of Quebec



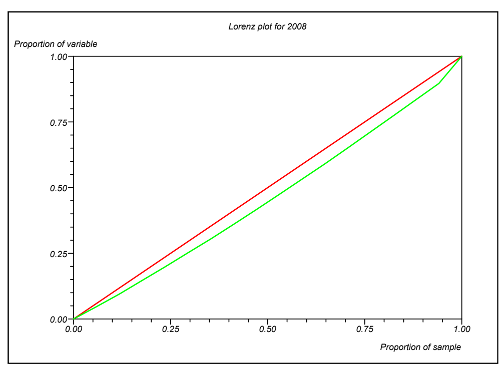
Sources: Calculated based on the data from Institut de la statistique du Québec, Site Web: www.stat.gouv.qc.ca.

Figure 5.67 Lorenz Curves of Per Capita GDP and Per Capita Personal Disposable Income: Quebec

Gini coefficient of inequality of Per Capita GDP



Gini coefficient of inequality of Per Capita Personal Income



If we compare the Lorenz curves of per capita GDP and per capita personal disposable income, the difference can be seen very clearly (Figure 5.67). The Lorenz curve line (green) between line of perfect equality (red) and the line of perfect inequality has approached the line of perfect equality significantly in per capita personal disposable Income. From the regional σ-Convergence and Gini coefficient of Quebec, it can be concluded that regional per capita GDP disparity is greater than per capita personal disposable income. However, it should be clear that regional per capita income and per capita personal disposable income are not necessarily related. Here, the results only show the change of regional per capita income and per capita personal disposable income.

Based on the absolute beta-convergence model 4.10 presented in Chapter 4, the regional beta convergence can be calculated:

by regressing the average growth rate of per capita GDP between time $t_{beg} = 1998$ and time $t_{end} = 2008$ on initial income at time $t_{beg} = 1998$ where:

$(\ln Y_{it(end)} - \ln Y_{it(beg)}) = \alpha + \beta \ln Y_{it(beg)} + \mu_i$ (5.3)

Here, i is the index for each region where i = 1 to 17 in Quebec. Time is indexed by t where t(beg) = 1998 and t(end) = 2008. The sample period is indexed by T where T = 11 years for the whole period. (The Beta Convergence rate β is calculated based on the formula $\beta = -\ln(1-\beta 1)/T$.)

lnY = natural log of real per capital income.

α = constant term and μ_i = random error term.

From this model, the absolute beta convergences for per capita GDP and per capita personal disposable income are calculated. There is a weak annual divergence rate of 0.011590229 in per capita GDP (LnY08-98=0.1197lnY98 -0.792481) and there is a not very significant convergence (LnY08-98= -0.1324 lnY98 + 1.747312) of per capita personal disposable income at an annual rate of 0.001059811 for this period. This is consistent with the σ-convergence change of per capita GDP and per capita personal disposable income for this period.

Another dimension of the convergence analysis is that the regional economic growth may follow a spatial pattern because of the uneven distribution of population and economic activities. Regional spatial dependence can be handled in beta convergence in alternative approaches by using the spatial error model (SEM), the spatial lag model (SLM) and the spatial cross-regressive model (SCM) (see more in Chapters 2 and 4).

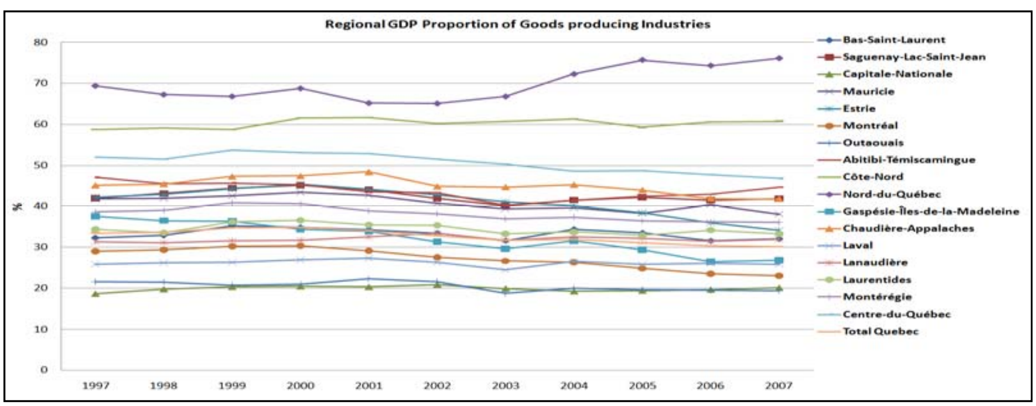
Table 5.9 Beta Coefficient of Spatial Dependency Models

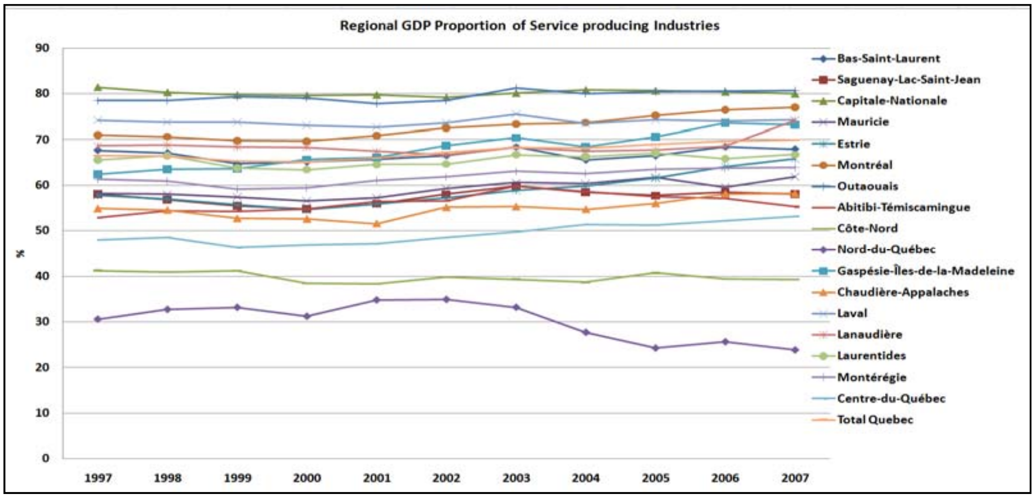
Indicators	Beta Coefficient			Annual Rate -Ln(1+b)/ T		
Models	SEM	SLM	SCM	SEM	SLM	SCM
Per Capita GDP	0.118611	0.081955	0.081955	0.011477837	0.007773534	0.007773534
Per Capita Personal Income	-0.107203	-0.107203	-0.240933	-0.00925791	-0.00925791	-0.019623956

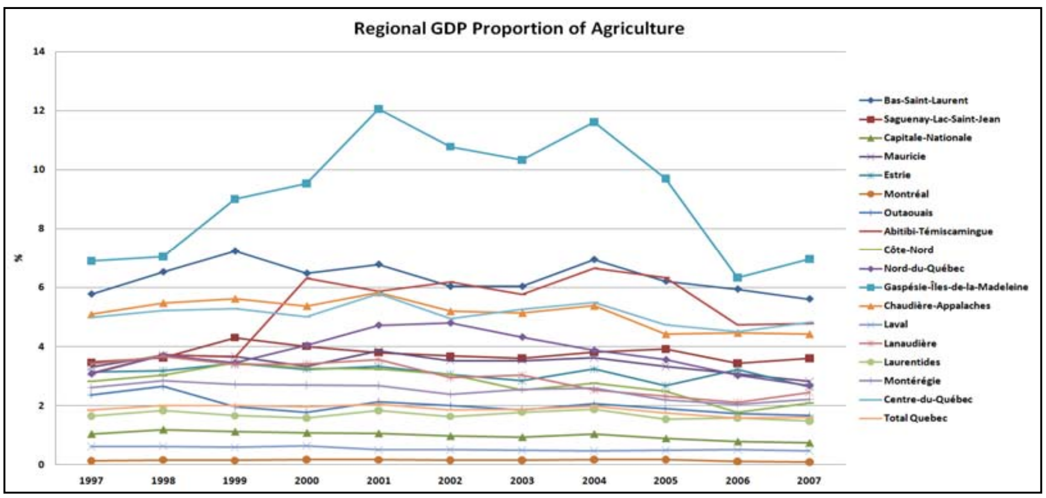
Notes: Estimated for the period 1998-2008 for all models

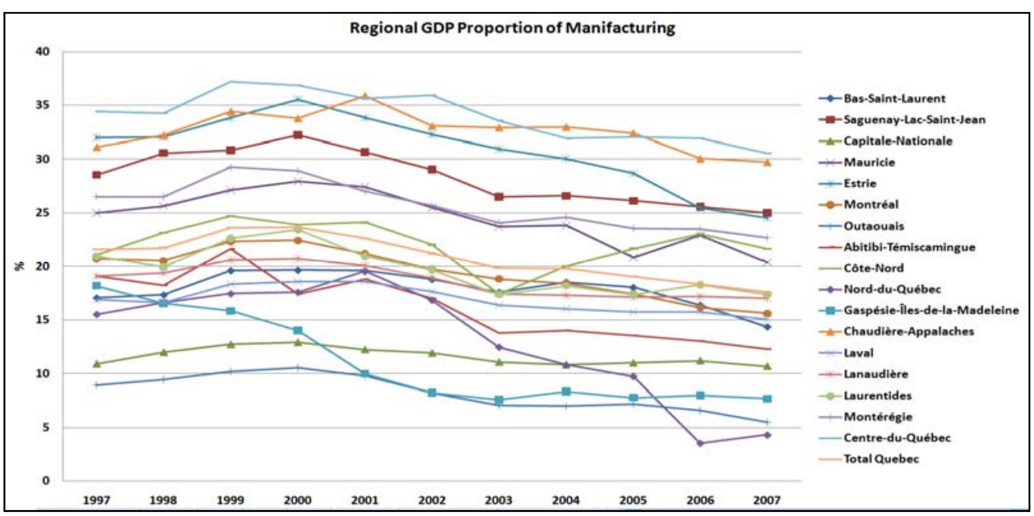
SEM, SLM and SCM Models are estimated by a non-linear version of the basic growth regression, for the period 1998-2008. From Table 5.9, it can be clearly seen that the beta coefficient $\beta<0$ for per capita personal disposable income during the whole period. There is a weak sign of convergence of regional per capita disposable income. This is consistent with the Beta Coefficient (-0.1324) of the absolute convergence value of per capita disposable income calculated earlier. In terms of regional per capita GDP, all the results of the SEM, SLM and SCM Models are similar to the absolute convergence value. All the results are significantly consistent with the σ-Convergence.

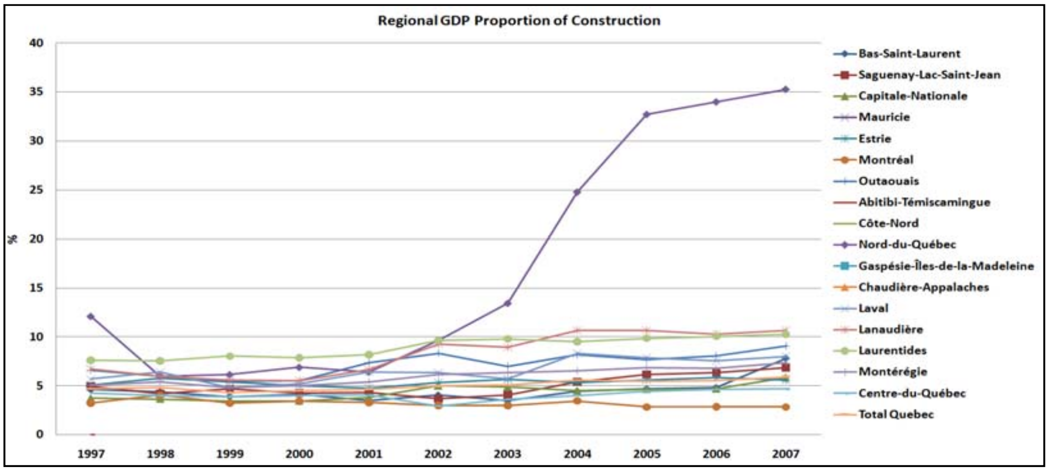
Figure 5.68 GDP at Basic Prices, by Sector by Region, 1997-2007




Regional GDP Proportion of Service producing Industries
%
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Bas-Saint-Laurent
Saguenay-Lac-Saint-Jean
Capitale-Nationale
Mauricie
Estrie
Montréal
Outaouais
Abitibi-Témiscamingue
Côte-Nord
Nord-du-Québec
Gaspésie-Îles-de-la-Madeleine
Chaudière-Appalaches
Laval
Lanaudière
Laurentides
Montérégie
Centre-du-Québec
Total Quebec


Regional GDP Proportion of Agriculture
%
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Bas-Saint-Laurent
Saguenay-Lac-Saint-Jean
Capitale-Nationale
Mauricie
Estrie
Montréal
Outaouais
Abitibi-Témiscamingue
Côte-Nord
Nord-du-Québec
Gaspésie-Îles-de-la-Madeleine
Chaudière-Appalaches
Laval
Lanaudière
Laurentides
Montérégie
Centre-du-Québec
Total Quebec


Regional GDP Proportion of Manifacturing
%
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Bas-Saint-Laurent
Saguenay-Lac-Saint-Jean
Capitale-Nationale
Mauricie
Estrie
Montréal
Outaouais
Abitibi-Témiscamingue
Côte-Nord
Nord-du-Québec
Gaspésie-Îles-de-la-Madeleine
Chaudière-Appalaches
Laval
Lanaudière
Laurentides
Montérégie
Centre-du-Québec
Total Quebec



As far as the regional GDP by industry is concerned, there are great disparities between regions in Quebec (Figure 5.68). In goods producing industries, Nord-du-Québec, Côte-Nord and Centre-du-Québec have the highest values of 76.08%, 60.7% and 46.8% respectively while Outaouais, Quebec City, Montreal and Laval have the lowest values at 19.3%, 20%, 23% and 25.79% respectively in 2007.

The trend of regional goods producing industries has increased in Nord-du-Québec due to the boom of the construction industries since 2003 while it has fallen slowly in many regions for the period 1997-2007. The regional GDP proportion of service producing industries has increased in all regions except Nord-du-Québec for this period. Outaouais, Quebec City, Montreal and Laval have the highest values of 80.69%, 79.94%, 77% and 74% respectively in service producing industries while Nord-du-Québec, Côte-Nord, Centre-du-Québec and Abitibi-Témiscamingue have the lowest values at 23%, 39.2%, 53.17% and 55.27% respectively in 2007. In agriculture, forestry, fishing and hunting, all the regions have experienced little change if we just consider the start and end points for this period. Gaspésie-Îles-de-la-Madeleine, Bas-Saint-Laurent and Abitibi-Témiscamingue have the highest values of 6.96%, 5.61% and 4.78% respectively while Montreal, Laval and Quebec City have the lowest values at 0.09%, 0.07% and 0.47% respectively in 2007. Gaspésie-Îles-de-la-Madeleine increased its share from 6.91% in 1997 to 12.05% in 2001, and then gradually dropped to 6.96% in 2007. All the regions saw a decrease in their share in the manufacturing sector slowly, except for the sharp drop in

Nord-du-Québec from 1997 to 2007. Centre-du-Québec, Chaudière-Appalaches, Estrie and Saguenay-Lac-Saint-Jean have the highest shares of manufacturing, while Nord-du-Québec, Quebec City, Outaouais and Gaspésie-Îles-de-la-Madeleine have the lowest shares. In mining and oil and gas extraction industries, Abitibi-Témiscamingue saw an increase in its GDP share from 10.2% in 1997 to 15.65% in 2007, while Gaspésie–Îles-de-la-Madeleine saw its GDP share reduced from 3.13% to 1.27% for this period. Construction in Nord-du-Québec increased from 12.11% in 1997 to 35.28% in 2007, indicating how this sector became an economic booster for this period

5.2.4 The Case of Xinjiang

China's Xinjiang Uyghur Autonomous Region is situated in the northwestern part of China, it has a surface area of 1.66 million km^2 and occupies one-sixth of China's national territory and is China's largest province. It neighbours eight countries (namely, Mongolia, the Russian Federation, Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, Pakistan, and India) and provides a corridor to the Central Asian region. Within China, it adjoins Tibet, Qinghai and Gansu. Xinjiang is the largest administrative unit in China and is rich in mineral resources, especially oil and natural gas that could make it a major player in generating rapid economic growth in the western part of China and in the changing geo-strategic and geo-economic environment in Central Asia in coming decades. Central Eurasia also has huge oil and natural gas resources, which make it the second most important region after West Asia and China was provided an opportunity to enter the economic and strategic vacuum in the newly formed Central Asian republics in the early nineties. These make the location of Xinjiang strategically significant and economically an important potential player in the post-Cold War period. It is surrounded by possible sources of tension and conflict: the unresolved border between China and India; the India–Pakistan conflict over Kashmir; civil war in Tajikistan; the volatile Fergana valley bordering Kyrgyzstan, Uzbekistan and Tajikistan; and Afghanistan since the withdrawal of

Soviet forces from that country. Its proximity to Tibet has also made it an important strategic area from the Chinese security perspective. Its strategic value has increased with the assessment of huge oil reserves in Xinjiang (Clarke 2003) and oil transportation corridors from central Asia countries in the region. Petroleum, Natural Gas Extraction and Coal Mining reached 5.6 million tons, 26.55×100 million m^3/year and 1453.5×10^4 tons in 2008 (Xinjiang Statistical Yearbook 2009). Xinjiang is not only far ahead of other western provinces in economic development after the 1980s, it also has the advantage of a flourishing international trade with eight neighbouring countries as well as with other countries in West Asia. Thus, Xinjiang is a key area in China’s ambitious Western Development Strategy. It is more or less certain that it will be become a new economic growth centre in central Asia in the near future (Map5.5 and Map 5.6).

Map 5.5 Strategic Location of Xinjiang

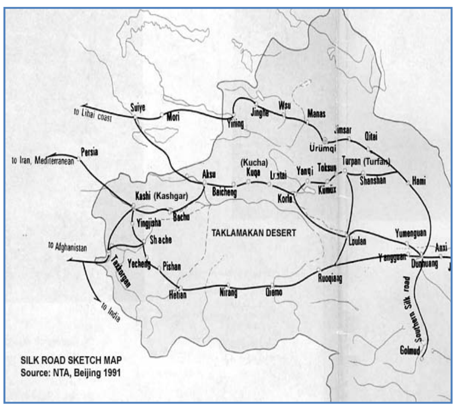
Source: MapInfo Professional 8.0.

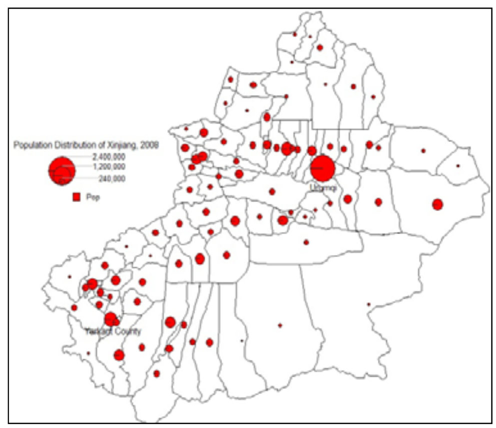
Map 5.6 Topographic map of Xinjiang

Source: http://www.chinatouristmaps.com/

In the past, Xinjiang was an economically backward, geographically landlocked region between the inner provinces of China and middle Asian countries. The famous ancient Silk Road passed on both sides of the Tangri Mountains. Half of the Silk Road, which wound along between ancient China's capitals Xi'an to the east bank of the Mediterranean, was located in Xinjiang. It was not only an important transportation route connecting the ancient world, but also a synonym for economic and cultural exchanges between the western world and the oriental world. The ancient Silk Road helped to integrate the old Chinese, Indian, Turkish, Persian, Arabian, Greek and Roman cultures and promoted the exchange of the Western and Oriental civilizations. There were a few famous ancient trade cities (Kashgar, Hotan, Kuqa, Turpan, Ghulja) and other small cities and towns along the route. It played a very important role in forming the spatial structure and improving the social and economic development of this region. The traditional economic landscapes of this Silk Road region were based on herding, oasis agriculture and trade. Nowadays, most of the cities and counties in this region have been created from the ancient trade centres and routes have been built along the ancient silk route (see Maps 5.7 and 5.8).

Map 5.7 Map of Ancient Silk Route in Xinjiang Map 5.8 Population Distribution of Xinjiang





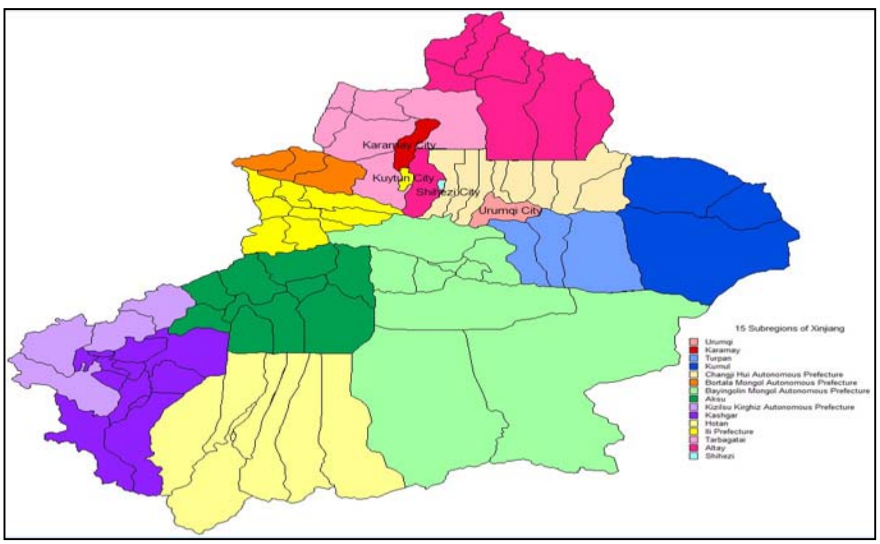
In the last several decades, after the founding of New China in 1949 and the establishment of Xinjiang Uyghur Autonomous Region in 1955, China has carried out different regional development policies such as its centralization, reform and open door policy and western development policy. Each of these policies has had a different impact on socio-economic development in the province. These changes are closely related to the physical context, geo-strategic and geo-economic importance of this region and show great regional disparity in their spatial distribution.

Xinjiang is situated far from any ocean. High mountains bar the approach of monsoons and wet winds from the Pacific and Indian Oceans. Only a small volume of wet cold air from the Arctic and Atlantic come through the mountain valleys and reach northern Xinjiang. Xinjiang thus has a dry continental climate with great extremes of winter and summer temperature. Rainfall is scant, seldom exceeding 20 in. (60 cm) annually in most regions. There are several huge mountain ranges running east to west across Xinjiang. On its northern border are the Altai Mountains, while the Tangri Mountains in the middle of the region extends across its entire length dividing the province into northern and southern Xinjiang. Two enormous basins - the Jungghar basin in the north and the Tarim Basin in the south - each spread out from the Tangri Mountains (see Map 5.6). In the central part of the Tarim Basin is found the Taklimakan Desert, covering an area of 324,000 km^2. It is the largest desert in China and the second largest desert with shifting dunes in the world. In the central section of the Jungghar Basin lies the Gurbantungghut Desert, the second largest in China covering an area of 48,000 km^2, consisting largely of stable and semi-stable dunes. Around the Tarim and Jungghar Basins are alluvial fans that connect to form extensive sloping plains. The middle and lower parts of the plains have fertile land with plentiful water resources. These Oases are population centres where people have for thousands of years reclaimed land, planted crops and built their homes. The total oasis area in these two enormous basins is estimated to be about 70,000 km^2.

Xinjiang has for long been characterized by an underdeveloped infrastructure, inconvenience of transport and slow economic development. This situation is unquestionably related at least in part to its basic geomorphologic structure (see Map 5.6). It affects the formation of spatial structure of economic activities to a large degree.

First, Xinjiang is surrounded by mountains. It depends upon snow melt water from these mountains to irrigate its oases. Xinjiang's oases are isolated and separated from each other by large expanses of desert. Transportation is poor and expensive; as a result many regions are to all intents and purposes closed economies. Although Xinjiang covers a vast area, the whole area of oases only accounts for about 4% of the total area of Xinjiang. The main economic activities of Xinjiang are centred in small oases that are distributed among the frontiers of the two large deserts; the other parts are unsuitable as human habitat. The oases are so dispersed that the average distance between counties is 112 km, sometimes exceeding 400km (from Qitai to Qinggel), and the average distance between each prefecture (city or county) is 155 km, sometimes reaching 794 km (Korla to Qarqan). Even the average distance between counties and villages is 35km; with the greatest distance being 317km, increasing population in the oases has put great pressure on water resources, leading to loss of vegetation on the fringes of the oases, accelerating desertification and grasslands deterioration. Many of these poor counties in southern Xinjiang are trapped in a vicious cycle of poverty. In 2008, the average GDP in the Hotan prefecture was 3928 Yuan/person and 5350Yuan/person RMB in Kizilsu prefecture, respectively the lowest and the second lowest per capita GDP among Xinjiang's regions (the average value is 19,725 yuan/person) while Karamay has the highest per capita GDP of 100,216 yuan/person.

Map 5.9 15 Subregions of Xinjiang

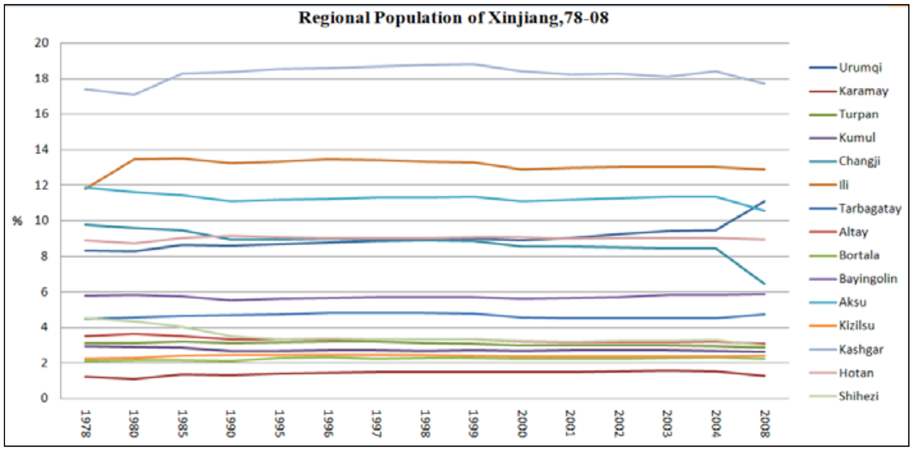


The distribution of natural resources, the great distances between the oases, and the degree of polarization and the province's relative economic independence are all factors that underlie the differences in regional characteristics of the Xinjiang economy. Based on the characteristics of climate, natural resources, economic structure, ethnicity, social economic development levels and regional economic relationships, Xinjiang can be divided spatially generally into 15 sub-regions (Map 5.9). These 15 regions include 2 cities at the prefecture level, 7 prefectures, 5 autonomous prefectures and 1 municipality (this number increased to 4 in 2008) directly under the control of the central government. They are Urumqi City, Karamay City, Turpan Administrative Offices, Kumul Administrative Offices, Changji Hui Autonomous Prefecture, Ili Prefecture, Tarbagatai Administrative Offices, Altay Administrative Offices, Bortala Mongol Autonomous Prefecture, Bayangolin Mongol Autonomous Prefecture, Aksu Administrative Offices, Kizilsu Kirghiz Autonomous Prefecture, Kashgar Administrative Offices, Hotan Administrative Offices, Shihezi (here, Administrative Offices means region). These 15 regions further include 19 cities (this includes 4 cities under the direct control of the Autonomous region and 15 cities under the prefectures), 68 counties (includes 62 counties and 6 autonomous counties) and 1000 townships and towns in 2008. For convenience, the 15 administrative regions are selected as the spatial units to analyze the provincial economy and their first names are used in the following graphics and tables.

In the provincial case of China in section 5.2.2, many indicators of Xinjiang are compared with other provinces. Fan (2005) discusses that Xinjiang is the only province in the western region that gained from a large amount of interprovincial migration. Xinjiang’s population increased rapidly from 4.33 million in 1949 to 21.41 million in 2008 due to the large interprovincial in-migration since 1950. The net provincial migration to this province reached 926,000 from 1995 to 2000. Its national share changed from 0.8% in 1949 to 1.6% in 2008. Changes in population development in Xinjiang during the decades from 1949 to the present can be divided into four stages. The first stage was the developing period from 1949 to 1958. Xinjiang's population increased from 4.3334 million to 5.8235 million with the annual increase rate being 3.34%. The second stage was from 1958 to 1962 with an annual increase of 4.67%. The third stage was from 1962 to 1978 with an annual increase of 3.61% and the fourth stage was from 1978 to the present, a period with a slow population increase. Generally speaking, the total population of Xinjiang increased from 4.334 million in 1949 to 21.03 million in 2000, a five-fold increase. Xinjiang is one of the provinces and autonomous regions with a lower population density in China, 13 persons per square kilometres on average. There are great differences in the density of population distribution in Xinjiang. About 95% of its population is mainly distributed on oases which make up 3.5% of the total area of Xinjiang. Population density in these areas is as high as 207 persons per square kilometre. Population is understandably unevenly distributed (see Map 5.9). The area distribution between nationalities is quite obvious. The areas with multi-nationalities show all the characteristics of a multi-national area, and at the same time more prominently show that of an area inhabited by minority nationalities in a compact community. The south is mostly Uyghur; the central is more Chinese than Uyghur, while the north has a mixed population of Kazak, Uyghur and Han.

Since 1949, the CPC has been encouraging Han settlements from China proper to the sparsely populated Xinjiang. This policy of population transfer is aimed at populating this Muslim dominated border region, reducing the minority problem through physical separation and creating an organized working force comprising of Han peasants, workers, experts and militia men. According to the inter-census data from 1953 to 1982 (Yuan 1990), Xinjiang ranked only second to the Heilongjiang province in terms of the rate of population increase (Chaudhuri, 2005). In 1945, the minority non-han population of the region accounted for 93.8% of the total population, which decreased to 59.7% in 1982, while the Han population increased to 40.3%. A large number of the in-migrant population has settled in the newly reclaimed areas in north Xinjiang and has effectively increased food grain production in the north. However, the growing population pressure has also created various environmental disorders in this water scarce region. Ninety-five percent of the population is concentrated in the oases of the region, which cover only 3.5% of the region's land area. With only 11 persons/km^2, the region ranks twenty-fourth in China, but the population density in the oases areas is more than 207 persons/km^2 which, in terms of actually inhabited area, is nearly equal to that of the coastal regions. Until 1949, over 70% of Xinjiang's population lived in the south and only 25% of the population lived in the north. The change in regional population proportions is not very significant except Urumqi for this period 1978-2008. The population share of Urumqi has increased from 8.28% in 1978 to 11% in 2008. Kashgar ranks first in total population and accounted for 17.7% of Xinjiang's population while Urumqi ranks second with a population accounting for 11% of Xinjiand's population in 2008 (Figure 5.69).

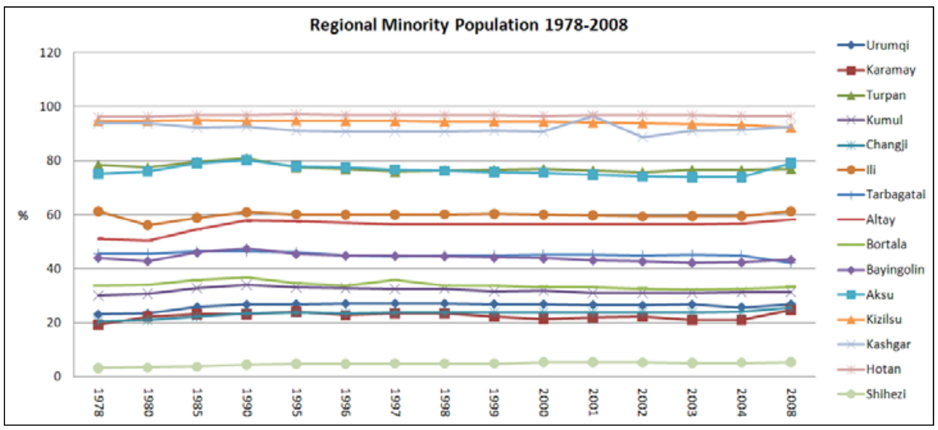
Figure 5.69 Regional Population of Xinjiang, 1978-2008



Source: 55 years statistical data of Xinjiang and Xinjiang Statistical Yearbook2009.

Due to a population influx and development in the north, by 1980 its population had exceeded that of the south (Yuan 1990). The Han population accounted for 39.23% in 2008 and is concentrated in the three large cities of Urumqi, Karamay and Shihezi, as well as in Cangji, Bortala, Qoqek, Kumul and Bayangol prefectures far exceeding the minority population (Figure 5.70). The minority ethnic populations are dominant in Turpan, Ili, Targhabatay, Aksu, Hotan, Kashgar and Kizilsu regions. Xinjiang's main minority groups are Uyghur, Kazakh, Kyrgyz, Uzbek, Tajik, Tatar, Salar, Hui, Mongol, Xibe, Manchu, Daur and Russian, all of which constituted 60.7% of the total population in 2008. In 2008, the largest ethnic group, Uyghur, accounted for about 46.14% of the region's population. The proportion of the Uyghur population in the south is still very high - in Khotan and Kashgar it is approximately 96.8% and 89% of the population of the respective prefectures. The Kazakh, Mongol and Kyrgyz mainly live in autonomous regions after their ethnic names. The majority of the region's nomadic and semi-nomadic population comprised of the Kazakh and Kyrgyz communities and some of the Kazakh inhabited areas - Ili, Barkol and Mori - have the best pasture land in the region. The increase in the Han population is also responsible for the rapid urbanization of the region. The proportion of non-agricultural population has generally increased in all regions gradually. The ethnic minority dominated regions have high levels of non-agricultural population while the Han-dominated regions have the lowest proportions of non-agricultural population. Shihezi (86%), Karamay (79%) and Urumqi (77%) have the highest share of non-agricultural population while the lower values are for Hotan (12.9%), Kashkar (19.2%), Kizilsu (23.3%), Aksu (28.2%) and Turpan (25.4%) (Figure 5.71).

Figure 5.70 Regional Minority Population Proportion in each Region of Xinjiang, 1978-2008



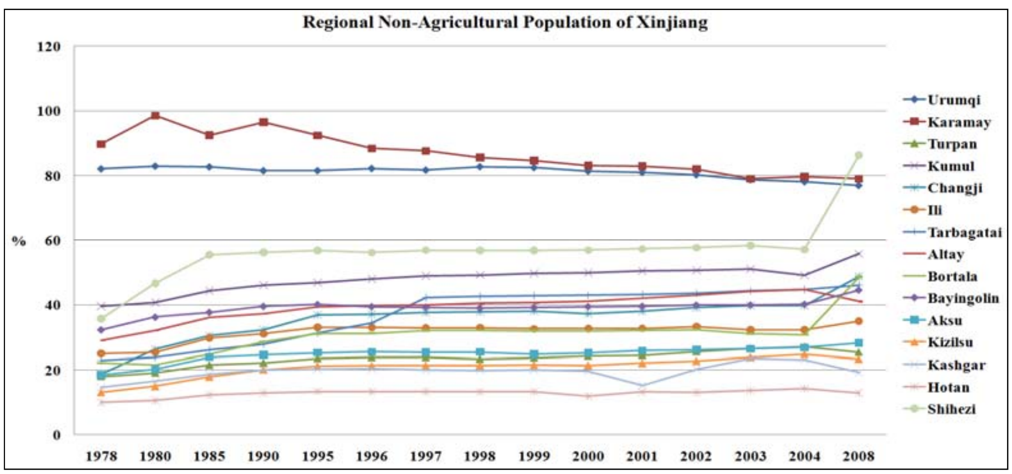
Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook 2009.

This whole period after the establishment of the Xinjiang Uyghur Autonomous Region of China in 1955 can be divided into three periods: the period of reconstruction (1955-1965) and the Cultural Revolution (1966-1978); the period of reform and opening up (1979 to 2000); and Western Development Policy (from 2000 until now).

A balanced and equitable economic growth constituted the main objective in China until the reform period forward. The Kashgar centred region had had a long history of being open to the outside (a large trade centre) and possessed rich oasis farmland resources. Conditions of heat, soil, water and light are well suited to the needs of agricultural development in this region. So this region had a larger volume of agricultural production and had become an economic centre at this time. Based on the 1949 GDP statistics, the GDP of Kashgar and Hotan Prefectures was 5.1643

$\times 10^8$Yuan, accounting for 46.97% of Xinjiang's total GDP (Wu Yiding 2002). If the Kizilsu Autonomous Prefecture were added (data not available), the economic power would account for more than 50% of Xinjiang' total. Its economic level and strength was much greater than that of any other region of Xinjiang, and it constituted an important economic centre of middle Asia at that time. The reason for the location of this original economic centre was that, in earlier times, high agricultural productivity and an oasis-based inner land closed economy was much more important. The bulk of western international trade at that time was conducted through the famous Silk Route which passed through the Kashkar and Hotan Region.

Figure 5.71 Regional Non-Agricultural Population of Xinjiang, 1978-2008



Source: 55 years statistical data of Xinjiang and Xinjiang Statistical Yearbook 2009.

Another more developed region was the Urumqi and Ili during this period. Ili and Changji had a better natural agricultural environment than any other place in North Xinjiang. Its climate is humid, with a plentiful rainfall, and it has extensive grassland resources suited to animal husbandry. Thus, this region also played an important role in Xinjiang's economy before 1949. The rank of regions' economic strength before 1949 was determined mainly by the volume of agricultural production. After the first few years of the establishment of the Xinjiang Uyghur Autonomous Region in 1955, because of the great distances from the inner provinces and the closed door policy in relation to neighbouring countries and poor transportation conditions, the traditional agriculture-based closed economy in the oasis had difficulty meeting the needs of an increasing population. This led to more and more farmland (called artificial oases) being developed to support the population.

During the First Five Year Plan (FYP) (1953–57), total investment in fixed assets increased in Xinjiang, as in other parts of China, and was largely financed and directed by the USSR, when large-scale geological explorations were carried out and some important centres (such as Karamay and Urumqi) of the petroleum industry were set up. Throughout the fifties, the central government invested heavily in capital construction in Xinjiang. During this period, local army units restored the old transportation network and constructed new highways centred on Urumqi. By 1956, both countries had become involved in bitter ideological disputes that resulted in the complete withdrawal of Soviet economic aid and assistance to the People's Republic of China (PRC).

Following the period of reconstruction, the Cultural Revolution era lasted 10 years from 1966 to 1976. This was a period of political chaos, accompanied by systematic destruction of any type of capitalist business management, as well as other policies including sending urban dwellers to the countryside, known as the Rustication Movement. Deng Xiao-ping transformed economic policy into one of reform and opening the economy up to the outside world in 1978. Reforms started first in agriculture with the dissolution of people's communes, while the government also pursued a policy of aggressively opening up to the outside world, e.g. through setting up special economic zones along the southern seaboard.

As in other parts of China, the new agricultural policy and price reform was also introduced in Xinjiang in the early reform period. In the 1980s, the household responsibility contract system, poor weather and natural disasters in some areas and factionalism within regional leadership on the question of ideological legitimacy of Deng Xiaoping's reform policy were also responsible for the bleakness of the region's economy in the first few years of the reform period. Due to widespread uncertainty and the prevalence of a chaotic situation in the region, these policies failed to produce expected results until 1983 (McMillen 1984).

In fact, the main factor underlying the changing pattern of regional economic development was the differential progress of industrialization between regions. After Urumqi City was selected as the capital city because of the centralization policy, almost all of the investment centred on this region during the period. So it quickly became an economic, cultural, political and industrial centre for Xinjiang, and the industrial pattern across Xinjiang focused mainly on the Urumqi and Karamay region right from the very beginning. The reason was that the strategic position of Urumqi is more important than other frontier regions considering the interprovincial relationships of China and its closeness to the inner provinces on China during those times. Under the industrial location policy, a complete industry base in Urumqi had been formed initially, and another city - Karamay (meaning black oil) – was founded because of the discovery of abundant oil resources, turning it very rapidly into a base for oil exploitation and a processing centre. The industrialization of this region is what led to the shift in the economic centre of the province from the Kashgar region to the Northern region. The reason was that Urumqi city was convenient for economic communication with the other interior provinces of China after the founding of New China. With a rather distinctive geographic location, a harsh climate and great distances economically, it has become more and more inconvenient for the Kashghar region to communicate with the other regions of Xinjiang and other provinces of China and countries. With its traditional economy characterized by a closed oasis economy, and owing to the closed door policy of China after 1949, it became gradually left behind and could not take a leading role in the modern economy.

The Chinese leadership in the reform period became more concerned about rapid economic growth and sought suitable locations for economic activities in coastal provinces in the east and south, rather than addressing issues of income or welfare differences across the country during the period of reform and opening up (1979 to 2000). Hence with the economic reforms that started in 1978 the coastal regions became more prosperous than the other regions. In this process, the western region gradually became poorer relative to other parts of the country. The significant characteristic of the western region is its demographic make-up - 70% of China's minority populations are concentrated here. Therefore, the uneven development during the reform period mostly affected minority-populated areas, which in 1988 constituted 74.5% of the poorest counties of China (Palmer 1997).

In order to revitalize economic activities at the local level, the central leadership pursued decentralization in the early reform period. Deng Xiaoping's policy of promoting growth in coastal regions during the sixth and seventh FYPs was based on the assumption that a spillover effect to the interior regions would be generated through an automatic process of technological transfers from the east. Owing to the policy of fiscal decentralization, the central government lost monopoly over revenue collection and fund allocation that made the centre less able to subsidize the minority regions.

Throughout the 1980s considerable changes occurred in the relationship between the centre and local governments in China. In the area of the economy, local units enjoyed a greater scope to bargain with the centre. In the late 1980s, regional and provincial authorities rampantly used protectionist measures to restrict inter-provincial import distribution. The tenth FYP (2001–2005) specifically focuses on the 'Great Opening of the West'. In 1999, the develop-the-west strategy was announced in China. Its purposes are not only to lessen the differences in economic development in the three regions, improving the functioning of the economic system, promoting social stability and strengthening national unity, but also for expanding domestic demand, stimulating economic growth and creating the conditions for the implementation of "the third step" in a "three-step" strategy. Policymakers hoped every region has an equal power and chance to participate in national economic activities from adjusting their spatial economic strategy and reducing differences of economic development, in order to promote the growth rate of their regional economies, and then improving the social and political stability.

In the early 1990s, the central government paid attention to regional inequalities. During the eighth FYP (1991–95) period, infrastructure investment in Xinjiang increased from 7.3 billion yuan to 16.5 billion yuan and the region's GDP in current price doubled (Becquelin 2000). The ninth FYP (1996–2000) continued to emphasize reduction of regional economic disparities. Throughout these two plan periods, Xinjiang received billions in state subsidies and infrastructure investment.

Despite all the difficulties, Xinjiang's performance in economic development was far better and Xinjiang's GDP grew faster in the 1990s than in the previous decade. In twenty-two years of reform, China's GDP has grown at the annual rate of 9.5%, whereas Xinjiang's GDP rose even faster at 10.3% annually.

During this period, Xinjiang's regional economy has experienced five short sub-periods in development. Different economic development strategies for each sub-period played very important roles in regional economic development.

From 1980 to 1985: Because this was the first period of the reform and opening up policy, regional economic development policy had not changed much from past central planning policy, and set out predetermined economic indicators to achieve in terms of objectives. During this period, the energy industry of the Tarim Basin was strengthened. From 1986 to 1990, a clear regional economic orientation plan was advanced, following the regional development strategy of "develop actively, make the focal [key] points stand out, forward sequentially". The industrial status of the Urumqi, Karamay, Shihezi and Changji regions became strengthened. The new secondary industry zone of Urumqi-Karimay-Kumul began to emerge. Agriculture became a factor in these regions which became one of the agricultural bases in Xinjiang. The cropping, animal husbandry, and fruit and food processing industries began to be established, but cropping output was still very high, accounting for 72.15% of all agricultural output.

From 1991 to 1995, the Urumqi-Karimay-Kumul region was strengthened by the coal, electric energy, petroleum processing, light industries and a strongly developing tertiary industry. The government supported the cropping and animal husbandry in the Kashghar, Hotan and Aksu regions, the food supplies production industry in the Ili region and the petroleum processing industry in the Bayingolin and Turpan region. Kashghar, Hotan and Aksu region only focused on the development of agriculture, so its secondary and tertiary sectors did not experience much development. The

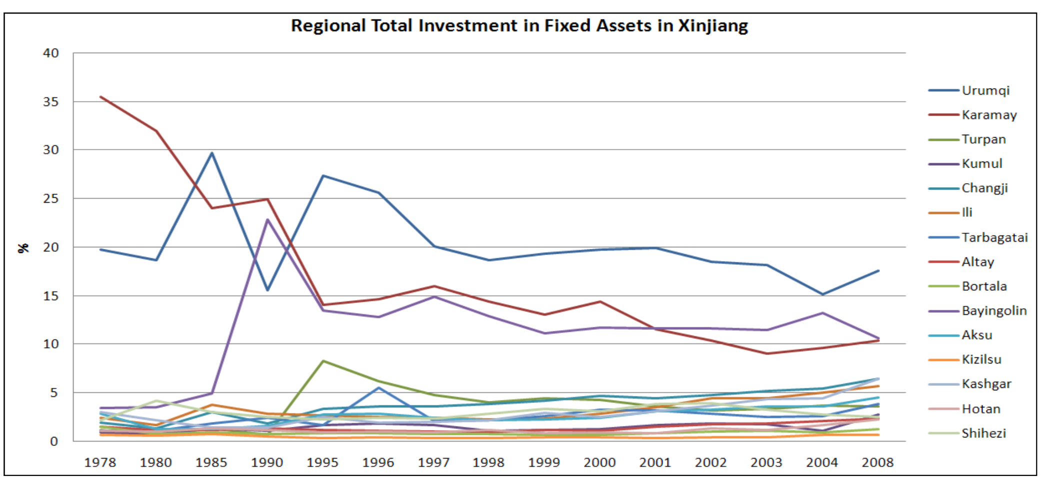
Urumqi-Karimay and Sihezi regions developed their coloured metal processing industry, gold production and the fur industry.

From 1996 to 2000, the Xinjiang Government implemented its "one black (oil), one white (cotton)" economic development strategy. The Kashghar, Hotan, Aksu and Bayingolin regions became the development centre of this strategy and developed very quickly. The Bayingolin region rose rapidly in the regional ranking to third place in 2008 from 8th place in 1990, based mainly on the new developed oil industry in Tarim Basin. The Urumqi-based Changji, Karamay and Shihezi region has become the economic belt of Xinjiang.

Alongside regional imbalances in the economic development during the reform period, geographical as well as historical factors, long-term policy, a phenomenon of localized economic development and prosperity have also emerged as factors that have marginalized the minorities of Xinjiang to a great extent.

The interregional disparity between the Han-dominated area and Minority dominated areas has become accentuated during this period in China. Addressing the problem of regional disparities and ethnic conflicts, the central government embarked upon the new regional development policy of the 'West Development Strategy' in 1999.

Figure 5.72 Regional Total Investment in Fixed Assets in Xinjiang, 1978-2008



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

The regional total investment in fixed assets in Xinjiang has concentrated in Urumqi, Karamay and Bayingolin since 1978 (Figure 5.72). However their investment proportion has gradually decreased while the investment in other regions has increased very slowly. This is one of the main factors causing large regional disparities.

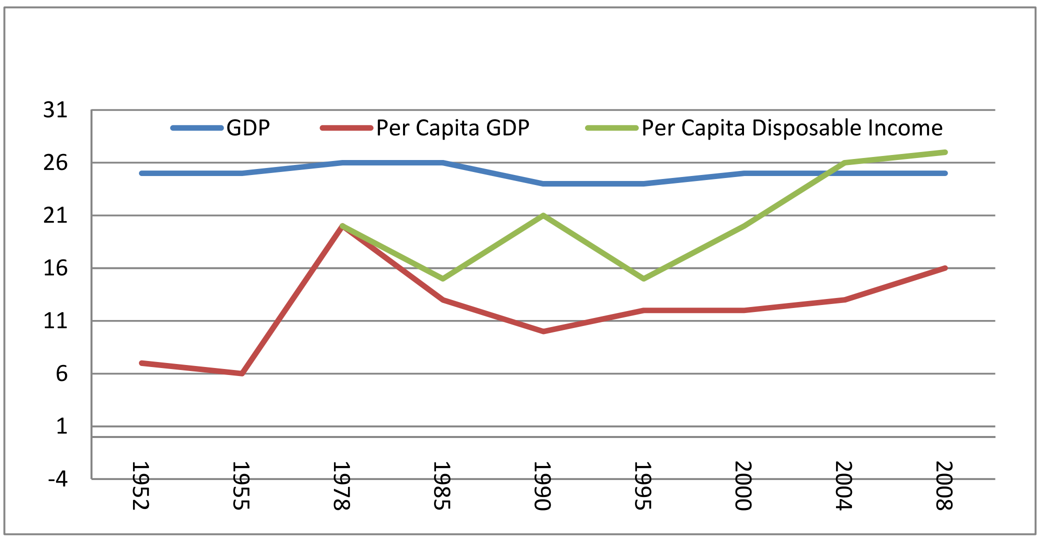
From 2001 until the present time, Xinjiang has benefited from large investment incomes from central and local government during the western development program. According to the Xinjiang development plan under the national strategy of western development, an amount of 900 billion Yuan in fixed assets will be invested in the next decade. By 2005, the region had invested more than 100 billion Yuan in seventy key projects, including infrastructure construction, environmental protection. In economic development, China's central government gave great support to Xinjiang in industrial distribution, infrastructure construction, finance, loan and opening up policy, which speeded up Xinjiang's economic development. However, Xinjiang has maintained the same position in national rank. In 2008, the total investment reached $1797*10^8$ Yuan (42.95% from central government, 57.05% from local government) and 60.8% of it was concentrated in secondary industry; 15.2% of the investment was invested in Urumqi while 12.79% and 11.82% were concentrated in Karamay and Bayingolin respectively. Primary industry experienced a lowering of its growth rate while the secondary and tertiary industry racked up a 10% growth rate for this period. The first rank of Urumqi was further strengthened while Karamay has followed more slowly. There were not many changes in the ranks of the regional economy in other regions during this period. Urumqi, Karamay, Bayingolin and Changji accounted for 59.6% of Xinjiang GDP.

In over 50 years, Xinjiang has witnessed a drastic change in the communications and transport industry. Today, the Silk Road is surrounded by a road network, railways and airports, which has formed a completed network including land and air transportation lines. Roads now wind around the high Pamir and the Kunlun mountains and cross the Tarim and Jungghar basins. In 1963, the completion of the Lanxin (Lanzhou-Xinjiang) Railway connected Xinjiang with central China. A stretch of 460 km was added to the western section of the Lanzhou-Xinjiang Railway in 1990, reaching the Alatav Pass from Urumqi, thus completing the second Eurasian continental bridge. This meant that the new Silk Road extended to West Europe and places even further afield. In 1994, the Lanzhou-Xinjiang Railway was double-tracked and opened to traffic. In 1999, the 975 km section of the Southern Xinjiang Railway was completed, extending from Korla to Kashgar, and plans made for its extension to Hotan. In 1949, Xinjiang had only several crudely built highways, with a total length of a mere 3,361 km, but by 2001, the region's highways had been extended to 80,900 km, including 428 km of expressways, 230 km of Grade 1 highways and 5,558 km of Grade 2 highways. The highway running through the Taklimakan Desert is a long-distance graded highway, the first one in the world built on shifting sands. Now, a highway network covers the whole region, with Urumqi as the centre and seven national highways as the backbone linking the region with the inner provinces of China to the east, the adjoining countries in Central and West Asia to the west and Tibet to the south. Xinjiang has 11 airports, either newly built or enlarged. In all, there are 92 air lines radiating from Urumqi to 65 cities in other parts of the country and abroad and to 12 prefectures and cities within the autonomous region. Now the new "Silk Road" increasingly has become an important channel for cultural and economic exchanges between Xinjiang and the rest of world. To satisfy the energy demands of China's fast-growing coastal cities, China built a 2,600-mile natural gas pipeline from Bugur to Shanghai, and recently started to construct second pipeline. In 2005, China constructed the Kazakhstan-China cross-border oil pipeline which carries oil across eastern Kazakhstan into China's Xinjiang autonomous region, and then sent directly to China's booming east.

Xinjiang has experienced great changes in regional development since 1950. Xinjiang accounts for only 1.28% of national GDP and ranked 27th in China's 31 provinces in 2008, while it accounted for 1.54% of national GDP and was ranked 25th in China's 31 provinces in 1949. From Figure 5.73, it can be seen clearly that the rank of total GDP has not changed since 1950. However, the ranks of per capita GDP and per capita disposable income have changed negatively in 31 provinces of China even though these indicators increased at a high speed (Figure 5.74-A).

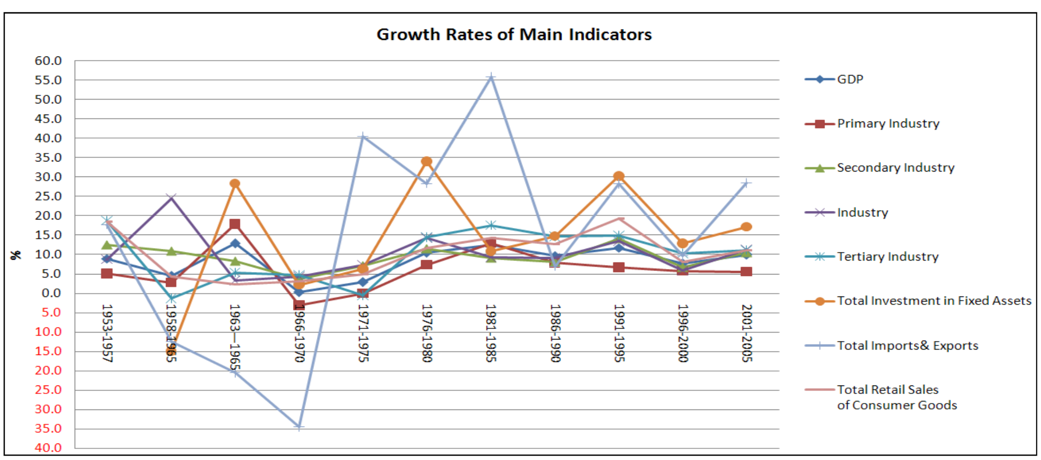
The average growth rate of GDP reached 8.3% since 1953, 10.4% since 1979 and 10.6% since 2001. The per capita GDP growth rate reached 5.3% for the period 1953-2008, and 8.5% and 8.7% respectively for the periods 1979-2008 and 2001-2008. Primary industry has not changed much while the secondary and tertiary industries have increased at a speed of more than 10% annually. The other indicators of investment, per capita disposable income, import and export have increased at an astounding speed in Xinjiang (Figure 5.74-B).

Figure 5.73 Changes in Xinjiang's Rank, 1952-2008



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

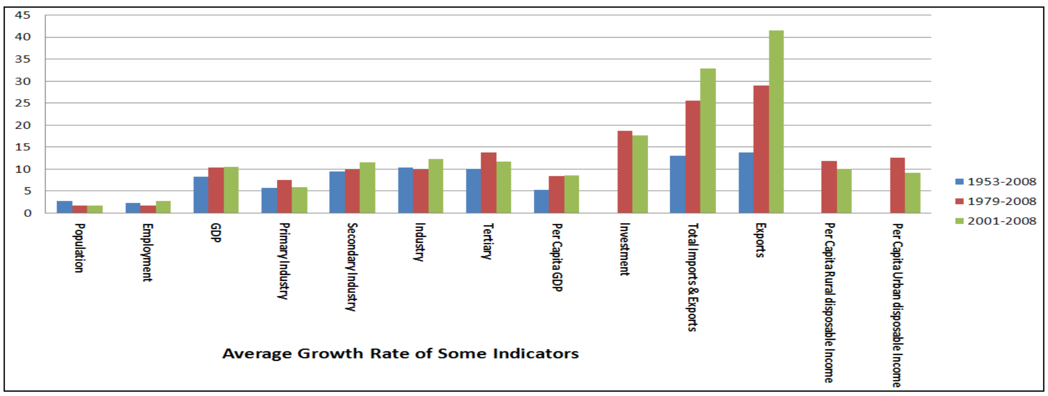
Figure 5.74-A Growth Rates of Main Indicators of Xinjiang



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

China's trade volume with the Soviet Union through Xinjiang has dropped steadily since the disputes in the 1950s, and between 1961 and 1970 it declined to extremely low levels. China implemented a strong closed door policy for several decades since then. As a result, total imports and exports dropped dramatically. It has resumed since the opening door policy until the break-up of middle-Asia countries from Soviet Union. Then it dropped again and resumed once more since 2000 with the improvement of the trade relationship between China and these countries. The tertiary industry has increased faster than the secondary and third industries since 1980 in Xinjiang.

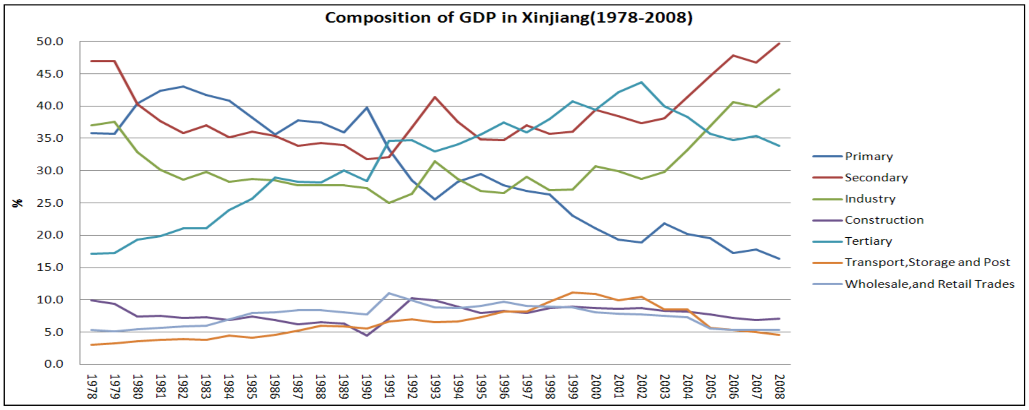
Figure 5.74-B Growth Rates of Main Indicators of Xinjiang during 1953-2008, 1979-2008, 2001-2008



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook2009.

In 1949 in Xinjiang, there was no modern industry and only a traditional agriculture-based economy. Agriculture accounted for 87.1% of overall GDP at that time. The composition of GDP in Xinjiang has changed obviously since 1978 (Figure 5.75). The tertiary industry has increased from a share of 17.2% in 1978 to 33.9% in 2008 while the primary industry dropped from 35.8% to 16.4% in 2008. Secondary industry has experienced a fall from 1978 to 1991 and then increased again to 49.7% in 2008 mainly due to the increase in the oil and gas extraction industry. Industry has increased from 37.1% to 42.6% in 2008 while the construction and other industries have not changed much.

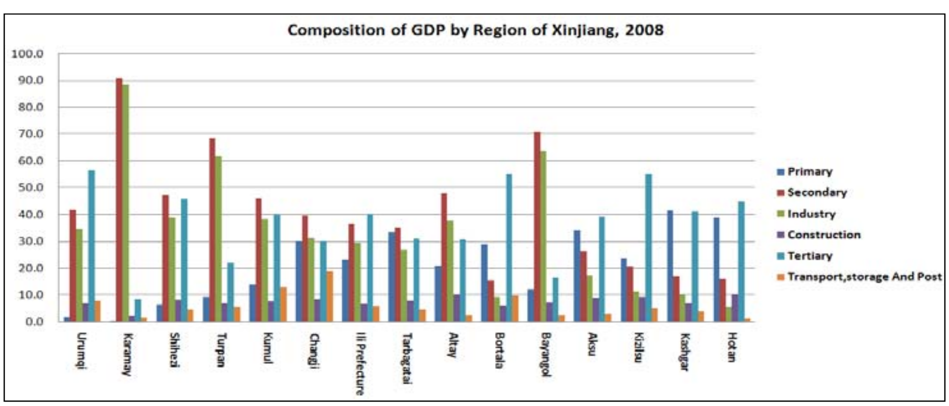
Figure 5.75 Composition of GDP in Xinjiang, 1978-2008



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

The sectoral composition of the 15 regions has changed substantially. On the whole, primary industry has been gradually decreasing, while secondary and tertiary industry has been slowly increasing in importance. During the 50 year period, secondary industry became more important than primary industry after the 1980s (the beginning of China's open-door and reform policy). The fastest change occurred in the Urumqi, Karamay and Bayingolin regions, especially in the primary and secondary industries. Karamay, Turpan, Kumul and Bayingolin have the highest value of secondary industries' proportion due to oil, gas extraction industries while Shihezi and Altay also have a high share of secondary industry due to industry and mining respectively.

Figure 5.76 Composition of GDP by region of Xinjiang, 2008

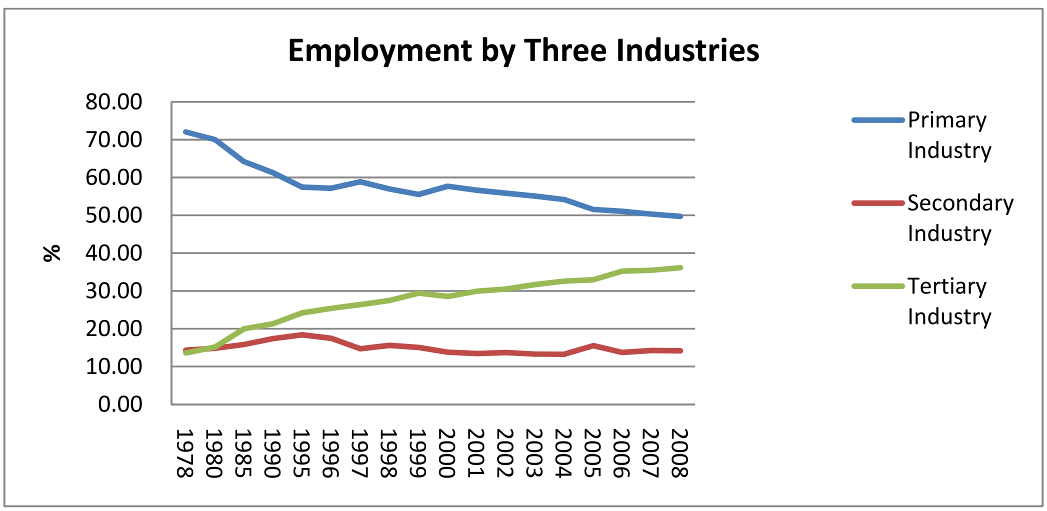


Source: Xinjiang Statistical Yearbook 2009.

The other regions have the highest proportion of tertiary industry due to a weak secondary industry except for Urumqi. Urumqi has the lowest value in the primary sector while it has high proportion in secondary and tertiary sectors. Kashkar and Hotan have highest values in primary sectors (Figure 5.76)

The overall production capacity of agriculture has risen notably. After 60 years of development and construction, and especially since the reform and opening policies were introduced, a complete farmland irrigation network in Xinjiang has been preliminarily formed, and the stock of modern farm equipment has risen. Specialty horticulture and crop planting have bounded forward in the past few years. Livestock breeding is being promoted with the use of the latest findings in agricultural science and technology. In addition, Xinjiang has become the largest producer of commodity cotton, hops and tomato sauce, and one of the major livestock breeding and beet-sugar producing centres in China.

Figure 5.77 Employment by the Three Major Sectors, Xinjiang 1978-2008



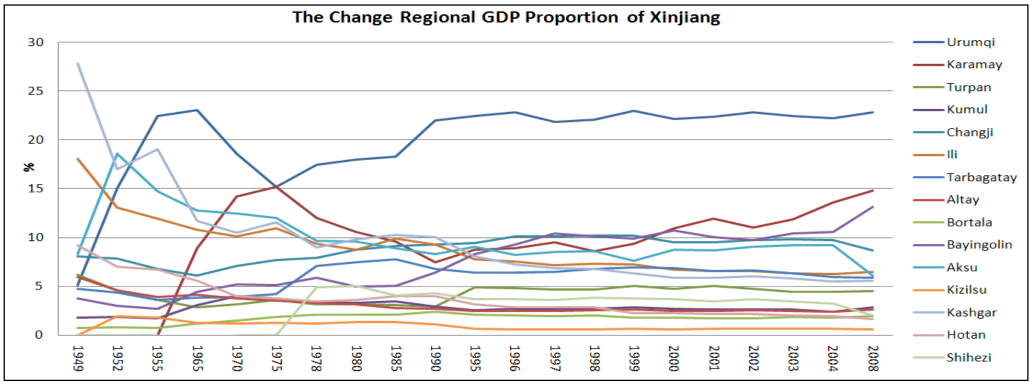
Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

Since China's economic reform and opening policy in 1978, especially since the implementation of China's Western Development Strategy in 2000, Xinjiang has witnessed a rapid development in its economy and a large adjustment in its industrial structure. The employment proportions of the three broad sectors have changed significantly since 1980 in Xinjiang. In the three decades of data on employment in the industries in Xinjiang from 1978-2008, Xinjiang's number of employed persons in the three major industry groups has been constantly modified. Employment in the tertiary industries has increased gradually while primary industry employment has dropped continuously since 1949. Primary, secondary and tertiary industries accounted for 49.71%, 14.16% and 36.13% of total employment in 2008, respectively, compared with 72.06%, 14.33% and 13.61% in 1978 and compared with the data 87.61: 7.29: 5.10 in 1949 (Figure 5.77).

In 2008, the gross output value of farming, forestry, animal husbandry and fishery was 16.4% of the region's GDP, 66.7% of which came from farming and 27% from animal husbandry. The composition of total energy production in 2007 was coal at 36.7%, petroleum crude oil at 34.7% and natural gas at 26% with water, wind and electricity at 2.6%. However, the composition of total energy consumption was coal at 57.8%, petroleum crude oil at 23.9% and natural gas at 14.1%, with water, wind and electricity at 4.2%. The extraction of petroleum resources is considered one of the main economic activities for the future development of Xinjiang. In the last two decades, new oil and natural gas fields have been discovered in Tarim Basin, in the Jungghar Basin, in the Turpan-Hami Basin and in some smaller basins. According to the third national resource estimation report, Xinjiang's total oil and natural gas reserves are about 20.92 billion tons and 10,790 billion m^3 respectively (www.xj.gov.cn). It is clear that Xinjiang will play a dual role as a major domestic producer of petroleum and petro chemicals and as a transit route for Central Asian oil to the eastern and southern provinces of China in the twenty-first century.

Kashgar once was the dominant regional economy with 27.84% of the total GDP of Xinjiang in 1949. At that time, Urumqi only accounted for 5.13% of the regional economy. Urumqi has increased its GDP share since 1995, reaching 22.89% in 2008. Karamay has increased its share of GDP since 1980 while Bayingolin raised its GDP proportion since 1990 with the development of the oil and gas industry of the Tarim basin in the Taklamakan desert (Figure 5.78).

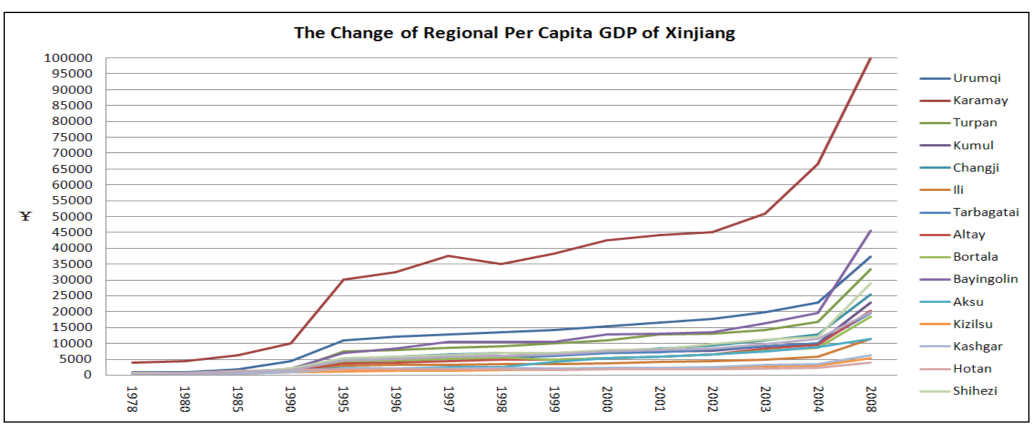
Figure 5.78 The Change of Regional GDP Proportion of Xinjiang, 1949-2008



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

In terms of per capita GDP, the largest disparity of per capita GDP in 1949 was 4.19 times between Urumqi and Kashkar (Figure 5.79). However, it increased to 25.51 times between Karamay (100216Yuan) and Hotan (3928Yuan) due to the large amount of increase in oil, gas industry in Karamay. In 2008, the total investment in fixed assets was 229×10^{8}Yuan. But 56.7% of it was invested in mining while only 0.13% of investment was concentrated in farming, forestry, animal husbandry and fishery.

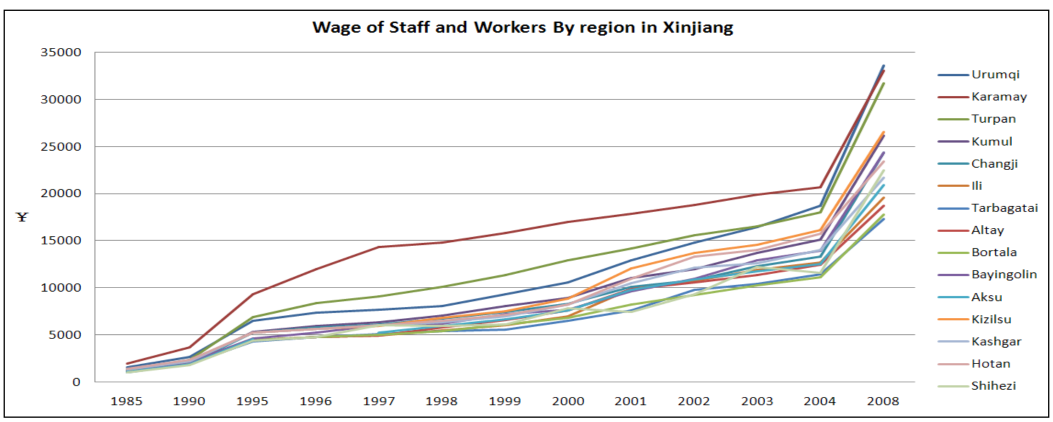
Figure 5.79 The Change of Regional Per Capita GDP of Xinjiang



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

The large regional disparities of per capita GDP have occurred since 1990; Karamay has advanced at a full speed while Urumqi and Bayingolin have followed at a somewhat lower speed. Bayingolin surpassed Urumqi since 2005 due to the development of the oil and gas industry. Aksu, Hotan, Kashgar and Ili have increased at a very low growth rate during this period. Hotan has the lowest GDP of 3928Yuan in 2008. There is concern that the only the oil and gas industry contributed have contributed a large proportion to the regional GDP and that this is under the direct control of central government. Does it represent the real per capita income in this region? (Figure 5.79). Regional income inequality does not fully reflect personal income inequality. So the regional wage of staff and workers in urban area and regional disposable income of rural households of Xinjiang are compared from 1985 to 2008 to more fully document regional per capita income. The wages have increased in all regions. The wage of staff and workers in Karamay, Urumqi and Turpan are higher than those in the other regions. The regional wage disparity in Xinjiang is much smaller than the regional per capita GDP disparity (Figure 5.80).

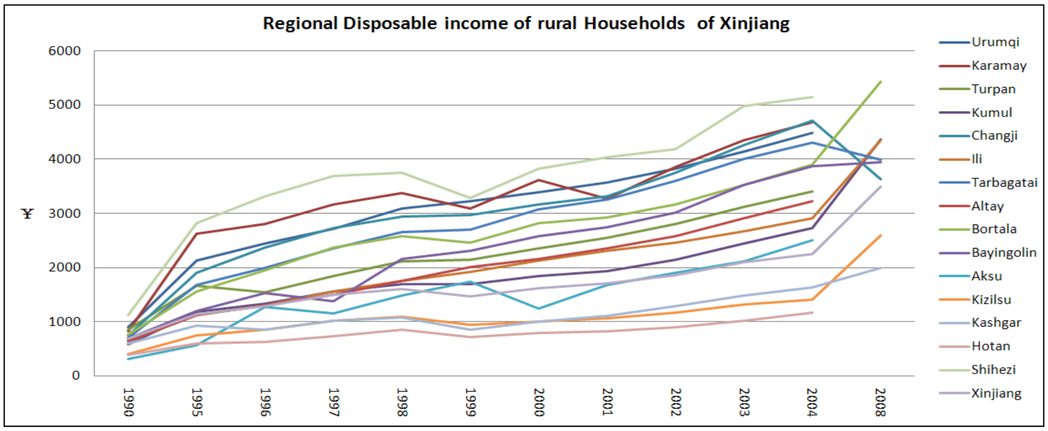
Figure 5.80 Wages of Staff and Workers by Region in Xinjiang, 1985-2008



Source: 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

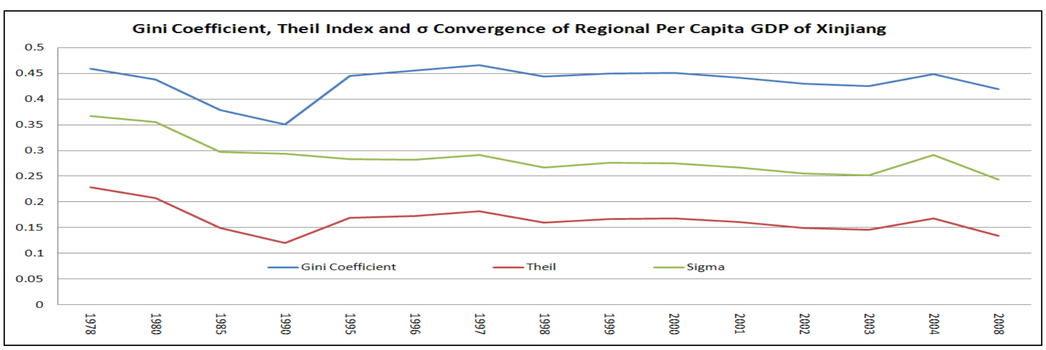
After six decades of development, there are still substantial disparities between per capita annual income of urban and rural households in Xinjiang. The ratio was 2.68: 1 (319/119) in 1978, but it rose to 3.26: 1 in 2008 (11,432/3503Yuan). Shihezi, Changji and Urumqi have the highest per capita annual income for rural households while Hotan, Kizilsu and Kashgar have the lowest during this period (Figure 5.81). The rural per capita income of rural households is much lower than the per capita income of urban households.

Figure 5.81 Regional Disposable Income of Rural Households, Xinjiang, 1990-2008



In order to fully understand the regional economic performance in Xinjiang, the different econometric methodologies of the Gini coefficient, Theil index, σ-convergence and beta convergence are calculated based on the long term data from 1978-2008.

Figure 5.82 Gini Coefficient, Theil Index and σ Convergence of Regional Per Capita GDP, 1978-2008



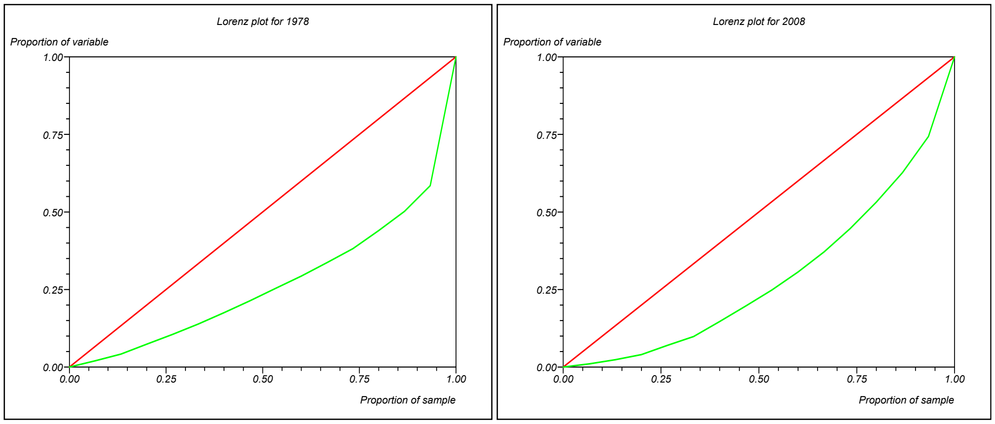
Source: Calculated based on the data of 55 years of statistical data of Xinjiang and Xinjiang Statistical Yearbook, 2009.

The Gini coefficient, Theil index and σ-convergence have decreased since 1978, showing the weak convergence for the whole period. However, they have different performance levels; the σ-convergence of regional per capita GDP indicates there is convergence trend for the period 1978-2003, then it begins to diverge (Figure 5.82). The Theil index and the Gini coefficient confirm the convergence from 1978 to 1990.

Then there is divergence until 2003.

Figure 5.83 Gini Coefficient of Inequality

Analysis for 1978: Analysis for 2008:



If we compare the Lorenz curves of per capita GDP in 1978 and 2008, the difference can be very clearly seen (Figure 5.83). The Lorenz curve line in 1978 (green) between the line of perfect equality (red) and the line of perfect inequality has approached the line of perfect equality slightly. However, it has not changed much for the whole period. From the regional σ-Convergence and Gini coefficients of Xinjiang, it can be concluded that the change of regional per capita GDP disparity is not very significant for the whole period. The disparity had decreased from 1978 to 1990, but since then has not varied much until 2004. The regional disparity has decreased again since 2004.

Based on the absolute beta-convergence model 4.10 presented in Chapter 4, the regional beta convergence can be calculated as below:

by regressing the average growth rate of per Capita GDP between time t_{beg} = 1978 and time t_{end} = 2008 on initial income at time t_{beg} = 1978 where:

$(\ln Y_{it(end)} - \ln Y_{it(beg)}) = \alpha + \beta \ln Y_{it(beg)} + \mu_i$ (5.4)

Here, i is the index for each region where i = 1 to 15 in Xinjiang. Time is indexed by t where t(beg) = 1978 and t(end) = 2008. The sample period is indexed by T where T = 31 years for the whole period. (The Beta Convergence rate β is calculated based on $\beta = -\ln(1-\beta)/T$.)

lnY = natural log of real per capital income.

α = constant term and μ_i = random error term.

Model (5.4) is estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1978-2008, (ii) the first sub period 1978-1990, (iii) the second sub-period 1991-2000 and (iv) the third sub period 2001-2008. The regression results confirm a weak convergence with the "beta" coefficient being negative for the whole period 1978-2008 with an annual rate of 0.008 (Table 5.11). But there are different outcomes for the sub-periods. For the first sub-period 1978-1990, there is significant convergence with an annual rate of 0.016 while there is strong divergence for the second sub-period 1990-2000, at an annual rate of 0.0235. The result for the last sub period 2001-2008 confirms divergence with an annual rate of 0.002.

Table 5.11: Regional Beta Convergence of Xinjiang

Period	Beta	Annual Rate	R
1978-2008	-0.288701	-0.008181766	(r) = -.282305 (r^2 = 0.079696)
1978-1990	-0.234201*	-0.016186446	(r) = -.58227 (r^2 = 0.339039)
1990-2000	0.228225	0.023551111	(r) = .301354 (r^2 = 0.090814)
2001-2008	0.018105	0.0020301	(r) = .079863 (r^2 = 0.006378)

Note: Significant at 5%.

Regional spatial dependence can be handled into beta convergence by using the same approaches, the spatial error model (SEM), the spatial lag model (SLM) and the spatial cross-regressive model (SCM) in this case (see more in Chapters 2 and 4) (Table 5.12).

Table 5.12 Beta Coefficient of Spatial Dependency Models

Indicators	Beta Coefficient			Annual Rate -Ln(1+b)/ T		
Periods	SEM	SLM	SCM	SEM	SLM	SCM
1978-2008	-0.261644	-0.185929	-0.336686	-0.0075	-0.0055	-0.00936
1978-1990	-0.229167	-0.188375	-0.24233	-0.01587	-0.01328	-0.01669
1990-2000	0.229156	0.165476	0.177602	0.023661	0.016445	0.017776
2001-2008	0.019973	-0.001305	0.019708	0.002242	-0.00014	0.002212

Notes: Estimated for the period 1978-2008 for all models

The SEM, SLM and SCM models are estimated by a non-linear version of the basic growth regression, for the period 1978-2008. From Table 5.12, it can be clearly seen that the beta coefficient $\beta<0$ for the whole period in all three models. This indicates a weak sign of convergence in terms of regional per capita GDP at an annual rate of 0.0075, 00.55 and 0.00936 in the SEM, SLM and SCM models respectively. In the first sub period 1978-1990, there is considerable convergence apparent in all models. The rate of convergence is 0.01587, 0.01328 and 0.01669 respectively per year. However, in the second sub-period 1990-2007, there is significant convergence with an annual rate of 0.023661, 0016445 and 0.017776 respectively in the three models. The estimation results are not satisfactory nor significant for the third short period 2001-2008; a weak convergence exists with the SEM and SCM models at the different annual rates of 0.002242 and 0.002212 respectively while the SLM model rejects the convergence with an insignificant convergence rate of 0.00014. In terms of regional per capita GDP, all the results of the SEM, SLM and SCM models are similar with the absolute convergence value. This result is consistent with beta convergence and of per capita GDP except for the slight differences in the third short-period 2001-2008.

5.3 Conclusion

In this chapter, analyses of the broad regional, provincial and the cases of Quebec and Xinjiang are presented. These analyses provide an overview of the regional economic situation at different scales with particular attention to structural differences of both economies (China and Canada) based on recently released updated long-term statistical data in both countries. Different economic indicators were used such as population, GDP, employment, investment, labour force, migration, personal income and disposable income, annual disposable income of urban and rural households (China), total investment in fixed assets (China), wages, transfer payments (Canada), industrial composition and the contribution of the different sectors to GDP. The analysis was undertaken by using descriptive statistics, relative indexes and empirical convergence analyses with the spatial models of SEM, SLM and SCM.

The Canadian Economy has undergone significant change since 1950. But in terms of population and economic activities, the results differ greatly from region to region. Central Canada has been the economic core of Canada. Western Canada has gained both in terms of population, the regional share of GDP since 1981, with the rapid growth in trade with Asia which has enriched British Columbia and the creation of the oil wealth which has provided a major boost to Alberta and Saskatchewan. The changes in the cross-regional σ convergence and Gini coefficients are consistent with the broad trends in the Canadian economy. The analysis based on the Gini coefficient showed that regional disparity in Canada has not changed much since 1981. The analyses based on the Lorenz curves for 1961, 1981 and 2007 showed there was a weak convergence between Canadian regions for this period. The regional Theil index and the beta coefficient with $\beta<0$ showed a weak convergence for the whole period 1961-2007. This is the reflection of steady and relatively insignificant provincial disparity in Canada over the long term.

In the case of China, the Eastern Coastal Region is regarded as the core region of the Chinese economy with its advantageous geographic location, abundant human capital resources, concentration of industry, and the advantages of international economic relations for attracting. The Western Region on the other hand can be considered as a peripheral region with the disadvantages of a landlocked geographic location, the difficulty and costs of engaging in international economic activities even though some of its provinces border with other countries, its poor natural conditions which are generally mountainous and lacking in adequate water supplies; however, it does possess rich mineral, energy resources and mostly consists of minority ethnic peoples. Between these two regions lies the Central Region.

The Coastal Region has diverged significantly with respect to the other two regions since 1980. The trend lines of the Regional Weighted and Unweighted σ convergence, the Theil Index and the Gini Coefficient for China have the same trajectory (in terms of the temporal patterns) and show the consistency of regional divergence for the whole period for the whole economy. The trajectories of the Lorenz curve and the beta coefficient show there is weak divergence for the whole period 1961-2007.

Based on the long term data, provincial differences changed significantly for many indicators in Canada after 1960. But geographic unevenness remains across the country. Significant changes have occurred in Ontario, Quebec, Alberta and British Colombia. Ontario has almost retained the 40% level of total national GDP, while Alberta and British Colombia have increased their national GDP share while Quebec has seen a decrease in its total GDP share. Provincial industrial composition differs greatly in Canada. The majority of recent immigrants have settled in Ontario. The three most recent decades of development in Ontario, Alberta and British Colombia have seen these provinces attract more international and interprovincial migrants than Quebec and other provinces.

Provincial disparity in China is larger than the regional disparity. National income and population were distributed unevenly between provinces. Provincial disparity has clearly emerged since the 1980s. Most employment is concentrated in the broad primary sector, mainly in agriculture. Living standards are actually improving in Central and Western China, but at **a much slower rate** than in the east as a result of large regional disparities. In relative terms, it reflects Myrdalian dynamics of cyclical cumulative causation with spatial core-prephery inequalities..

Quebec's abundance of natural resources gives it a favorable position in the national global economy. Quebec accounts for almost a fifth of the Canadian economy. Over the last decade, Quebec has had a strong economic performance while experiencing a gradual shrinkage of its national share. Variations in per capita income and economic structure among the administrative regions of Quebec demonstrate clearly the province's core-periphery spatial structure. Each administrative region differs from the others with regards to its geography, natural resources, inhabitable land, economy and industrial activities. In Quebec, the Montreal region has dominated Quebec's economy. The σ-Convergence of regional per capita GDP of Quebec has converged slowly from 1998 to 2003, and then it experienced a slight divergence between 2003 and 2008. The SEM, SLM and SCM models showed a weak convergence of regional per capita disposable income.

The natural, ethnic, economic and territorial landscapes combine in layers to make up the complex and diverse landscape of Xinjiang. In fact, the main factor underlying the changing pattern of regional economic development has been due to the differential progress of industrialization between regions, a number of geographical as well as historical factors, long-term policy, and a phenomenon of localized economic development and prosperity which have also emerged as factors that have marginalized the minorities of Xinjiang to a great extent. After six decades of development, there is still substantial disparity between per capita annual income of urban and rural households in Xinjiang. The Gini coefficient, the Theil index and the σ-convergence and "beta" coefficients confirm a weak convergence for the whole period 1978-2008. The SEM, SLM and SCM models indicate a weak convergence and all the results are significantly consistent with the σ-Convergence. It is clear that Xinjiang will be become a new economic growth centre in western China in the near future due to its rich resources, ethnic composition and its economic and political status in China.

The next chapter, Chapter 6, treats the urban case of the two metropolitan centres of Montreal and Urumqi.

Chapter 6
The Urban Case

In this Chapter, after briefly dealing with the national, regional and provincial scales of analysis, emphasis is then placed on a smaller unit of analysis – Montreal in Quebec and Urumqi in Xinjiang which are selected as the metropolitan cases for comparison as the ‘core’ regions of their respective provinces.

The rapid increase of urban population in less developed countries and the changing demographic structures in more developed countries represent one of the world's most important challenges. According to the United Nations Population Fund, in 2008 the world achieved an urbanization milestone, with 3.3 billion people, more than half the world’s peoples, then living in cities. The world's urban population now exceeds the world's rural population.

The world’s urban population will grow from 2.86 billion in 2000 to 4.98 billion by 2030, of which high-income countries will account for only 28 million of the expected increase of 2.12 billion. The world’s annual urban growth rate is projected to be 1.8% in contrast to the rural growth rate of 0.1%; and about 60% of the world’s population will live in cities (UN-HABI[1] 2004). Urban-based economic activities account for more than 50% of GDP in all countries, and up to 80% in more urbanized countries in Latin America, and even more in Europe (Tan vom Hove 2004).

The urban system in most countries is influenced by market forces. Cities that produce goods and services that are in demand and attract people to live in them tend to have faster growth than those that do not. In most countries, government generally has had little direct influence on the development of the urban system. Since World War II, and especially in the past two decades, urban systems in western countries have been influenced by regional shifts in production as a result of the restructuring of the economy (Wallace 2002).

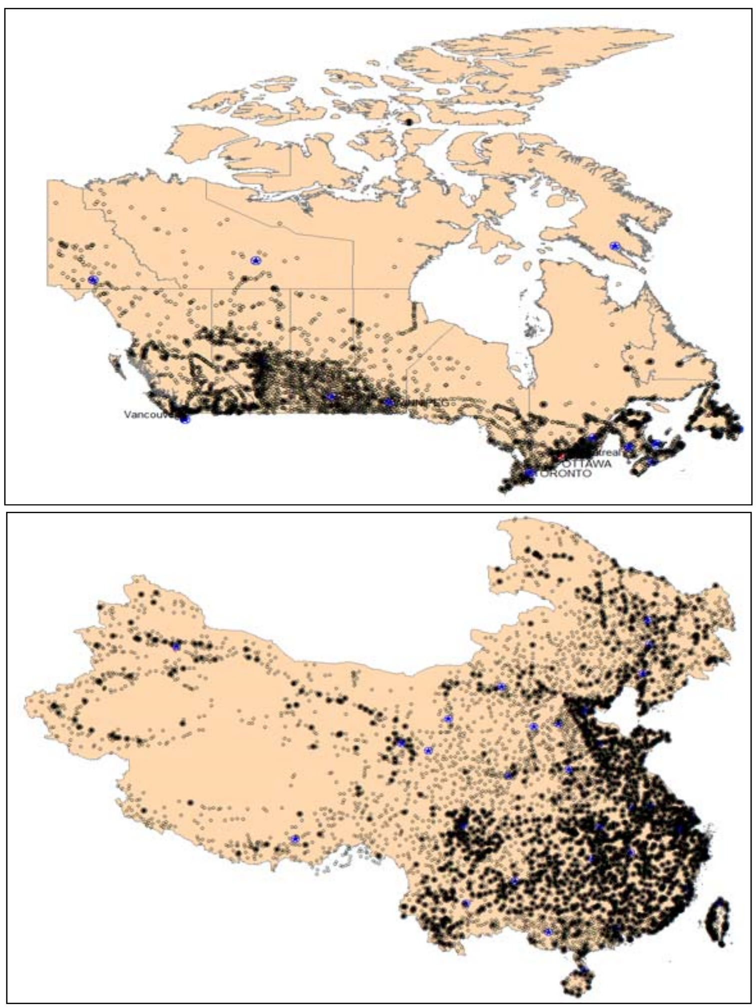
6.1 The Urban System in Canada and China

Cities play a very important role in countries with large territories because they are linked to urban population increase, centralization and distribution of economic

[1] UN-HABI (2004/05), http://www.unhabitat.org/

activities. They are the economic engines of a territory. Economic outputs are mostly based in cities in both China and Canada. However, there are important differences in their urban systems, urban size, distribution, definitions, and in their number and regional distribution between Canada and China due to differences in population size and economic activities (Map 6.1). In Canada, most cities are concentrated in the south, a short distance from the US, while in China the cities are strongly concentrated in the eastern coastal area, with an inland extension along the Yangtze and Yellow Rivers. It has been argued that rapid urbanization has been a characteristic of many developing countries in recent decades. Furthermore, urbanization is closely related with rural change and development. Generally, urbanization in China has experienced a higher growth rate than that of Canada.

Map 6.1 The Distribution of Population of Canada and China

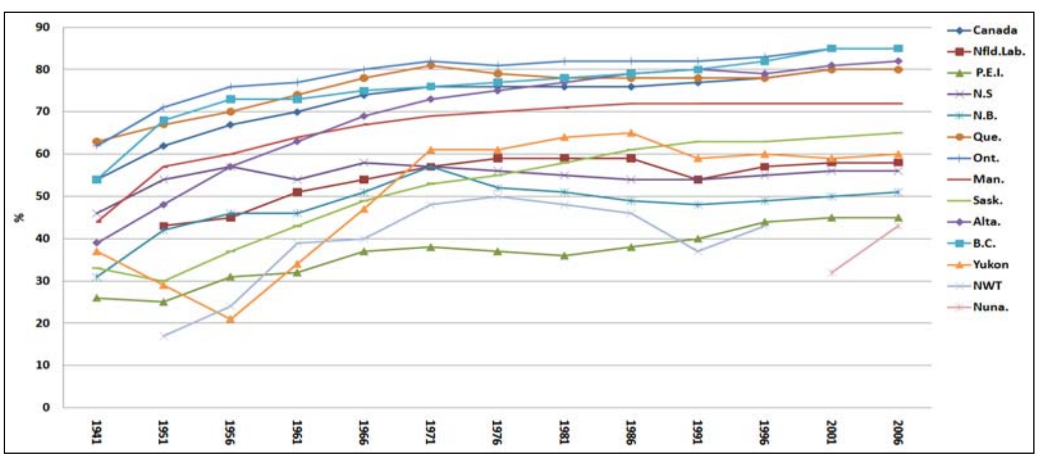


Source: Calculated based on MapInfo 8.0 data source.

Based on the statistics[2] of the 50 richest cities and/or their metropolitan areas in the world by GDP at purchasing power parity (PPP), there are two Canadian metropolitan areas listed. Toronto CMA ranks 22nd with a GDP of $253 billion and a population of 5.16 million, while Montreal CMA ranks 41st with a GDP of $148 billion and a population of 3.216 million. There are three Chinese cities on this list. Shanghai ranks 25th with a GDP of $233 billion and a population of 12.63 million, Beijing ranks 38th with a GDP of $166 billion and a population of 10.85 million and Guangzhou ranks 44th with a GDP of $143 billion and a population of 8.5 million.

Despite its vast territory and smaller population, Canada is one of the most highly urbanized nations in the world. Cities play a unique role in Canada, and most Canadians live and work in cities. Canada's urban regions have been growing relatively fast. In 1961, about 50% of Canadians lived in large cities of 100,000 residents or more (Census Metropolitan Areas - CMA). By 2001, this had grown to 64%. The urbanization rate reached 80% in 2008, and has increased in all provinces (Figure 6.1). However, the rate of urbanization differs greatly between provinces. Ontario, British Colombia, Alberta and Quebec have the highest urbanization rates (85%, 85%, 82% and 80% respectively) while Nunavut, Prince Edward Island, New Brunswick and Nova Scotia have the lowest urbanization rates (Nunavut 43%, 45%, 51%, and 56% respectively). Among them, Alberta has the highest rate of urbanization. It ranked 7th with a 48% urbanization rate in 1951, and second in 2006 with an urbanization rate of 82%.

Figure 6.1 Provincial Urbanization Rates, Canada, 1901-2006



Source: Statistics Canada, Census of Population, 1851 to 2006.

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[2] (PricewaterhouseCoopers 2009)

In Canada, the major urban areas are divided into Census Metropolitan Areas (CMAs) or Census Agglomerations (CAs). A CMA is an area consisting of one or more adjacent municipalities situated around a major urban core. A CMA must have a population of at least 100,000, and the urban core must have a population of at least 50,000. The urban core is a large urban area around which the boundaries of a CMA or CA are defined. An urban area is an area with a population of at least 1,000 and no fewer than 400 persons/km^2, and rural areas are the residual.. Canada currently has 33 CMAs, up from 27 in 2001. The eight largest CMAs, in descending order by population size, are Toronto, Montréal, Vancouver, Ottawa-Gatineau, Calgary, Edmonton, Québec City, and Winnipeg (Turcotte 2008)[3].

The term 'metropolitan' is a new concept to China. In China, its urban system is more complicated due to its large population. There are three types of cities: a municipality as a provincial-level division (e.g. Shanghai, Beijing); a prefecture-level city which is governed by provinces or autonomous regions; and a county-level city which is a sub-unit of a prefecture-level administrative division. Due to the complexity of the administrative divisions, sometimes the difference between the administrative units in China called municipalities and what are real cities causes ambiguity. The criteria of designation have changed in different time-periods, reflecting prevailing urbanization policy, economic development and political ideologies. After 1949, there were no formal criteria for defining and establishing cities. As a result, many cities were established. To control the rapid increase in the number of cities, the State Council passed the "Decision on the Establishment of City and Town Government" in June 1955 (Ministry of Civil Affairs 1986: 461-464). Population size and economic and defence significance became the main criteria for granting city status. Urban centres with a population of more than 100,000 could be granted city status, whereas those of less than 100,000 could be granted city status only if they were an important industrial or mining base, the home of provincial institutes, a large market town or if they an important urban centre on the border. Cities established before 1955 that did not meet these criteria were to be downgraded from cities to towns. These criteria were used until 1963, when the State Council

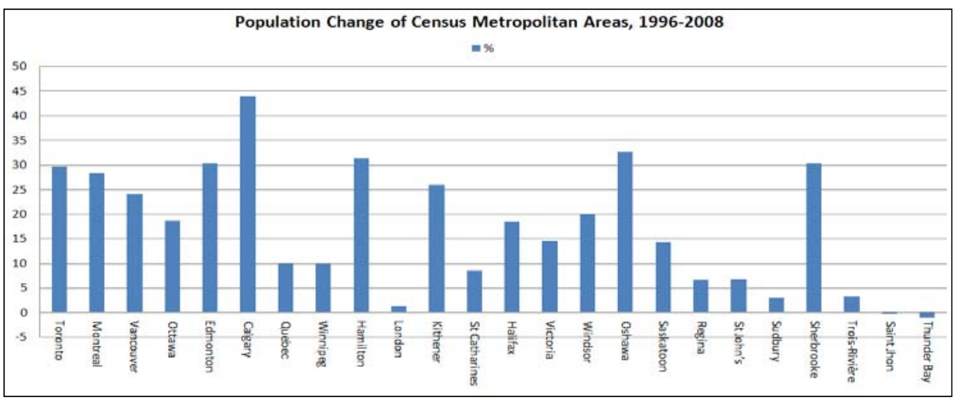
[3] For more details, please visit the following Web page:
http://www12.statcan.ca/english/census06/reference/dictionary/geo009a.cfm

decided that there were too many cities in China. In some cases, the mainly rural population of a city's suburban districts was much larger than the population in its urban district. To correct for abuse of the population criterion, the State Council announced the "Instruction on the Adjustment of the Establishment of City and Town Government and the Reduction of the Areas of City Suburban Districts" in December 1963 (Ministry of Civil Affairs 1986: 464-468). The proportion of agricultural population in a city was not to exceed 20%. If it was over 20%, it had to be reduced. These criteria for granting city status continued until 1978. They were relaxed after 1978 to meet the demand for rapid economic development of the open policy and the concomitant changes in the characteristics of cities. The definition of urban population has been very problematic in China, particularly in 1983 when many counties were abolished and turned into cities and in 1984 when many townships were abolished and turned into towns (Chan and Xu 1985; Ma and Cui 1987). In 1983, a new set of criteria for granting city status were used internally by the Ministry of Civil Affairs. These criteria were finally formally adopted in April 1986 in the "Notice on the Report of the Adjustment of the Criteria of Establishing City Government and the Conditions for City Governing County" (Ministry of Civil Affairs 1986: 470-472). Compared with the previous criteria, more emphasis was given to the employment structure and economic development of the urban centre rather than to population size. An urban centre could be granted city status if it had a non-agricultural population of over 60,000 with an annual GNP of 200 million Yuan and had become an important economic centre.

Before the adoption of the open policy in 1978, the Chinese government played an important role in urban system development. The ability of the government to exert a strong influence on urban development was mainly through population control and resource allocation. A household registration (*hukou*) system was established in 1954 to stop unauthorized migration from the countryside to the cities and uncontrolled growth of large cities. With population control and resource allocation, the Chinese government was remarkably successful in shaping the urban system according to its public policy and ideology. The growth of large cities was successfully curtailed, small towns were developing rapidly, and cities and city population were successfully shifted from the coast to interior and border locations. This was the result of a centrally controlled government.

Politics and public policy were the two most important factors shaping urban development in China (Lo 1987). The centralization policy has greatly helped the formation of a large city in each of China's provinces. Politics and public policy exerted a strong influence over the growth of the urban population (Xu 1984), urban system development (Xu 1984), city system development (Yeh and Xu 1990), the provincial distribution of the urban population (Yeh and Xu 1984) and interprovincial migration (Fan 2005). However, the importance of government's role in shaping urban development has been reduced since the adoption of economic reforms and the open policy in 1978. Fan (2005) pointed out that the relaxation of migration controls in China since the 1980s has become a more effective factor of population redistribution and regional development. The recent and substantial surge in mobility in China signals that migration is playing an increasingly central role in shaping its demographic and economic landscape.

Figure 6.2 Population Change of Census Metropolitan Areas:Canada 1996-2008



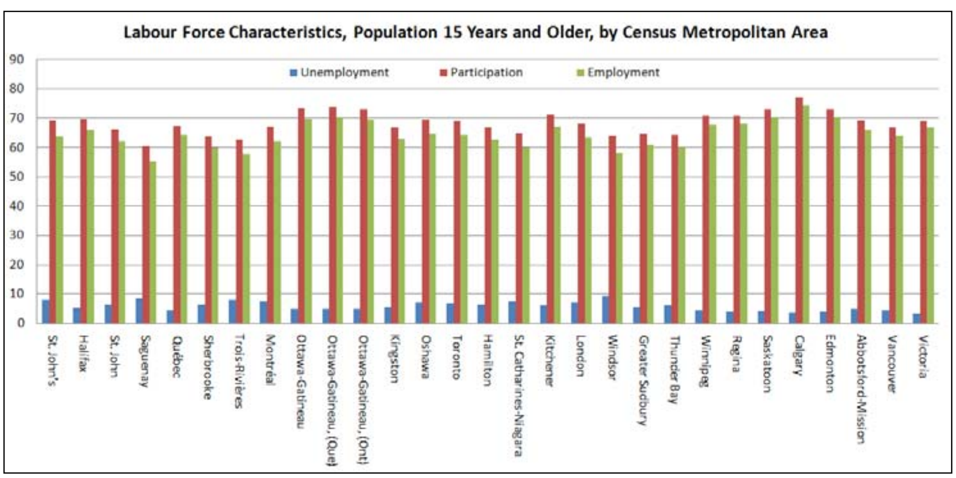
Source: Census of Canada 2006; Data for 1996 comes from Iain Wallace (2002). Data for 2008 comes from CANSIM, table (for fee) 051-0046 and Catalogue.

Like many other industrialized countries, Canada is a very highly urbanized nation. Canada's metropolitan areas are significantly distributed in regions that border the United States, particularly the southern parts of Ontario, Quebec and British Columbia. In 2006, just over 80% of the population lived in urban areas, and roughly two-thirds of Canadians lived in Census Metropolitan Areas (CMA). Over three quarters of Canadians in 1996 resided in the 137 urban places of 10,000 inhabitants or more (McCann and Simmons 2000). Over a third (34.8%) of the total population resides in the three largest metropolitan areas of Toronto, Montreal and Vancouver (11,553,000), 53.27% of the population lives in the top 10 Census Metropolitan Areas (CMAs) and

68.5% of the population lives in the top 33 Metropolitan Areas (Statistic Canada 2009) in 2008. In Canada's economy, the service sector plays a substantial role in the development of the national economy. It can be seen that the majority of Canadians live and work in towns and cities, and a large percentage of national economic output is based on these urban centres. There are six cities with a population over million in Canada, and they constituted 45% of Canadian population in 2008. They are Toronto (Ont.), Montréal (Que.), Vancouver (B.C.), Ottawa-Gatineau (Ont.-Que.), Calgary (Alta.) and Edmonton (Alta). There are 42 cities in Canada with populations of over 100,000.

In terms of CMA population change in Canada between 1996 and 2008, Calgary (43.8%), Oshawa 32.5%), Hamilton (31.3%) and Sherbrooke (30.2%) have the highest rate of population increase over that period, while Thunder Bay (-1.11%) and Saint-John (-0.16%)) (Figure 6.2). Toronto, Montreal and Vancouver also have high rates of increase of population 29.7%, 28.4% and 23.4% respectively during this period due to the large number of immigrants they have received in recent years.

Figure 6.3 Labour Force Characteristics by CMA



Source: Statistics Canada, CANSIM, table (for fee) 282-0053 and Catalogue no 71-001-PIB

In addition, in terms of labour force characteristics of the population 15 years and older by CMAs in Canada, the fastest growing CMAs have higher participation and employment rates and lower unemployment rates. For example, Calgary (77.1%, 74.4%, and 3.5%), Ottawa-Gatineau (73.3%, 69.7%, and 4.8%), Edmonton (73%, 70.3% and 3.7) and Saskatoon (73.3%, 70.2% and 4 %) have the highest rates of labour force participation rates and employment rates and the lowest unemployment rates respectively. Windsor and Saguenay have the highest unemployment rates of 9.3% and 8.5% respectively in 2008 (Figure 6.3).

Census Metropolitan Areas with a population of more than 500,000 accounted for more than half of Canada's population. Of the 19% of Canadians living in rural areas, close to two-thirds were living in an area subject to the strong or moderate influence of one of Canada's metropolitan areas. Thus, 60% of the rural population was living in areas in which at least 5% of the employed labour force was commuting on a daily basis to the city for work purposes. Thus, less than 8% of Canada's population in 2006 was living in areas where direct metropolitan influence was low or non-existent. In 2006, more than four immigrants out of five (85%) choose to settle in Quebec, Ontario or British Columbia. Ontario alone received half of Canada's newcomers in 2006, whereas the demographic weight of that province was less than 40%. This situation is a result of the strong concentration of Canadian immigration in the country's most urbanized areas. Indeed, the propensity of newcomers to settle in Toronto, Montreal or Vancouver is a major factor in the differential growth among the various provinces and territories. In 2006, immigrants to Canada were strongly concentrated in the country's largest urban areas. In the 2006 Census, 81% of recent immigrants (i.e. those who arrived in the 10 years preceding the census) were living in Canada's six largest urban areas. In 1981, 70% of all recent immigrants were living in these same six large cities, i.e. 11 percentage points less than in 2006. The concentration is especially strong in Canada's three largest metropolitan areas, viz. Toronto, Vancouver and Montreal, which in 2006 were home to 70% of recent immigrants. The Toronto Census Metropolitan Area alone accounted for more than 41% of all recent immigrants to Canada[4].

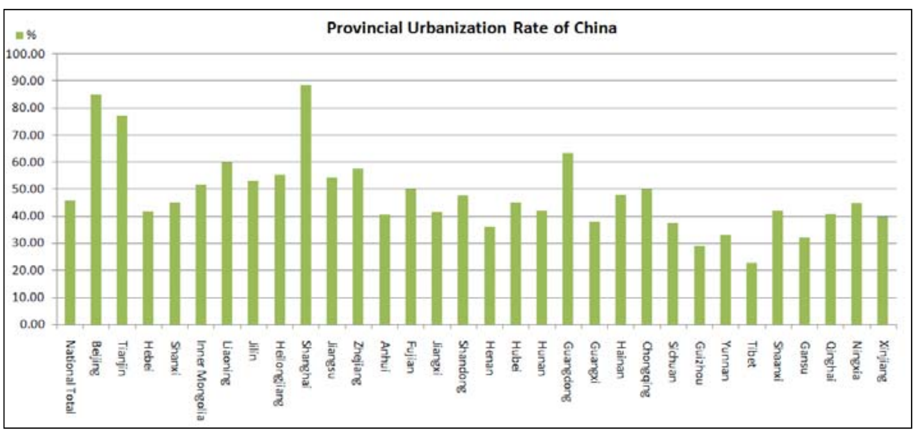
On the other hand in China, most of the largest cities are distributed in the eastern coastal portion of the country. China has large numbers of cities because of its huge population. In 2008, there are 651 cities in China (which includes 283 prefecture level cities and 368 county level cities). The distribution of prefecture level cities and county level cities in the three broad regions is 34.63% and 44.03% in the Eastern

4 Canadian Demographics at a Glance, Catalogue no. 91-003-X, Minister of Industry, 2008, Statistic Canada.

Provinces, 35.69% and 33.97% in central provinces, and 29.68% and 22.01% in the Western provinces respectively. Most of these cities have a population of over million, but the urbanization rate of China was only 45.7% in 2008, with therefore 54.3% of its population living in rural areas.

A lack of large and medium sized cities helps us understand the urbanization gap between regions. China has a population of 1.3219 billion but with 188 cities with a population size of one million and above, they only contain 27.38% of the national total population and 58.43% of the national urban population. Most of the cities are distributed in the high population density area in the eastern coastal provinces. There are 13 cities population of over 4 million, and 27 cities with a population of between 2 million and 4 million, 148 cities with a population from 1 million to 2 million, 272 cities with a population from 500,000 to 1 million, and 190 cities with a population from 100,000 to 500,000. Uneven urban development across different regions, and in particular, the widening wealth gap between urban and city residents is another issue of great concern.

Figure 6.4 Provincial Urbanization Rate of China, 2008

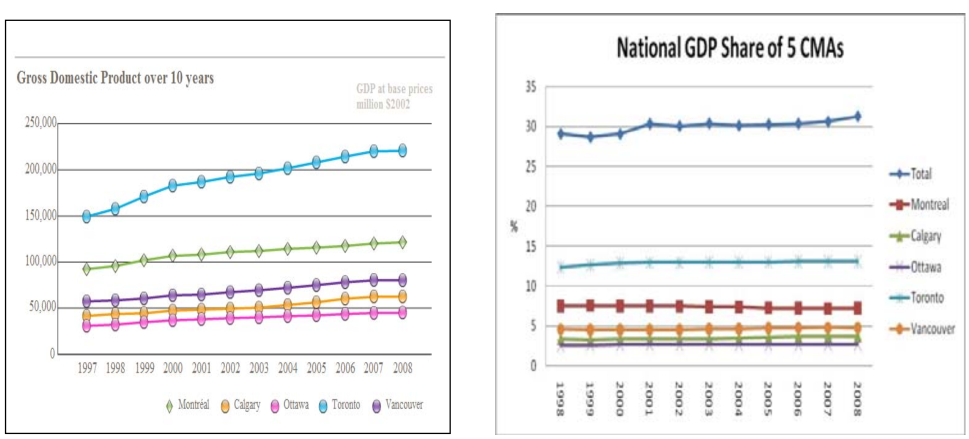


Source: Xinjiang Statistical Yearbook 2009.

During the last few decades, urbanization in China has been accelerating. The rate of urbanization measured by the proportion of urban population in total has grown from 17.9% in 1978 to 45.7% in 2008, a 27.8 percentage points increase. However, due to the institutional constraint inherited from the planned economy and the hukou system, the rate of urbanization in China is lower than not only the developed economies but also other economies at the same level of development. There are also great disparities between the eastern, central and western provinces. Their proportion of urbanization is 60%, 46% and 36% respectively in 2007. The central and west regions have thus lagged behind in the process of urbanization. In 1982, the gap between the east and the west was 7.5 percentage points, growing to 24 percentage points in 2007. The provincial urbanization rate also differs greatly in China. Three of the four municipalities which are controlled directly by the central government, Beijing, Tianjin and Shanghai, have the highest urbanization rates of 84.9%,77.2% and 88.6% respectively while Tibet, Guizhou and Gansu have the lowest urbanization rates of 22.6%, 29.1% and 32.15% respectively (Figure 6.4). Ravallion and Chen (2007) pointed out that almost one quarter of China's poverty reduction over 1981-2001 can be attributed to urbanization of the population, even holding poverty measures constant in both urban and rural areas. It can be seen that urbanization has become a vehicle of economic growth of China since the economic reform of China.

The largest 5 CMAs of Canada have raised their GDP continuously since 1997. Toronto raised its GDP faster than the others. These 5 Canadian CMAs have maintained a steady national share of GDP since 1998 with a slight increase from 29% to 31.2%. Calgary has increased its national GDP share while Montreal has gradually seen a decrease in its national share from 7.48 in 1998 to 7.19% in 2008 (Figure 6.5).

Figure 6.5 GDP Change of 5 CMAs of Canada, 1997 - 2008

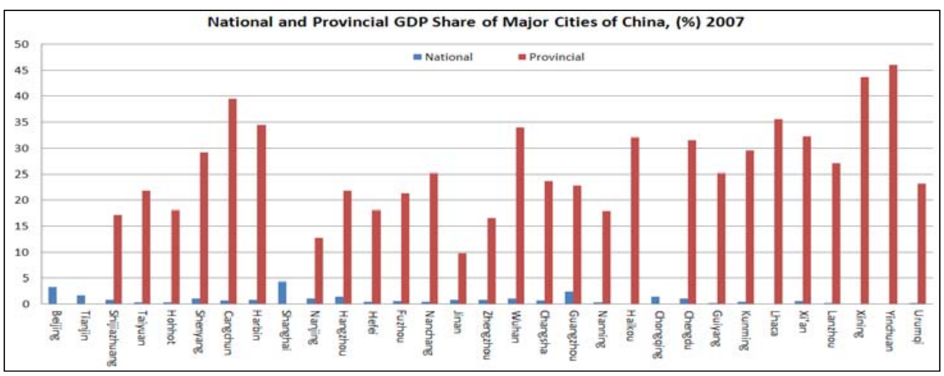


Source: Calculated based on over 10 years of data released by the Conference Board of Canada, Board of Trade of Metropolitan Montreal (2010).

Urban-based economic activities are highly concentrated in urban areas (naturally!) and account for most part of corresponding regional GDP. But the concentration rate differs greatly in both countries. The concentration of the population and economic activities in cities is more pronounced in Canada than in China. This concept is consistent with the urban case of China where, for instance, the western poor provinces have higher concentrations of their population in their provincial capital cities in contrast to the eastern and central provinces.

In Canada, most of the CMAs have a leading share of GDP in their provinces. In 2006, the study of the Conference Board of Canada, "Canada's Hub Cities: A Driving Force of the National Economy", identifies eight economically-leading large cities that function as 'hub cities' for their province - Vancouver, Calgary and Edmonton, Regina and Saskatoon, Winnipeg, Toronto and Montreal - and a ninth city, Halifax, that functions as a hub city for the Atlantic provinces. They released data for the hub cities and their provincial GDP shares; thus, Toronto accounted for 44% of Ontario's GDP and 18% of Canada's GDP, and Winnipeg, Vancouver and Montréal accounted for 65%, 53.2% and 49% of their respective provincial GDPs. Calgary and Edmonton combined accounted for 64% of Alberta's GDP. Regina and Saskatoon combined account for 44.7% of Saskatchewan's GDP. Halifax is added as a hub city because it accounts for 46.3% of Nova Scotia's GDP[5].

Figure 6.6 National and Provincial GDP Share of Major Cities of China, (%) 2007



Source: China City Statists 2008.

In China, the strong influence of government on urban development and the long term centralization of Chinese policy have helped the concentration of urban economic activities into the cities directly controlled by the state and provincial capital cities.

5 http://www.citymayors.com/politics/canada_hubs.html ; http://www.canadascities.ca/.

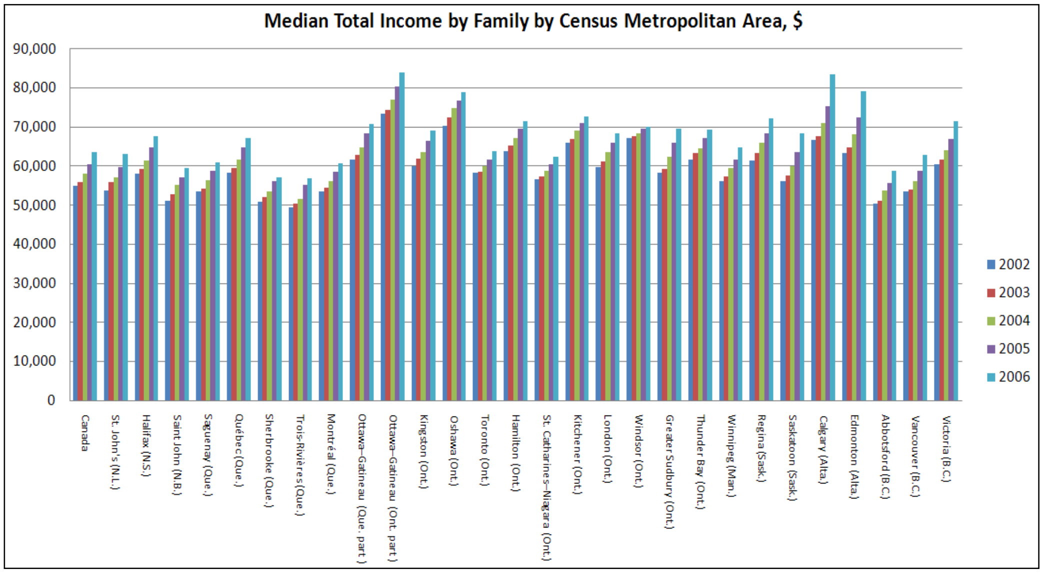
The four cities directly controlled by the state and the other 27 capital cities of China, account for 30.4% of national GDP. Among them, the four cities of Shanghai (4.42%), Beijing (3.39%), Tianjin (1.83%) and Chongqing (1.5%) that are directly controlled by the state, accounted for 11.14% of national GDP in 2007. In addition, Guangzhou City accounts for 2.58% of national GDP. In the share of provincial GDP accounted for by provincial capital cities, most of the provincial capital cities accounted for more than 20% of their provincial GDP. The capital cities of the western provinces and the traditional industrial base of the easternmost northern provinces have the highest GDP share - Yinchuan (45%, Ningxia Province), Xining (43%, Qinghai Province), Changchun (39.5%, Jilin Province) and Lhasa (35.6%, Tibet). The lowest GDP share of 9.87% is attributed to Jinan city in Shandong Province. It can be seen that the western provinces have higher GDP concentration rates than those of China's central and eastern provinces (Figure 6.6).

Another way of looking at the role cities play in the regional economy is to compare the distribution of per capita income. In Canada, a frequently used indicator is the median family income of CMAs. Seychuk (2005) using this indicator measured the urban-rural income gap of Canadian provinces in 2001. He concluded that Ontario had the highest family income and also the highest CMA median income, Alberta had the highest rural median income of $47,500 and Oshawa had the highest median family income in 2001 in Canada[6].

In Figure 6.7, the median family income of major CMAs is compared for the period from 2002 to 2006. Ottawa–Gatineau (Ont. part), Oshawa (Ont.), Windsor (Ont.) and Calgary (Alta.) had the highest median family income of $73,400, $70,300, $67,100 and $66,700 respectively, while Trois-Rivières (Que.) and Sherbrooke (Que.) had the lowest median family income of $49,400 and $50,800 respectively in 2002. Calgary still led the ranking with a median family income of $83,500. In 2006. Ottawa-Gatineau (Ont. part), Edmonton (Alta.) and Oshawa (Ont.) had the highest median family income of $84,000, $79,300 and $78,900 respectively while Trois-Rivières (Que.) and Sherbrooke (Que.) still had the lowest median family income of $57,000 and $56,900 respectively in 2006. The disparity between the highest and the lowest median family income was $24,000 in 2002; it increased to $27,100 in 2006.

6 Available on the internet at: www.rbc.com/economics

Figure 6.7 Median Family Income by Census Metropolitan Area ($), 2002-2006



Source: Statistics Canada, CANSIM, table (for fee) 111-0009.

Mittelstaedt (2010) assessed the disparity between the richest and the poorest and found that Oakville, Ont., has the highest income per person at $40,311, nearly double the bottom ranking figures of less than $22,000 in the Quebec cities of Trois-Rivières and Sherbrooke[7].

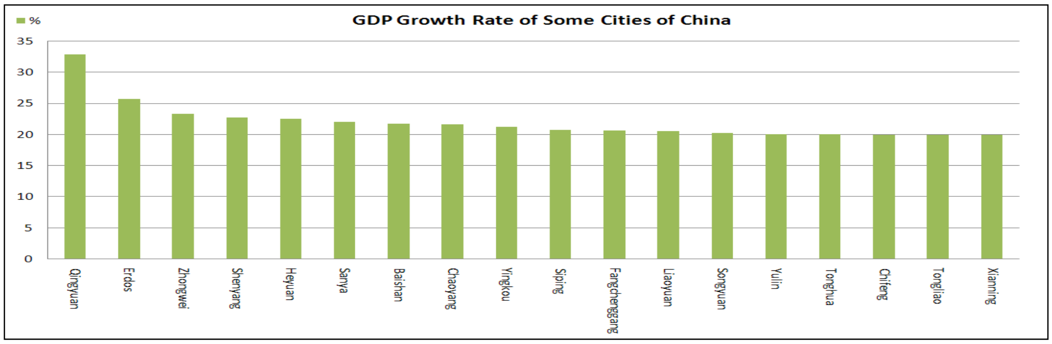
All of Canada's metropolitan regions have been affected by the current recession. Montreal and Toronto, for example, have been hard hit by deteriorating world trade and major corporate restructurings. Regions in Western Canada have faced declines in raw materials prices, which have not only reversed the earlier wealth effect, but have also led to delays and cancellations of major private investments in the energy sector. With the exception of Ottawa, which will likely record very modest economic growth (+0.2%), it was expected that the economies of other metropolitan regions would likely shrink, including Toronto (-1.6%), Vancouver (-0.9%) and Montreal (-0.5%) in 2009[8].

In contrast, almost all the cities in China saw very rapid increases in population and GDP in recent years. The smaller cities had high growth rates while the larger cities had lower growth rates. The average GDP growth rate for the prefecture level of cities in China was 15.17% in 2007. The fastest one is Qingyuan City (Guangdong)

[7] Martin Mittelstaedt, "Going Places? Big Cities aren't best", Globe and Mail, Jan 14,2010, A4
[8] Sources: Conference Board of Canada and Desjardins Economic Studies, www.desjardins.com/economie

which had a rate of 32.9% while Hengshui City (Hebei) had the lowest rate at 3.6% in 2007. Shanghai, Beijing and Guangzhou had a growth rate of 14.3%, 13.3% and 14.9% respectively (Figure 6.8).

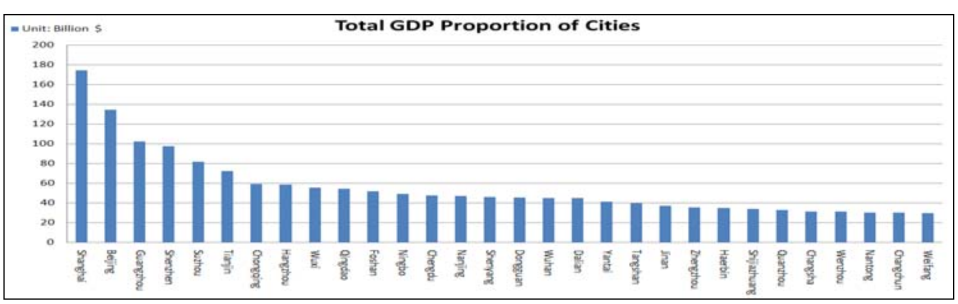
Figure 6.8 GDP Growth Rates of Some Cities of China, 2007



Source: China City Statists 2008. Note: In the figure, only the top 30 cities are listed.

GDP, per capita GDP, per capita disposable income of urban households or average wages of staff and workers in urban area are key indicators for measuring urban income distribution in China. Shanghai ($174 billion), Beijing ($134 billion) and Guangzhou ($102 billion) are the top three cities by total GDP in 2007 (Figure 6.9). These three cities accounted for 10.4% of national GDP. They had been the key players in the development of the Chinese economy with Guangzhou being the manufacturing hub for China as well as the logistics hub for Hong Kong, Shanghai being China's commercial and service hub and Beijing gaining in status as the political hub.

Figure 6.9 The GDP Comparison of Cities in China



Source: China City Statists 2008. Note: In the figure, only the top 30 cities are listed.

In terms of per capita GDP by cities in China, Karamay (Xinjiang) had the highest value of $14,134 (98938Yuan) due to the oil industry while Dingxi (Gansu) the lowest per Capita value $485 (3398 Yuan), the disparity reached 29.1 times among prefecture level cities in China in 2007. Guangzhou ranked 7th with per capita GDP $10,258 while Shanghai and Beijing ranked 9th and 16th with per capita GDP of $9,481 and $8,314 respectively (Figure 6.10).

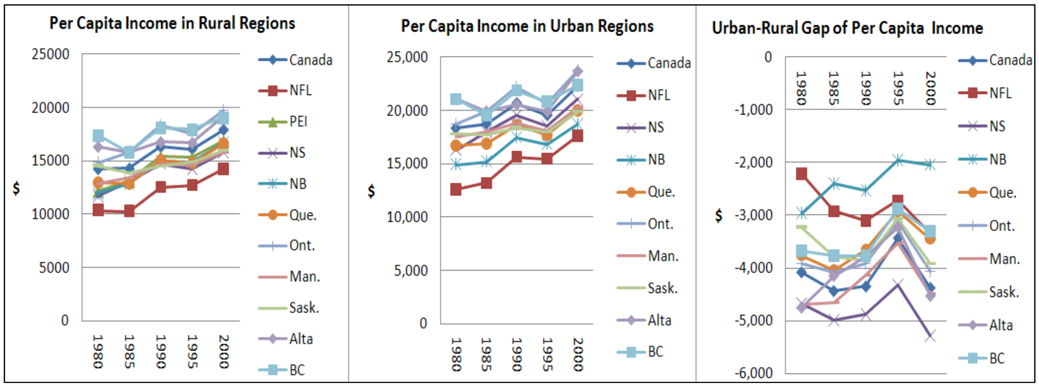
Figure 6.10 Per Capita GDP of Some Cities in China

Source: China City Statists 2008. Note: In the figure, only the top 30 cities are listed.

The average wage of staff and workers in urban area is $3,558 (24,909 Yuan) in 2007. If all 651 cities of the prefecture level and county level are compared by the average annual wage of staff and workers, there are 109 cities that are above the average wage level while the others are below it. Most urbanized areas have the highest average annual wage of staff and workers. Shanghai had the highest wage of $7044 while Wuchang City had the lowest wage of $186.5. The disparity is 37.7 times. Lhasa City is the only exception being ranked second with the highest wage level of $6707 due to its small population and large government contribution to the average annual wage of official staff and workers.

Another way of looking at urban-rural relationships is by stressing regional disparities – between urban areas and rural areas. Here the evidence shows quite clearly that the urban-rural gap in China is generally far more marked than for Canada. Urban regions have a higher income per capita than rural regions nationally and provincially in Canada. During the period from 1980 to 2000, the rural-urban gap at the Canada level has ranged from -$4073 (in 1980) to -$4370 (in 2000) as shown in Figure 6.11. It seems that the urban-rural disparity has been quite steady during this period in Canada. There were different rural-urban per capita income gaps across the provinces, ranging from -$2214 in Newfoundland to -$4690 in Manitoba (in 1980) and from -$2040 in New Brunswick to -$5273 in Nova Scotia in 2000.

Figure 6.11 Urban-Rural Per Capita Income Disparity of Canada, 1980-2000 (1995$)



Source: Calculated based on the data of Vik Singh (2002), Rural and Small Town Canada Analysis Bulletin Catalogue no. 21-006-XIE, Statistics Canada and Chalifoux et al (2004), Industry Canada. Note: PEI is not included in per capita income in urban regions due to it being designated as a predominantly rural region.

Nova Scotia and Alberta had the largest rural-urban gaps in per capita incomes of -$4654 and -$4690 respectively in 1980 and -$5273 and $4517 respectively in 2000 again. The rural-urban income disparity is the smallest within New Brunswick and Newfoundland in 1980 and within Newfoundland and British Colombia in 2000.

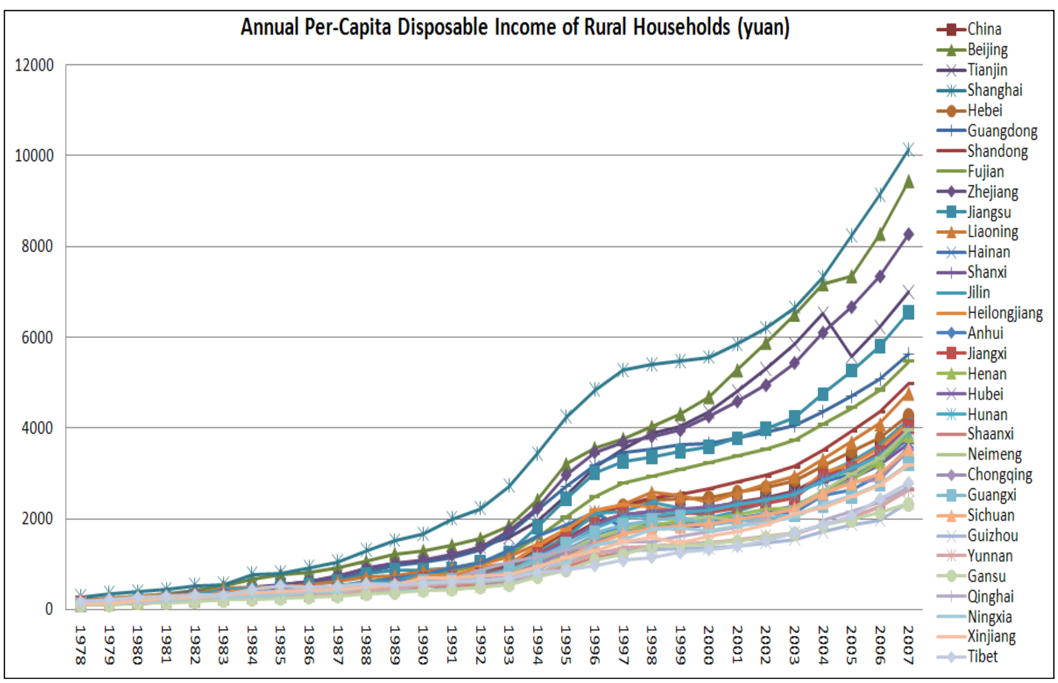
In 1980, British Colombia had the highest rural per capita income of $17,382 while Newfoundland had the lowest rural per capita income of $10,376. Meanwhile Alberta had the highest urban per capita income of $21,060 while Newfoundland had the lowest urban per capita income of $12,590. The highest urban-rural gap was $10,684 (proportion 0.51) between Alberta and Newfoundland in 1980. In 2000, Ontario and Alberta had the highest rural per capita income of $19,710 and $19,144 respectively and the highest urban per capita income of $23,771 and $23,661 respectively in 2000. The highest urban-rural gap was $9502 (proportion 0.6) between Ontario and Newfoundland. It can be seen that the urban-rural gap has increased slightly in Canada since 1980. If it is compared for the whole period, it has not changed much however (Figure 6.11).

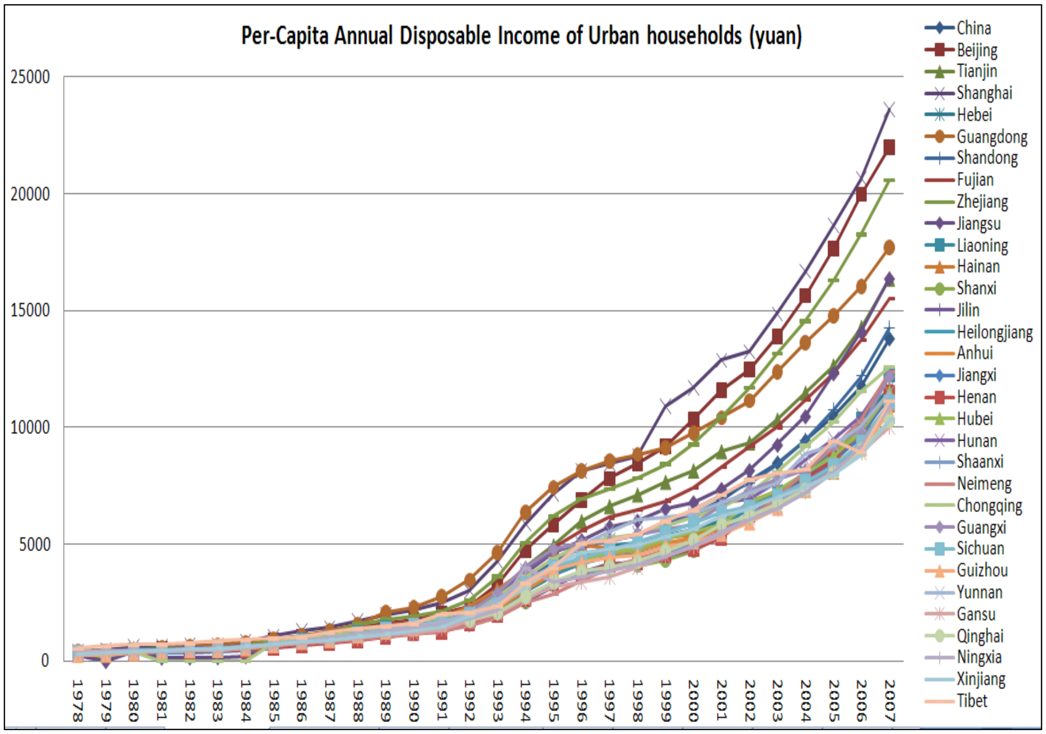
The urban-rural gap in China has been significant since 1978. There were smaller disparities of per capita disposable income of urban and rural households in 1978 in China. Shanghai (281Yuan), Beijing (225 Yuan), Guangdong (193 Yuan) and Liaoning (185 Yuan) had the highest per capita disposable income of rural households while Gansu (101 Yuan), Ningxia (115 Yuan), Henan (105 Yuan) and Shanxi (101

Yuan) had the lowest values. The largest disparity was 2.8 between Shanghai and Gansu in 1978. If the provinces are compared by per capita disposable income of urban households, Guangdong (412 Yuan), Shanghai (406 Yuan), Shandong (391 Yuan), Beijing (365 Yuan) and Tianjin (388 Yuan) had the highest values while Guizhou (261 Yuan), Shanxi (301 Yuan) and Inner Mongolia (301 Yuan) had the lowest values of urban income in 1978. The largest disparity of per capita disposable income of urban households was 1.58 between Guangdong and Guizhou. The largest urban-rural gap of disposable income was 4.08 between Gunagdong and Gansu, while the ratio of national per capita disposable urban-rural income was 2.56 in 1978. This has increased continuously in China since 1980.

Despite the three decades of fast growth of its economy after 1980, China still suffers from a considerable disparity between rural and urban areas. Shanghai (23,622 Yuan), Beijing (21,988 Yuan), Zhejiang (20,573 Yuan), Guangdong (17,699 Yuan) and Jiangsu (16378 Yuan) had the highest values of per capita disposable income of urban households while Gansu (10,022 Yuan), Qinghai (10,276 Yuan), Xinjiang (10,313

Figure 6.12 Annual Per-Capita Disposable Income of Urban& Rural Households (Yuan)





Source: Calculated based on China Statistical Yearbooks 2008 and 55 years statistical Yearbook

Yuan) and Ningxia (10,859 Yuan) had the lowest values of per capita disposable income of urban households in 2007. In terms of per capita disposable income of rural households, Shanghai (10,144 Yuan), Beijing (9439 Yuan), Zhejiang (8265 Yuan) and Tianjin (7010 Yuan) had the highest values while Guizhou (2374 Yuan), Gansu (2328 Yuan), Qinghai (2683 Yuan) and Yunnan (2634 Yuan) had the lowest values in 2007. The largest urban-rural gap was a factor of 10.14 times between Shanghai (23,622 Yuan) and Gansu (2328 Yuan), while the ratio of national per capita disposable urban-rural income was 3.32 in 2007.

The official data also demonstrate the striking urban-rural income gap in China. The income ratio between urban and rural residents was 3.33:1, which means that city dwellers' average incomes were 3.33 times greater than the average for farmers (rural residents). In 2008, the ratio was 3.31:1. In comparison, the income ratio was 2.56:1 in 1978 when city dwellers' average incomes stood at 343 Yuan while that of farmers was 134 Yuan, based on Ma Jiantang (Director of the National Bureau of Statistics (NBS)) said[9]. The government figures also showed the net per capita income in urban China in 2009 was the equivalent of $2890 Canadian and in rural areas it was just

[9] http://www.chinadaily.com.cn/language_tips/columnist/2009-08/12/content_8560816.htm

$790[10]. This high ratio data shows that the income gap between rural and urban areas is significant and that the income gap between rural and urban residents has kept growing in the past three decades and China has become one of the countries with the largest urban-rural gaps in the world.

6.2 Urban Areas in Quebec and the Case of Montreal

In section 6.1, Canada and China were compared in terms of their urban systems, urban size distribution, urban definitions, the number of cites by hierarchical level and their regional distribution and urban income in a national context, and urban-rural income gap in order to better analyze the selected smaller units of analysis, Montreal in Quebec and Ürümqi in Xinjiang, the metropolitan cases that represent the 'core' regions of their respective provinces. There are 6 CMAs in Quebec - Montréal, Quebec, Gatineau, Sherbrook, Saguenay and Trois-Rivières. Earlier in this chapter, these CMAs were compared with the other CMAs in Canada on the basis of population change, median family income and labour force characteristics. Variations in total income and per capita income, net migration and economic structure among the administrative regions in Quebec demonstrated clearly the province's core-periphery structure.

The dominance of Montreal reflects its strategic location at what were, until the opening of the St Lawrence Seaway in 1959, the head of ocean navigation and the focus of valley corridors linking the city to New York, the Great Lakes, and via the Ottawa Valley, to the Canadian West. It developed as an archetypal gateway city (Burghardt 1971), with major transportation and wholesaling functions that paved the way for an emergent diversified manufacturing sector. Until the 1950s, it was Canada's largest city, financial hub and foremost industrial centre (Wallace 2002). Of the 29 metropolitan regions in North America with populations of more than 2 million, the Montréal metropolitan region ranked 28th in per capita GDP in 2007 (Cubin 2009: The Gazette 2009/05/21).

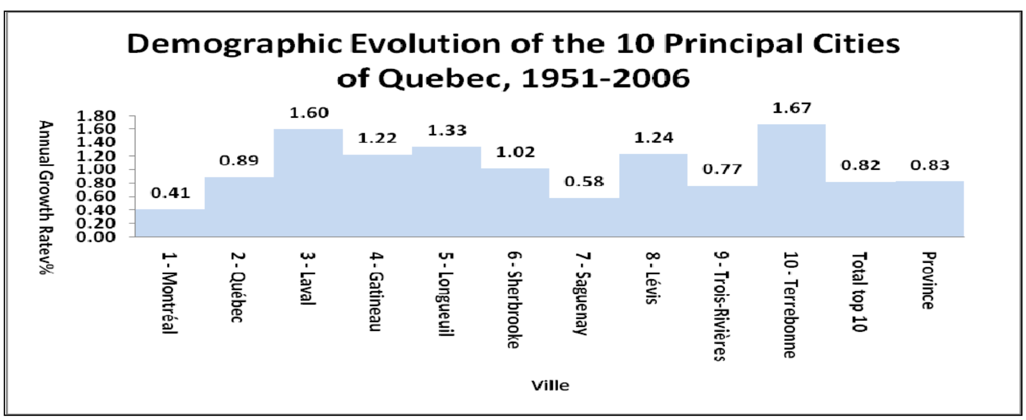
Montreal is the second largest metropolitan centre in Canada based on size, population density and ethnic composition. Economic activities and population in Quebec are heavily concentrated in the Montreal metropolitan area (3.695 million

[10] Aileen Mccabe, "China's economy on pace to become world no.2", Page B2, Gazette Montreal, January 22, 2010.

population). It is part of the Montreal-Toronto axis which connects to both the Canadian hinterland, particularly Vancouver and Winnipeg, and with the United States heartland, particularly New York and Chicago. If comparisons are made on the basis of the 17 administrative regions, Montreal is home to 1.8 million people, or a quarter (24.3%) of the population of Québec. It accounted for 23.85% of total employment in Quebec, 35% of total GDP (2008), 20.57% of capital expenditure (2009), 37.4% of exported merchandise (2006), and 43.13% of the number of manufacturing establishments of Quebec (2007). Among the top 10 principal cities in Quebec, Laval and Terrebonne had the highest annual growth rate of l.6%, Gatineau (1.2%), Longueuil (1.3%) and Sherbrooke (1.01%) for the period 1951-2006. The average annual growth rate of Quebec was 0.82% for this period. The population of Laval reached 400,000 in 2009 (Figure 6.13).

If comparisons are made between the CMAs, the 6 CMAs constituted 68.03% of Quebec's population in 2008. Among them, the population of Gatineau has increased 15.5% since 1996, while Saguenay's population diminished 5.12%. Montreal and Sherbrooke had 10% population growth rates while Quebec (City) and Trois-Rivières only had 7.44% and 1.48% rates from 1996-2008. The Montreal metropolitan area alone makes up 48.08% of Quebec's total population. In employment, Montreal accounts for 49.95% of employment in Quebec, compared to 10% for Quebec City and 4.4% for Gatineau in 2008[11].

Figure 6.13 Demographic Evolution of the 10 Principal Cities of Quebec, 1951-2006

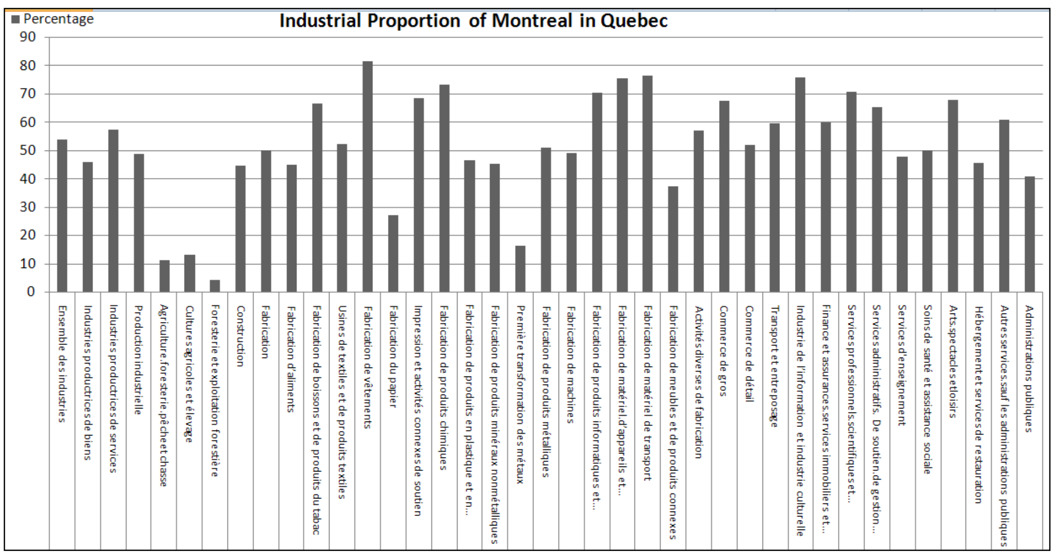


Source : Institut de la statistique du Québec , Statistique Canada, Recensements du Canada.2008

[11] http://www.stat.gouv.qc.ca/donstat/societe/march_travl_remnr/parnt_etudn_march_travl/pop_active/index.htm

Montreal is responsible for 78.58% of international net migration and 66.58% interprovincial net migration in Quebec for the period 1996-2008. Montreal accounted for 53.89% while the Quebec CMA accounted for 10.58% of total GDP Quebec in 2008. Besides being an important scientific, intellectual and cultural centre, Montreal boasts major manufacturing and service sectors, which employ over 1,900,100 people. The region has made a successful shift to a knowledge-based economy focusing on telecommunications, aerospace, biotechnology, pharmaceuticals and information technology. A cosmopolitan city known for its cultural activities, Montreal is a prime destination for tourists. A growing number of international organizations are based in Montréal. All the industrial activities are decomposed into 92 industrial sectors to compare the economic activities in the 6 CMAs in Québec from 1997 to 2007.

Figure 6.14 Industrial Proportion of Montreal in Quebec, 2007



Source: Institut de la statistique du Québec; Ministère des Affaires municipales, des Régions et de l'Occupation du territoire; Ministère du Revenu du Québec; Pêches et Océans Canada and Statistique Canada.

The data show the strong core performance of Montreal in almost any type of industry in Quebec except some agriculture-related industries. All industries in Montreal produce 54% of Quebec's GDP. Goods producing industries and service producing industries are responsible for 45.85% and 57.35% of Quebec's GDP respectively. The strong economic activities of Montreal are clothing manufacturing (81.4%), drink and tobacco manufacturing (66.6%), textile manufacturing (52.1%), printing and associated support activities (68.3%), chemical products (73.2%), information and electronic products manufacturing (70.2%), transport materials manufacturing (76.2%), electrical goods and components manufacturing (75.2%), other various products manufacturing (56.9%), manufacturing of metal products (50.2%), wholesale (67.5%) and resale (52%), transportation and warehousing (59.6%), information and cultural industries (75.8%), finances, assurances et services (59.9%), and professional, scientific and technical services (70.6%), education (47.7%), health and social assistance (49.8%), arts and entertainment (81.4%), administration services (65.3%) and other services (60.8%) sectors (Figure 6.14). They account for almost half or more of the province of Quebec. These indicators strongly confirm the obvious core position of Montreal in Quebec's economy.

The second contributor to the Quebec economy among the 6 CMAs is the Quebec CMA. As an administrative centre of Quebec with some resource processing industries, the Quebec CMA ranked second on most of the indicators and accou8nted for 10.52% of Quebec's GDP. It accounted for 11.92% of service producing industries, 7.27% of goods producing industries, 22.2% of public administration, 15.34% of restaurant and hotel services, 10.72% of construction, 11.46% of retail sales, 11.17% of professional, scientific and technical services, and 10% of administrative services in Quebec in 2007. The other 4 CMAs are not very significant except for Sherbrooke with its 8.52% share in manufacturing of plastic rubber products. The peripheral regions of Quebec have a high share of agricultural related industries. They account for 80.38% of agriculture, forestry, fishing and hunting, 79.09% of crop and animal production and 87.54% of forestry and logging. They also account for a high percentage of some resource-based manufacturing industries in Quebec such as food, textile, paper and furniture manufacturing industries (Table 6.1).

The Quebec CMA has increased its good producing industries share from 5.57% in 1997 to 7.27% in 2007 and its share of manufacturing of plastic rubber products from 3.38% in 1996 to 7.08% in 2007.

Real GDP in the Quebec City region grew by 1.9% in 2008, compared to increases of 0.5% in Canada and 1.0% in the province of Quebec, thereby outpacing the country's largest metropolitan areas, including Edmonton (+1.5%), Calgary (+1.3%) and Montreal (+1.0%). A number of sectors helped reinforce the regional economy's foundations in 2008, particularly the construction industry, which carried out several office tower projects. Quebec City's 400th anniversary celebrations gave the tourist industry a significant boost, while a number of sectors of excellence recorded continued growth, including finance, insurance, life sciences, composite materials and

Table 6.1 Industrial Composition of CMAs in Quebec, 2007

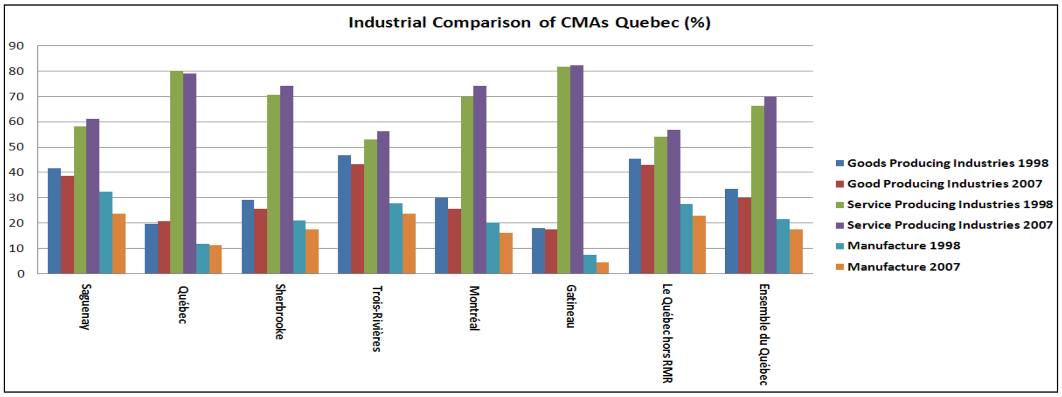
Source: Calculated based on Institut de la statistique du Québec; Ministère des Affaires Municipales, des Régions

Industry 2007	Saguenay	Québec	Sherbrooke	Trois-Rivières	Montréal	Gatineau	Québec outside the CMAs
All Industries	1.92	10.52	2.15	1.98	53.89	3.11	26.44
Goods Producing Industries	2.47	7.27	1.83	2.86	45.86	1.82	37.89
Services Produce Industries	1.68	11.92	2.28	1.60	57.35	3.67	21.50
Industrial production		6.61			48.65		36.14
Agriculture, Forestry, Fishing and Hunting	1.50	3.81	0.99	1.13	11.18	1.01	80.38
Crop and animal production	0.97	3.94	1.26	1.35	13.07	0.32	79.09
Forestry and logging	2.76	2.13	0.22	0.58	4.09	2.71	87.54
Construction		10.72			44.58		33.09
Manufacturing	2.62	6.86	2.15	2.70	50.00	0.84	34.84
Food manufacturing		8.56		0.99	44.86		43.73
Beverage and tobacco product manufacturing					66.60		14.97
Textile and textile product mills		1.67	4.87		52.13		40.18
Clothing manufacturing					81.41		14.73
Paper manufacturing		2.55			27.17		53.10
Printing and related support activities		7.83	3.44		68.27	0.94	17.61
Chemical manufacturing		5.60		1.30	73.22		16.93
Plastics and rubber products manufacturing		7.09	8.52		46.48		37.20
Non-metallic mineral product manufacturing		9.83		2.90	45.21		38.48
Primary metal manufacturing					16.15		55.67
Fabricated metal product manufacturing		8.06	2.08	3.28	50.91		33.04
Machinery manufacturing			2.99	2.22	48.89		34.10
Computer and electronic product manufacturing		7.93			70.25		16.98
Electrical equipment, appliance and component manufacturing		6.63			75.23		15.47
Transportation equipment manufacturing					76.20		19.58
Furniture and related product manufacturing		7.11		1.85	37.19		50.29
Miscellaneous manufacturing		11.63			56.98		22.40
Wholesale Trade	1.28	8.01	1.55	1.05	67.53	1.04	19.54
Retail Trade	1.97	11.46	2.50	2.05	51.99	2.67	27.36
Transportation and Warehousing	1.42	9.00	1.32	2.00	59.62	1.97	24.66
Information and Cultural Industries	1.02	7.81	1.74	1.56	75.78	1.59	10.51
Finance and Insurance, Real Estate and Leasing and Management of Companies and Enterprises	1.25	11.52	1.96	1.33	59.87	2.96	21.12
Professional, Scientific, and Technical Services	1.49	11.17	1.52	1.02	70.64	2.34	11.81
Administrative and Support, Waste Management and Remediation Services		10.10		1.35	65.32	3.08	16.73
Educational Services		12.31	4.57	2.44	47.68		26.89
Health Care and Social Assistance	2.36	11.91	3.70	2.20	49.88	3.18	26.76
Arts, Entertainment and Recreation	1.04	8.10	1.34	0.89	67.67	3.06	17.90
Accommodation and Food Services	1.52	15.34	1.94	1.61	45.55	2.49	31.55
Other Services (except Public Administration)	1.42	9.35		1.54	60.80		22.51
Public Administration		22.22		1.38	40.58		17.84

et de l'Occupation du Territoire; Ministère du Revenu du Québec; Pêches et Océans Canada and Statistique Canada. Blank spaces indicate missing data for some CMAs.

electronic component manufacturing, as well as information technologies and communications[12].

Figure 6.15 Industrial Comparison of CMAs Quebec (%)



Source: Produit intérieur brut régional par industrie au Québec, 2008, www.stat.gouv.qc.ca.

There has not been much change in the other CMAs except for slight changes such as Saguenay seeing an increase in its oil, gas extraction industry share from 1.69% in 1997 to 2.47% in 2007. If the industrial composition of each CMA is compared, the goods producing sectors in all CMAs have decreased and the service producing industries have increased from 1998 to 2007 except for the Quebec City CMA (Figure 6.15). Manufacturing industries have diminished in importance in all CMAs since 1998. This is the main cause of the decline of the Quebec provincial share at the national level, even though Trois-Rivières, Sherbrooke and Saguenay have a high manufacturing industries share in their economies.

In terms of per capita income distribution in the 6 CMAs of Quebec from 1998-2008, there has been a steady increase of per capita GDP and per capita personal income in all CMAs since 1998. In 1998, Montreal ranked first with a per capita GDP of $28,371 and personal income $25,201 in 1998. However, the Quebec CMA took the lead with per capita personal income of $36,002 while Montreal ranked first with a per capita GDP of $40,766 in 2008. The rest of Quebec except for the 6 CMAs had the lowest per capita GDP of $30,018 and personal income of $29,749 in 2008 (Figure 6.16).

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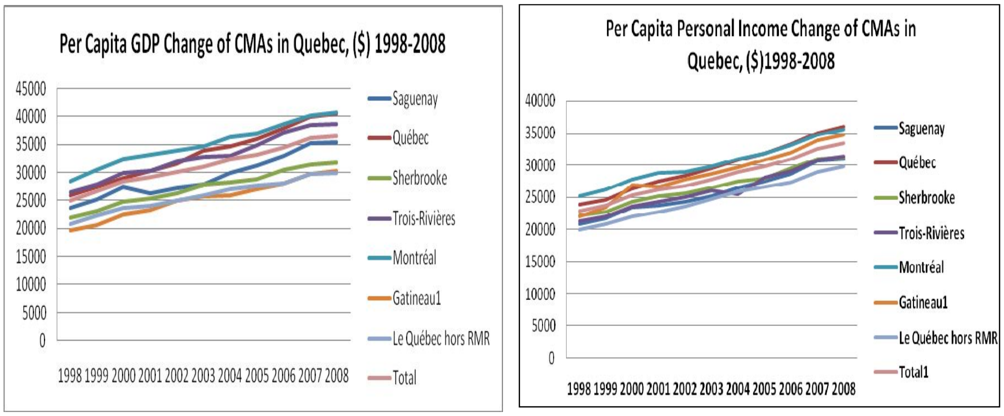
[12] Desjardins Economic Studies Regional Studies, June 2009 Volume 1 / Number 1 www.desjardins.com/economie.

Figure 6.16 Per Capita GDP and Personal Income Change of CMAS in Quebec

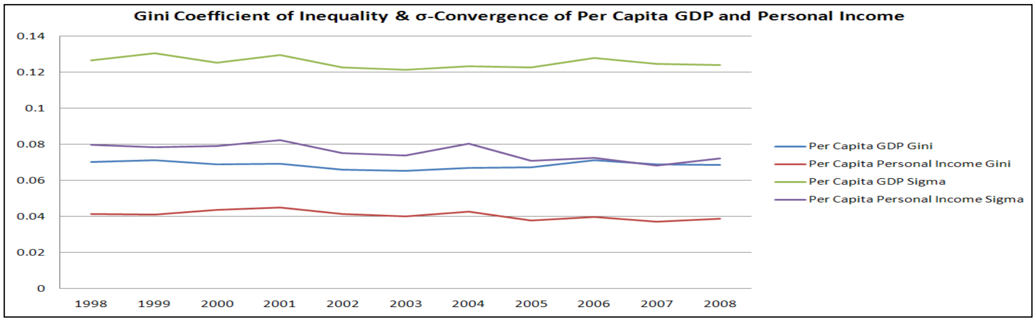


Note: Gatineau 1 indicates Gatineau in Quebec Province[13].
Sources: Institut de la statistique du Québec; Ministère des Affaires municipales, des Régions et de l'Occupation du territoire; Ministère du Revenu du Québec; Pêches et Océans Canada; Statistique Canada. 2008, www.stat.gouv.qc.ca.

The highest disparity of per capita GDP and personal income was $8591 and $3922 respectively in 1998. It changed to $10,476 and $5021 in 2008. From the Gini coefficient of inequality of per capita GDP and of personal income (Figure 6.17), it can be seen that the disparity of per capita GDP and personal income between the 6 CMAs and the rest of Quebec has been steady from 1998 to 2008. The disparity of per capita GDP is larger than that of per capita personal income for this period. The analysis of σ-convergence shows that there is a very weak convergence of per capita GDP and personal income for this period. The σ-convergence rate of per capita personal income is faster than that of per capita GDP. The Lorenz curves analysis of 1998 and 2008 for both indicators confirm the disparity of per capita GDP and personal income. The Lorenz curve line (green) between the line of perfect equality (red) and the line of perfect inequality has approached the line of perfect equality more significantly in per capita personal income than for per capita GDP (Figure 6.18 and Figure 6.19). The absolute beta coefficients of per capita GDP and personal income are negative (-0.030713, -0.15095) for this 11 year period. The annual beta convergence rate of per capita personal income (-0.01278) is faster than that of per capita GDP (-0.0027) for this period. This result is consistent with the results of the Gini coefficient of inequality and σ-convergence of per capita GDP and personal income.

[13] Compilation : Institut de la statistique du Québec, Direction des statistiques économiques et du développement durable. Chapitre 1 Vue d'ensemble des régions du Québec

Figure 6.17 Gini Coefficient of Inequality and σ-Convergence of Per Capita GDP and Personal Income



Note: Calculation includes 6CMAs and the rest of Quebec from 1998 to 2008.

Figure 6.18 Per Capita GDP Analysis for 1998 and 2008

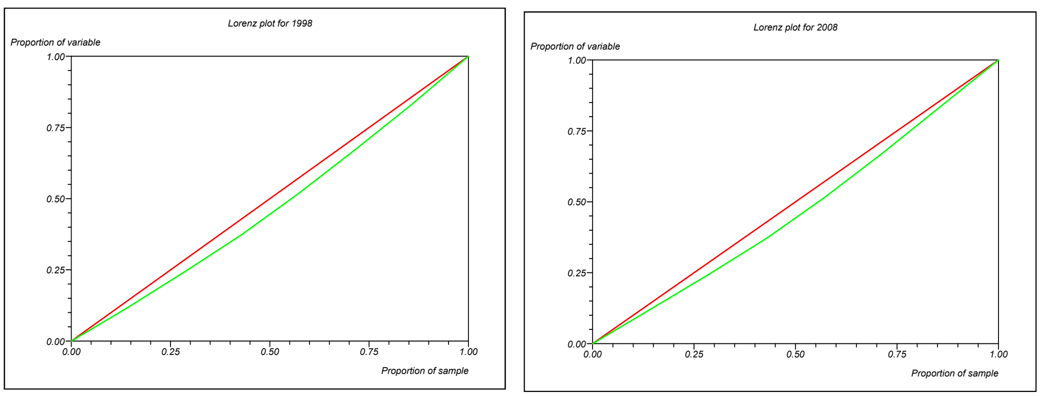
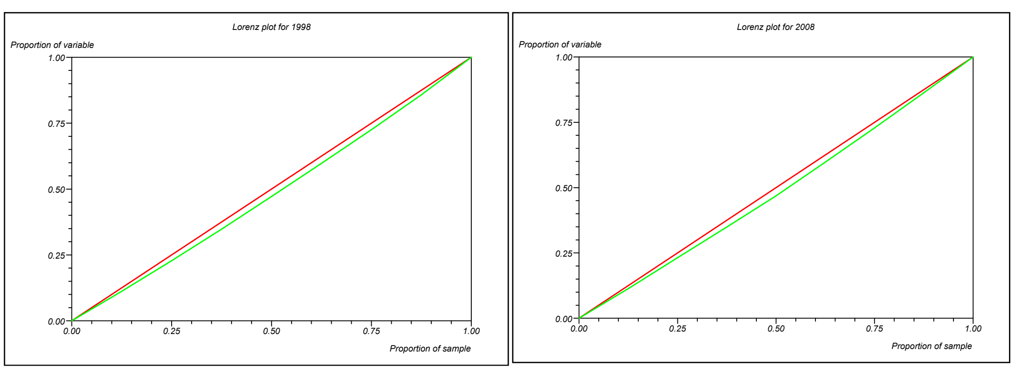


Figure 6.19 Per Capita Personal Income Analysis for 1998 and 2008

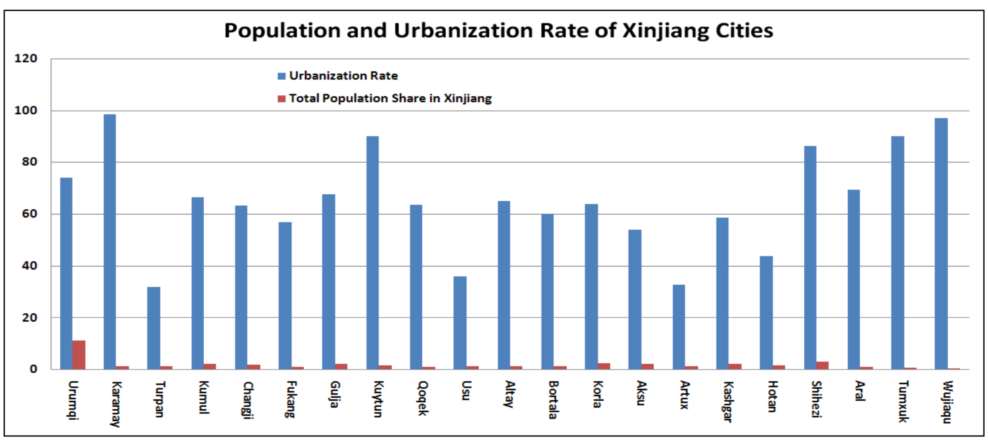


6.3 Urban Areas in Xinjiang and the Case of Ürümqi

Xinjiang ranked 5th among the 12 western provinces and 24th in China with a 39.64%

urbanization rate[14] in 2008. It had a rural population of 60.36%. The urbanization of rural population and net interprovincial migration are the main causes of the increasing urban population in recent years in Xinjiang. But the problem is that there are only 21[15] cities (includes 4 cities under direct control of the autonomous region and 17 cities under the prefectures) in such a large territory compared to the inner provinces of China. They are the largest city Ürümqi, 6 medium size cities (each with a population over 400,000) and 15 smaller sized cities. Sixty-one percent (61.9%) of the cities and 66.8% of the urban population are distributed in the northern part of Xinjiang (i.e. north of the Tangri Mountain range), and in this broad region, they have formed a more developed urban hierarchy including large, medium and small size cities. But in southern and Eastern Xinjiang, there are only 8 central cities, accounting for only 28.5% and 9.5% of the total number of cities in these two regions respectively, and 24.7% and 8.42% of total urban population in Xinjiang respectively. It can be seen from this that urban density, urban size and urban structure do not form an easily recognizable urban hierarchy. Thus, south and east Xinjiang do not have a well-developed urban hierarchy and these cities cannot play the central role of economic centres due to the large distances between the urban centres.

Figure 6.20 Population and Urbanization Rate of Xinjiang Cities, 2008



Source: Xinjiang Statistical Yearbook 2009.

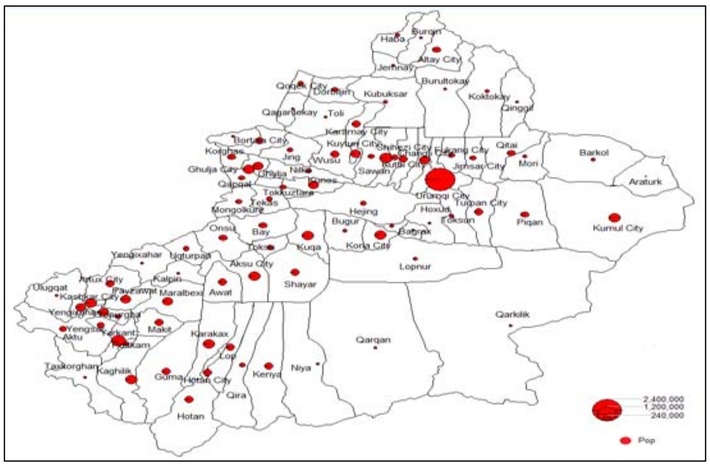
It can therefore be concluded that, in Xinjiang, there are more cities and higher city

[14] Note: This population of "Urban" municipalities includes some agricultural population. In relation to Urban Population and Rural Population in China, Urban Population refers to all people residing in cities and towns, while Rural Population refers to population other than the Urban Population.

[15] The newly added three cities (Aral, Tumxuk and Wujiaqu) under direct control of the autonomous region in 2005 are not included in some of the data analysis due to missing data for previous years.

density in the north than in the south. The total population of 21 cities (8.48 million) accounts for 39.6% of Xinjiang's population and took up 11.23% of the land area of Xinjiang. Urbanization rates are high in Karamay, Shihezi, Ürümqi and some newly built cities such as Kuytun, Wujiaqu and Tumxuk in Xinjiang. Some 11.1% of population of Xinjiang is concentrated in Ürümqi City while the other 20 cities account for 28.72% of the total population (Figure 6.20).

Map 6.2 Urban Distribution of Xinjiang



Source: Xinjiang Statistical Yearbook, 2009 and MapInfo8.

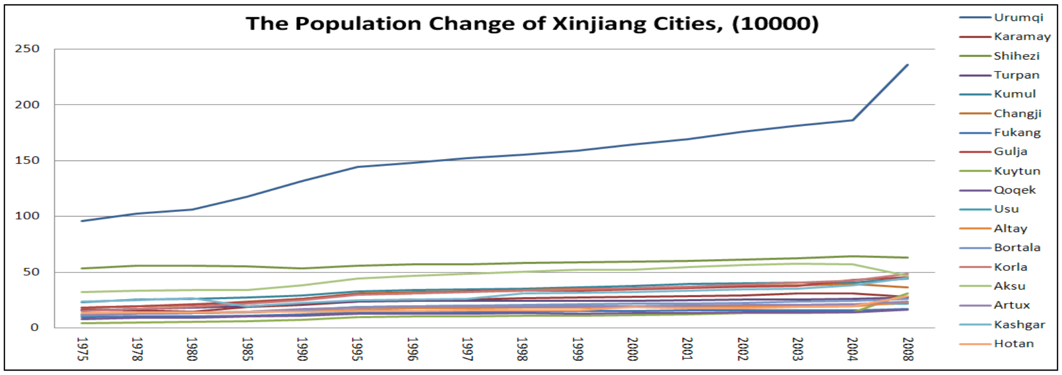
In Xinjiang, the urban population has increased steadily in all cities except Ürümqi (Figure 6.21). The population of Ürümqi increased from 955,000 in 1975 to 2.36 million in 2008. The proportion of the total population living in Ürümqi went from 2.49% in 1949 to 11.1% in 2008. As mentioned earlier, the main centres of economic activities are situated in the Han dominated north of Xinjiang. Most of the non-agricultural population is concentrated in Karamay (98%), Ürümqi (73.6%), Kuytun (89.9%) and Shihezi (86.3%) which have high proportions of non-agricultural population while Hotan, Aksu, Kashgar and Wusu have large proportions of agricultural population (map 6.2).

The predominant minority[16] population, mainly Uyghur and the other ethnic groups, dominated the five cities of Turpan (78.87%), Gulja (65.3%), Artux (90.3%), Kashgar (83%) and Hotan (88%) while the Han-ethnic population dominates the other 12 cities, i.e. Kuytun (94.7%), Shihezi (94.4%), Karamay (75.3%), Ürümqi (75%),

[16] Ethnic minorities in China refer to the non-Han Chinese population in mainland China.

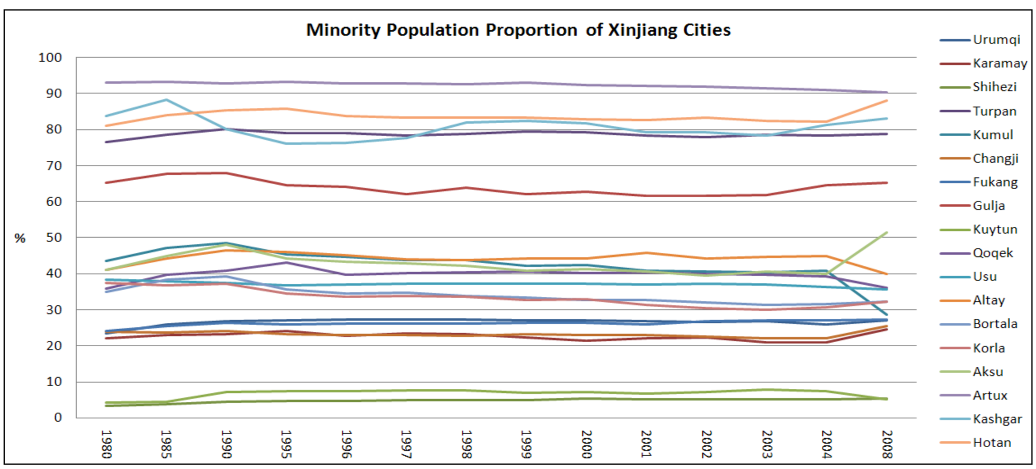
Changji (74.4%) and Fukang (72.2%). The change in Kumul city is very obvious in recent years that the proportion of the ethnic minority population dropped from 43.7% in 1980 to 28.65% in 2008 (Figure 6.22).

Figure 6.21 Population Change of Xinjiang Cities (10,000's)



Source: 55 years statistics of Xinjiang, Xinjiang Statistical Yearbook 2009.

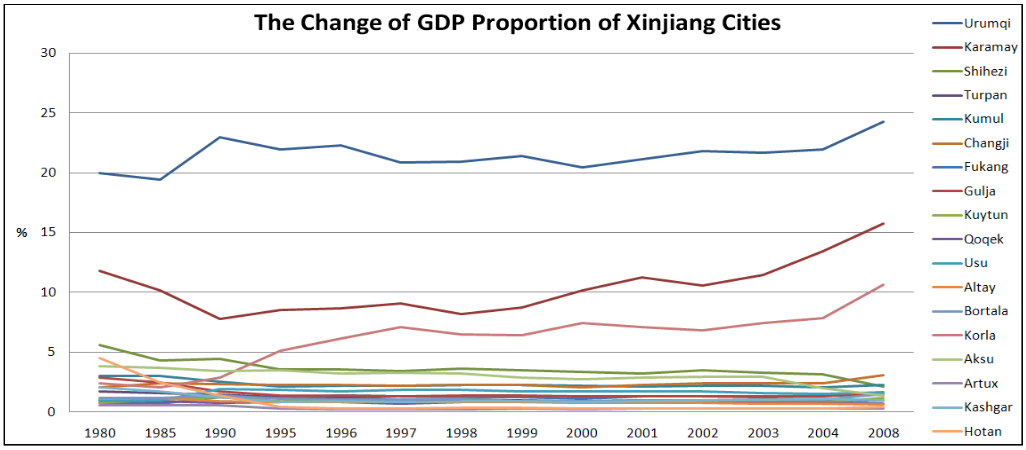
Figure 6.22 Minority Population Proportion of Xinjiang Cities



Source: 55 years statistics of Xinjiang, Xinjiang Statistical Yearbook 2009.

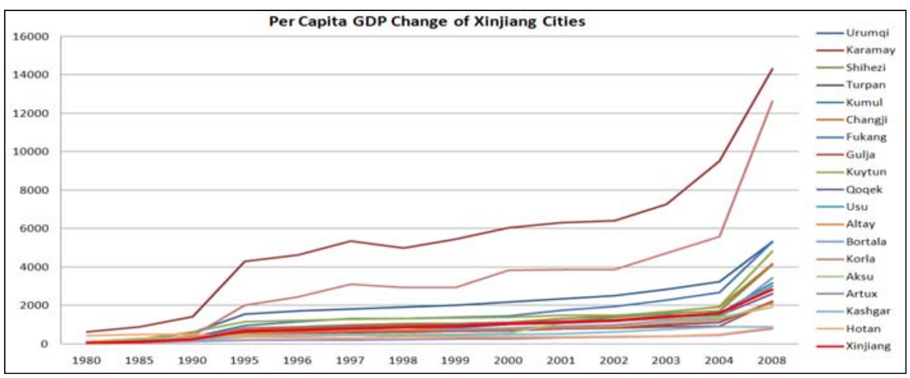
Like other parts of China, widening urban income disparity was the main source of inequalities in Xinjiang during the reform period. The centralized development plan has contributed much to intra-regional disparities in Xinjiang. The total GDP of 11 cities in the economic belt on the northern slope of the Tangri Mountains accounts for 52% of Xinjiang's total GDP in 2008. The change in the GDP proportion of Ürümqi, Karamay and Korla Cities has increased since 1990 and diverged from the other cities very clearly (Figure 6.23).

Figure 6.23 GDP Proportion of Xinjiang Cities, 2007



Source: 55 years statistics of Xinjiang, Xinjiang Statistical Yearbook 2009.

Figure 6.24 Per Capita GDP of Xinjiang Cities, 2008 ($)

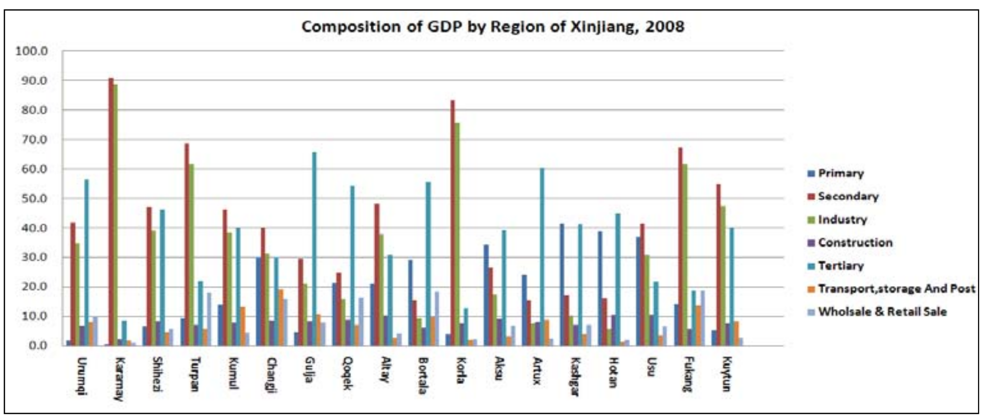


Note: Exchange rate of 2007. 1$=7 Chinese Yuan(￥). Source: 55 years statistics of Xinjiang, Xinjiang Statistical Yearbook 2009.

The sum of GDP of the three cities of Ürümqi (24.27%), Karamay (15.73%) and Korla (10.6%) alone account for half the GDP of Xinjiang. The five cities of Korla, Aksu, Kashgar, Hotan and Artux only accounted for 13.75% of total GDP of Xinjiang in 2008. Among them, Korla city accounted for 10.6% and became the economic centre of south Xinjiang. Changji, Fukang, Kuytun and Usu have seen their GDP proportion increase while Turpan, Kashgar, Hotan, Aksu and Artux have seen their share of the total GDP of Xinjiang decrease.

In terms of per capita GDP of cities, per capita GDP has increased in all cities but at different growth rates. Karamay, Ürümqi and Korla Cities have diverged from the other cities since 1980 while Changji, Kuytun and Fukang Cities have followed slowly since 1990. The other cities have seen their per capita GDP increase at a very slow rate. Most of the minority dominated cities, i.e. Gulja ($2213),Turpan ($2238), Kashgar ($910), Hotan ($885), Aksu ($1936) and Artux ($816), had the lowest per capita GDP and were below the per capita GDP level of Xinjiang $2841 in 2008 (Figure 6.24). The disparity of the highest per capita GDP and the lowest per capita GDP in 1980 was 4.44 times between Ürümqi ($145) and Atux ($32.7). In 2008, the disparity of the highest per capita GDP and the lowest per capita GDP increased to 17.5 times between Karamay ($14,316) and Artux ($816). Karamay ranked first with $14,316 (100216￥) not only in Xinjiang but also in the whole of China due to the mining and gas extraction industry. If the oil and gas city of Karamay is excluded, the disparity between the second highest per capita GDP of Ürümqi ($5334) and the lowest per capita GDP of Artux ($816) is a ratio of 6.53.

Figure 6.25 Composition of GDP by Xinjiang Cities, 2008



Notes: The three new cities are excluded due to missing data. Xinjiang Statistical Yearbook 2009.

One of the important features of the industrial development of the region in the reform period is that heavy industry has outgrown light industry. In 2000, in Xinjiang heavy extractive industry constituted 61% of the industrial share of the GDP. A similar situation existed in the manufacturing and light industry in the region. The technological renovation in the old industries and the establishment of technologically advanced industries has changed the industrial landscape of Xinjiang to a remarkable extent during the reform period. During the reform period, the production of petrochemical, textile, coal, electricity, iron and steel, chemical fertilizers and cement has increased rapidly. According to 2006 statistical data, gross industrial output of the petroleum and natural gas extraction in the region was 66.4%% of the total gross industrial output in Xinjiang, centred on Ürümqi, Karamay and Korla cities. In terms of the composition of GDP by industry, by cities, Kashgar, Hotan, Aksu and Changji have the highest shares of 41.6%, 38.9%, 34.3% and 30.1% respectively in primary industry while Karamay, Korla, Turpan and Fukang are strong in secondary industry with 91%, 75.8%, 68.7% and 61.7% respectively in 2008 (Figure 6.25).

Ürümqi is also the largest consumer centre in the region, recording $4.6 billion retail sales of consumer goods in 2007, an increase of 18.24% from 2006. Ürümqi ranked 7th in 2007 by disposable income for urban residents among cities in Western China. Ürümqi has been a central developmental target for the China Western Development project that the Central Government has been pursuing.[17]

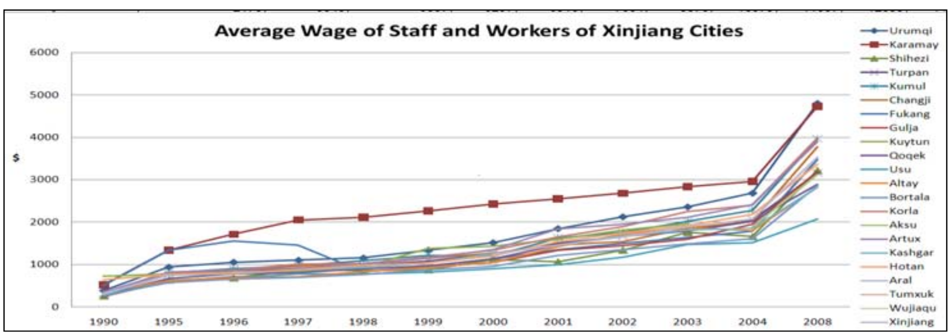
Ürümqi, Ghulja, Qoqek, Botala, Artux and Hotan had the highest share of tertiary industries while the share of the secondary sector in GDP in Aksu, Kashkar and Hotan is the lowest in the region except for Ürümqi. Aksu, Kashkar and Hotan are lagging behind in industry, construction, transportation, storage, post and telecommunications and wholesale, retail and catering trade in Xinjiang. Ürümqi had 41.7% and 56.5% shares of secondary and tertiary industries respectively and a 1.8% share of primary industry. Ürümqi, Karamay and Korla cities have been the focus of total fixed investment in Xinjiang since the 1980s, 40% of total fixed investment being concentrated in these cities in 2008. The disparity of average wage of staff and workers in Xinjiang cities is smaller than that of per capita GDP. The average wage of staff and workers has increased steadily in all cities since 1990. Karimay has had the highest wage since 1995 while Ürümqi has seen a quickening of its growth rate since 2000 and has surpassed Karamay city. The disparity between the highest and the lowest value wage is 2.31 between Ürümqi ($4799) and Usu City ($2077) in 2008 (Figure 6.26).

Urumqi means 'A beautiful pasture land' in ancient Mongolian used by the Junggar tribe; 2000 years ago it was once an important town on the new northern route of the Silk Road, which made an important contribution in promoting Sino-foreign economic and cultural exchanges[18]. From the above data analyses, it can be seen that Ürümqi has become a major economic centre not only in western China

[17] http://news.xinhuanet.com/english/2009-09/05/content_12001223.htm
[18] http://www.chinatoday.com.cn/English/chinatours/urumqi.htm

but also it has become one of the largest cities in central Asia countries. Ürümqi is a core industrial, economic, cultural and political centre in Xinjiang. Ürümqi City accounts for 11.07% of the population, 17.5% of employment, almost a quarter of GDP, 20.39% of secondary industry, 17% of industry and 40.46% of tertiary industry, 30.45% of Gross Industrial output value, 17.51% of total imports and exports (18.3% export and 11.75% import), 15.2% of investment in fixed assets, 65% of regular institutions of higher education and 41% of specialized secondary schools in Xinjiang in 2008. Since the 1990s, Ürümqi has become gradually developed economically and now serves as a regional transport node and commercial centre even though it is the most "inland" city in the world - the furthest from any major body of water and it is far from any other major economic centres (from Beijing 3,270 km. or 2,050 miles or a four-hour flight) in China and in the world.

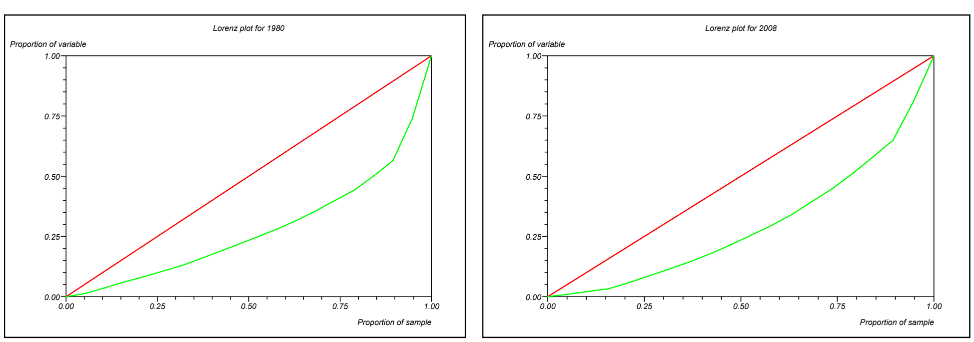
Figure 6.26 Average Wage of Staff and Workers of Xinjiang Cities



Note: Exchange rate of 2007. 1$=7 Yuan. Source: 55 years statistics of Xinjiang, Xinjiang Statistical Yearbook 2009.

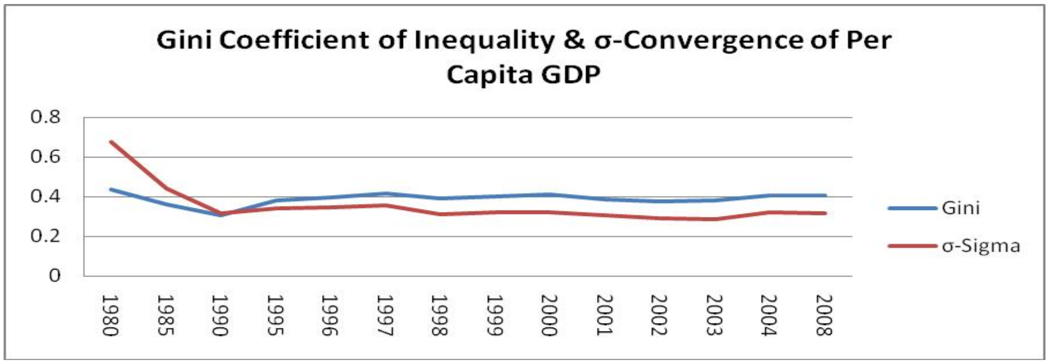
Figure 6.27 Gini Coefficient of Per Capita GDP Inequality

Analysis for 1980 and 2008:



In terms of income distribution, the Lorenz curves show the clear disparity between cities if compared by per capita GDP. The curve point of Lorenz curve line (green) between line of perfect equality (red) and the line of perfect inequality have come closer together somewhat, but it is not very significant if we compare the Lorenz curves for 1980 and 2008 respectively. This means there has been a very weak convergence among Xinjiang cities for this period (Figure 6.27).

Figure 6.28 Gini Coefficient of Inequality and σ-Convergence of Per Capita GDP



If we compare the Gini Coefficient and σ convergence of per capita GDP for the period 1980-2008, the trend line of convergence indicates that they converged for the whole period, but that there is a significant but short-lived convergence from 1980 to 1990, then there is weak divergence from 1990 to 2008. The Gini Coefficient more clearly indicates the last period of divergence than the σ convergence (Figure 6.28).

Based on the absolute beta-convergence model 4.10 presented in Chapter 4, the beta convergence can be calculated as follows:

- by regressing the average growth rate of per Capita GDP between time $t_{beg} = 1980$ and time $t_{end} = 2008$ on initial income at time $t_{beg} = 1980$ where:

$$(\ln Y_{it(end)} - \ln Y_{it(beg)}) = \alpha + \beta \ln Y_{it(beg)} + \mu_i \quad (1)$$

Here, i is the index for each city where i = 1 to 18 in Xinjiang. Time is indexed by t where t(beg) = 1980 and t(end) = 2008. The sample whole period is indexed by T where T = 29 years for the whole period.

lnY = natural log of real per capital income.

α = constant term and μ_i = random error term.

Model (5.1 – from Chapter 5) is estimated by a non-linear version of the basic growth regression, for different periods: (i) the whole period 1980-2008, (ii) the first sub period 1980-1990, (iii) the second sub-period 1990-2000, and (iv) the third sub-period 2001-2008.

From Table 6.2 it can be clearly seen that the beta coefficient $\beta<0$, and significant in Xinjiang during the whole period 1980-2008. It shows there is a convergence rate of 0.017 for the whole period, and strong convergence during the first sub-period 1980-1990 at the rate of 0.029 while there is weak divergence during the second sub-period 1990-2000 and the third sub-period 2001-2008 at the rate of 0.0036 and 0.008 respectively. The result for the whole period is consistent with Gini Coefficient and σ convergence of per capita GDP for the whole period.

Table 6.2 Beta Convergence Rate of Xinjiang Cities

Period	Equation	Beta Coefficient	Annual Rate
1980-2008	LnY 08-80 = -.658611 LnY80 + 7.741064	-0.65861	-0.017447604*
1980-1990	LnY 90-80 = -.382175 LnY80 + 3.753563	-0.38218	-0.029423486*
1990-2000	LnY00-90 = .039803 LnY90 + .797787	0.039803	0.003692437
2001-2008	LnY08-01 = .063356 LnY01 + .387594	0.063356	0.008181501

Note: Significant at 5%.

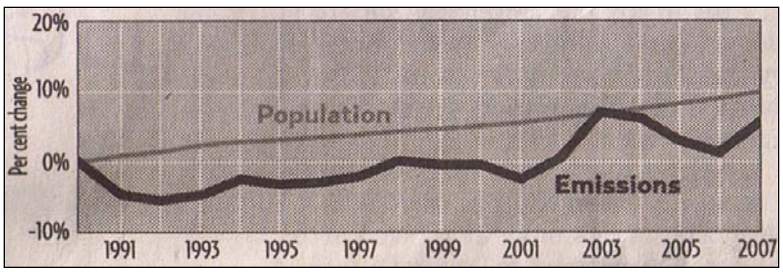
6.4 Conclusion

Overall, the above results show that urbanization (metropolitan areas and cities) has been a major factor contributing to the regional economy in large territories. There are sharp differences between Canada and China in terms of the nature of the urban system, urban size, definition, the number of urban centres at different hierarchical levels and their regional distribution; many of these differences are related to differences in population size and economic activities. However, economic outputs are mostly concentrated in the cities in both countries. The concentration rates of population and GDP are higher in Canada compared to China.

China's rural-urban income inequalities are very high compared with Canada. The most urbanized regions have the highest per capita income in both economies. Thus, one could conclude that the level of urbanization is positively associated with the level of economic development among the regions. Canada's urban regions have been growing relatively fast. However, the rate of urbanization differs greatly between provinces. During the last few decades, urbanization in China has been accelerating. However, due to the institutional constraint inherited from the planned economy and the household registration system (hukou) system, the rate of urbanization in China is lower than not only the developed economies but also those at the same level of development. There are great disparities between the Eastern, Central and Western provinces in China.

Urban-based economic activities are naturally highly concentrated in urban areas and account for a significant regional share of GDP. But the concentration rate differs greatly in both countries. In Canada, most of the CMAs have a leading share of the GDP in their provinces. In China, the strong influence of government on urban development and China's long term centralization policy certainly helped the concentration of urban economic activities into the cities directly controlled by the state and provincial capital cities. The capital cities of the Western provinces have higher GDP concentration rates than those of the Central and Eastern provinces of China.

Figure 6.29 Greenhouse Gas Emissions of Quebec



Source: Quebec's Ministry of Durable Development, The Environment and Parks

Montreal is the second largest metropolitan centre in Canada based on population. Economic activities and population in Quebec are heavily centred in the Montreal metropolitan area. The data show the strong core performance of Montreal in almost any type of industry in Quebec except for some agriculture related industries. In Xinjiang, the centralized development plan has reinforced intra-regional disparities in Xinjiang. Ürümqi is a core industrial, economical, cultural and political centre and the largest consumer centre in Xinjiang. In terms of the environment, there are sharp contrasts between Quebec and Xinjiang based on their resource development and energy consumption patterns. The environment of Xinjiang is more vulnerable compared to Quebec. It is also one of the large coal, oil and gas producers of China. In energy consumption, coal made up 57.8% while crude oil, natural gas and hydro-wind power constituted 23.9%, 14.1% and 4.2% respectively in 2007. The rapid increase of population with scarce water resources, the overexploitation of mineral products and water resources, has already brought about serious ecological and environmental problems such as water shortages, air and water pollution, threatening the ecological balance between society, economy and nature. Quebec's greatest green energy resource is its hydropower, which generates about 97% of the province's electricity. Other sources of electricity include nuclear power, wind and thermal generation. Québec's forest areas are immense when compared with those in Xinjiang. Forests cover constitutes more than half of Québec[19], i.e. 757 900 km² while it is only about 2.94%[20] in Xinjiang. However, greenhouse-gas emissions are up in Quebec despite the province's large effort. After three years of decline, Quebec's greenhouse-gas emissions rose by 3.7% in 2007. Emissions are now 5.6% higher than in 1990[21] (Figure 6.29). Forbes Magazine ranked Montreal as the 10th cleanest city in the world and in the June 19th, 2008 edition of London based Monocle Magazine, Montreal was ranked 16th in a list of the world's 25 most liveable cities[22]. The Toronto Star recently listed China's Urumqi as one of the top ten worst places to live in the world[23], although Urumqi has made massive investments to clean up its dirty air[24]. Based on the statistical data of the National Bureau of Statistic China[25] in 2007, Urumqi had the worst air quality, ranked last (31th) in sulfur dioxide and nitrogen dioxide amount in air quality of cities[26] in China.

[19] http://www.gouv.qc.ca/portail/quebec/pgs/commun/portrait/economie/ressourcesnaturelles/foret/?lang=en
[20] http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm
[21] Henry Aubin (2010), An Environmental Setback, Gazette, Thursday,A15, February 4, 2010.
[22] http://www.pulsejobs.com/canada/working-in-montreal.aspx
[23] http://alisonbate.ca/2009/01/14/winter-in-the-worlds-most-polluted-city/
[24] http://english.peopledaily.com.cn/90001/6613153.html
[25] http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm
[26] Note: On the list of the four city provinces and the other 27 provincial capital cities.

Summary and Conclusion

Here, a synthesis of the research findings of previous chapters and the research conclusions of the thesis are presented. The discussion ends with a discussion of the research limitations of the thesis and some concluding remarks, particularly about future research directions.

SC.1 Summary

In previous chapters, based on the analysis of long term statistical data from Canada and China, the regional economic development trajectories of both countries since 1960 were compared, in an attempt to examine systematically the changing patterns of regional disparities by using a multi-scalar approach and multivariate measurement methods at four scales – national (cross-country and within country), regional, provincial and urban areas (based on some short term data), the last of which also provided some insights on the rural peripheries. Four dimensions (Natural, Economic, Social and Environment) were explored with respect to the different socio-economic indicators available.

In its focus on regional disparity, regional development policy and cross-country comparisons, the study used two empirically-based approaches – "sigma" and "beta" convergence – for measuring convergence between countries and across regions; it also included a form of spatial analysis.

To summarize:

In the introduction, the general framework of the study was presented. In Chapter 1, the theories and concepts used in the principal theoretical literature relevant to the study were reviewed. Chapter 2 outlined the research methodology. Chapter 3 presented an overall perspective of the regional economic development policies and programmes of Canada and China in different periods at different scales. In Chapter 4, the patterns of cross-country convergence between Canada and China at the national scale and within country provincial convergence for each country were examined using different measurement methods such as traditional statistical methods, beta convergence and sigma convergence. The spatial dimension was taken into consideration in the beta convergence analysis in this chapter.

In the most complex chapter, Chapter 5, regional and provincial comparative case studies were presented to further provide an overview of regional economies with particular attention to structural differences in both economies based on recently released updated long-term statistical data for both countries. In Chapter 6, this was complemented by an analysis of selected urban regions which also provided insights on the more peripheral regions. Different economic indicators were used such as population, GDP, employment, investment, labour force, migration, personal income and disposable income, annual disposable income of urban and rural households (China), total investment in fixed assets (China), wage, transfer payments (Canada), industrial composition and its contribution to GDP and a number of analytic approaches were used involving the application of descriptive, absolute, relative indexes and empirical convergence approaches with the spatial models of SEM, SLM and SCM. In the research proposed for this thesis, policy, population, income, employment, industrial composition and its contribution, investment, trade and migration factors were taken into account as important factors of regional analysis given the territorial size of the two countries and the population differences between them.

SC.2 Research Findings

Through cross-national, national, regional, provincial and urban case studies and an appreciation of regional development policies and statistical analyses of convergence and regional disparities, the research objectives of this thesis were to attempt to provide an explanation of the different processes and patterns of regional economic development in large territories (countries) using Canada and China as examples, to undertake an analysis of the different factors and driving forces underlying regional development in both countries, and to explore both the apparent successes and failures in regional development policy through comparing and contrasting the regional development experiences and models of these two countries. From the analyses undertaken, several research findings can be identified. They are as follows:

1. Both economies have some parallels in the implementation of regional economic development policies, but there are important differences.

Geographically large territories invariably face the problem of regional disparity because natural endowment, climate and physical conditions differ significantly across their regions (even though the analyses in this thesis also show that there are significant regional disparities within smaller territorial units, such as within a province). However, regional development policy can either reduce or aggravate the disparities. Regional development policies should be adapted to the specific conditions prevailing in each country or region. In the context of a strong demand for direct government intervention to reduce regional disparities in various spheres because of the substantial lagging regions frequently encountered in a large territory, it is important to identify those factors and determinants of regional disparity that can be directly influenced by government policies.

The complex pattern of federal-provincial relations has become a central element of Canadian government and policymaking, and a fundamental characteristic of Canadian federalism. In China, fiscal policy and economic reform are also always affected by the relationship between central and provincial powers. It is certain that central power dominates everything (fiscal power) while Eastern provinces have much greater bargaining power than the other provinces.

Canada and China have both implemented development policies based on growth centre theory. After the failure of the growth centre strategy in Canada in 1972, Canada implemented more selective and flexible measures in a so-called decentralization policy to address the specific problem of regional disparity. To equalize disparities and enable comparable service delivery nationwide, the federal government had already engaged in pooling and transferring moneys through equalization payments. Since then, Canada's ten provinces and three territories have exhibited relatively high GDPs with relatively small variation among them.

China implemented an egalitarian and centralized policy at first, then pursued a high growth rate by uneven investment, then promoted the welfare of urban and rural people differently and later implemented the Western and Northeastern Development program to reduce regional disparity. But it is likely to be far too early to identify its effectiveness. It seems that China achieved great success in economic development after the implementation of the open door policy by building economic growth centres and zones. So, the coastal provinces that were the object of favorable regional development policies tended to grow faster than the others.

The results showed that Canada has a smaller and steady level of regional disparity while China has had a large and fluctuating level of regional disparity. Five decades of data showed that although there were some slowdowns and stagnation in Canada's economy, it has been steadier and regional disparity has attained a more or less steady state. Canada has experienced relatively good economic performance compared to other OECD countries, even since 2008 when a global economic crisis has been affecting most economies of the world. China has succeeded in obtaining more national economic efficiency with high growth rates while losing ground in terms of regional equality since 1980. Hence, there has been recognition of the need to address regional disparities but little by way of policy specificity, which suggests that the long-standing problem is unlikely to be reversed in the near future unless there is direct government intervention to reduce regional disparities. Though there have been successes over the years, more often than not regional development policies have not reduced disparities in either country. Thus, it is hard to believe the effectiveness of regional development policy in either country. Canadian regional development policy, at least, has avoided further regional divergence, while Chinese regional development policy has slowed the achievement of regional convergence.

2. Regional disparity depends on the economic characteristics of the territory itself, not on size.

The results of this study demonstrated that disparity in regional income is a reality in every geographically large area, the causes of which are numerous and complex. It has been argued that a geographically large territory has more difficulty compared to small ones in achieving more balanced patterns of economic and social development. It is also true that small countries can be regionally more homogenous while large countries can be regionally more heterogeneous. However, there is no reason to expect that territorially large countries will exhibit larger regional disparities. Depending on agglomeration affecting economic activities, openness to external trade, government structure, regional development policy, central-provincial relationships and regional divisions, the outcome of regional development may be uncertain, leading in either direction - both towards regional divergence (the case of China) and convergence (the case of Canada). It is also apparent however that smaller territories, such as provinces, are also characterized by significant regional disparities. So it can be concluded that the different economic characteristics of territories will produce different results.

3. Both economies have developed since Second World War but China has grown faster than Canada on many indicators since 1980.

In Chapter 3, both countries were compared by using many indicators in the cross-country analysis section. It must be admitted that China has achieved impressive successes in a catching-up effort on a range of general economic indicators on the world stage while Canada has experienced solid, steady economic growth with several ups and downs. The thesis attempted to answer the question whether China could converge with Canada on some key economic indicators. In terms of per capita GDP (at current US$), China matched the per capita level for 1970 in Canada. However, China is now faced with a number of economic and social problems, including pronounced regional disparity, an increasing rural-urban income gap, an aging population, unemployment, poverty and rapid environmental degradation with ever-increasing energy demands. Moreover, it will likely still remain a very poor country by international standards. But significant gaps also remain in terms of standards of living between China and Canada, with regional standards of living being much higher in Canada than China. Though the growth in gaps between the regions in each country or between both countries may be improved, convergence of the two countries is not likely to be achieved in the near future.

4. There are significant differences between the two countries' economic structure. The service sector appears to have played a significant role in the economy of Canada.

The differences in population composition, geography, industrial structure, government policies, and productivity all result in different economies in both countries. The data on economic structure reflects a significant disparity in terms of labour productivity between Canada and China. The results showed that high income regions in both economies are characterized by larger shares of the service sector. However, this reaches much higher levels in Canada than in China. The service and agriculture sectors in each country are very different in terms of their sectoral contribution to GDP and the labour force. Canada's service sector is an economic strength for this nation. More than two-thirds of the country's output is related to the services sector, which employs 76% of the working population and accounts for nearly 67.9% of GDP. In China, at present, 43% of the population depends on agriculture for its living. However, surprisingly enough, the GDP share of manufacturing industry in China has remained fairy stable since 1978 while the decrease of the share of primary industry from 30% level has been compensated by an increase in the relative importance of the tertiary sector. Agriculture's contribution to GDP has remained low at only 10.6%. This reflects the dual economic structure with both traditional and modern sectors and the lower labour productivity of agriculture in China. China is still in the early stage of development. It is difficult to explain this through the "stages" theories without mentioning the fast developing skill and knowledge oriented industries in China.

5. Regional economic development in China is more unbalanced than in Canada.

The empirical results (Chapter 4) showed that there are substantial variations in growth across the regions of the two economies and that they are very different in economic status and level. The results showed that in Canada, provincial disparity has gradually decreased since 1960, while in China provincial disparity decreased during the period 1981 to 1990, then increased until 2003, and finally decreased or kept the same level. In the case of the cross-country analysis for the whole period, there was weak convergence between both economies while the weighted σ convergence showed significant divergence between the two countries. In the case of Canada, the estimation results of β-convergence showed weak convergence in Canada during the whole period. In the case of China, per capita provincial income converged for the whole period from 1981 to 2007, but this was not very significant. All the results of the β-convergence analysis are consistent with those of the sigma convergence analysis.

The spatial analysis including Global Moran's I and Local Moran's I were calculated and the spatial error model, the spatial lag model and the spatial cross-regressive model were also taken into consideration in the beta convergence analysis of each country individually. The Global Moran's I statistic showed that there has been a stronger tendency for spatial dependence among the regions in Canada than in China since 1997 and that there has been a gradual increase in spatial interaction among the Chinese regions, but the speed of change has been very slow. The Local Moran's I analysis confirmed the more positive spatial autocorrelation in China. The spatial clustering trend in China's provincial per capita income reflects the significant provincial disparity of China, while it is insignificant due to relatively small provincial disparities in Canada. The estimated results of the spatial SEM, SLM and SCM analyses for Canada are mostly consistent with the beta convergence results of other researchers, e.g. Sala-i-Martin (1996b), Colombo (1996) and Shiller (2009).

The empirical results as reported in Chapter 5 showed that the regional economy of Canada has undergone significant change since 1950. But in terms of population and economic activities, there are important differences from region to region. The Canadian equalization program has played a key role in reducing regional disparity to some degree and has undoubtedly helped avoid greater divergence. Central Canada has been the economic core of Canada, dominates the national economy on the basis of almost any indicator and is regarded as the core region of the Canadian economy based on the Toronto and Montreal economic centres, while the other regions have been described as 'peripheral' regions (certainly a debatable category!). Western Canada has gained both in terms of population and its regional share of GDP since 1981 with the rapid growth in trade with Asia which has enriched British Columbia and the oil wealth which provided a major boost to Alberta and Saskatchewan. The Centre has dominated the goods producing industries and service producing industries except for mining, quarrying and oil well industries for the whole period while the West has increased gradually.

A sluggish economic performance has characterized the Atlantic Provinces for many decades. This region is far from the most dynamic regional markets of North America, the Pacific Rim and the main domestic economic centres. A low urbanization rate and slow growth below the national average are the main characteristics of the Eastern Region's recent economic performance. The Northern economy has been characterized by high costs and a narrowly based market economy. Long distances from manufacturing centres, sparse population spread over a vast territory, limited transportation and climatic restrictions severely limit its economic development. In recent years, diamond, gold and copper production surges have improved the economy of the Northwest Territories.

The regional economy has kept a relatively steady trend in Canada since 1980. Regional per capita personal income and disposable income converged for the period 1961-2008, but there was a significant divergence in 1981 due to the economic challenges of Canada at the time and there has been a slight divergence in both indicators since 1999 due to the increasing disparity between the Northern and Atlantic regions. The change of cross-regional σ convergence and Gini coefficients is consistent with the trends in the Canadian economy. The Gini coefficient analysis and the Lorenz curves for 1961, 1981 and 2007, and Theil index showed there is a weak convergence between Canadian regions for this period.

In the case of China, the Eastern Coastal Region is regarded as a core region of the Chinese economy (39.2% of its population and 59.3% of national GDP on only 13.8% of the national territory) with its advantages of a better geographic location, favorable policy, abundant human capital resources, concentrated industry and the advantages of international economic relations that have helped attract FDI. On the other hand, the Western region is considered as a peripheral region (27.5 % of the population, producing only 17.3% of national GDP on 56.8% of the national territory) with the disadvantages of its landlocked geographic location, the difficulties and costs of engaging in international economic activities although some of its provinces border on other countries, and poor natural conditions which are generally mountainous and lacking adequate water supplies, even though it has rich mineral and energy resources. Between these regions lies the Central region which occupies 29.4% of the national territorial area with a national population share of 31.7%, contributing 23.4% of national GDP. The Coastal region has diverged significantly with the other two regions since 1980. The trend lines of the Regional Weighted and Unweighted σ Convergence, the Theil Index and the Gini Coefficient of China share the same trajectory and show the consistency of the divergence for the whole period for the whole economy. Investment was highly centralized through centralized planning, centralized administration and state-controlled banks. The control of the state over investment has been declining during the reform period, and the influence of local factors and foreign direct investment in capital formation has risen. The Chinese Government has attempted to control the investment rates since the end of the 1990s to reduce regional disparities, but owing to local investment and market force-induced foreign direct investment, the regional disparity in terms of investment has been further enlarged. As a consequence, China quickly promoted the “Western Development” program and “Northeast Industry Base Strategy” program to catch up with the coastal regions. It is hard to believe these programs have played a role in reducing disparities, but it is clear that the absolute disparity between regions is moving towards divergence.

The Lorenz curve analysis showed that there was divergence among Chinese regions for this period. This result is consistent with the results of most other studies that have confirmed these patterns of divergence and convergence in China's regional economy.

In the provincial cases based on the long term data**,** provincial differences have changed significantly for many indicators in Canada after 1960. But unevenness remains across the country. Significant changes have occurred in Ontario, Quebec, Alberta and British Colombia. Ontario has almost succeeded in maintaining its 40% level of national total GDP, while Alberta and British Colombia have increased their national GDP share and Quebec has seen a decrease in its total GDP share. Eighty-sex per cent of Canada's population is concentrated in the four provinces of Ontario, Quebec, Alberta and British Colombia. Provincial industrial composition differs greatly across Canada. The service industries in Ontario, British Colombia and Alberta have increased gradually while they have decreased in Quebec. Mining, quarrying and oil well industries are extremely strong in Alberta due to the boom of the oil industry and gas extraction. Manufacturing industries have remained at about the same level in Quebec (about 26%) while it has diminished in Ontario. The distribution of employed people by industries obviously differs between provinces in Canada. The proportion of manufacturing employment is high in Quebec and Ontario while the proportion of construction employment is high in Alberta and British Colombia. Employment in professional, scientific and technical services is highly concentrated in Ontario, Quebec and Alberta. In terms of per capita GDP, Alberta and Ontario have kept the level above the national average together with the Yukon since 1980, while the other provinces increased slowly. This is also consistent with the patterns of provincial per capita Transfer Payments and Investment Income of Canada. Equalization payments have played an important role in reducing fiscal and income disparities among provinces.

Provincial disparity in China is larger than broad regional disparity. National income and population are distributed unevenly between provinces. Provincial disparity has emerged since 1980s. Living standards are actually improving in Central and Western China, but at a much slower rate than in the east as a result of large regional disparities. It is obvious that the rich get richer and the poor get poorer in relative terms. The change in the provincial share of total GDP and per capita GDP change are highly correlated with the provincial total investment in fixed assets in China. The average wage of staff and workers by province is an important indicator to compare with provincial per capita income because it is mostly controlled by the state. Shanghai, Beijing, Tianjin, Zhejiang, Guangdong and Jiangsu have the highest salary levels while the Central provinces have lower salaries and the Western provinces have the lowest ones. Beijing, Tianjin, Shanghai and Guangdong are the province-level administrative units which have the highest non-agricultural population in China. This is highly consistent with the provincial GDP, per capita income, investment, Engel's Coefficient and salary data. This is also closely related with industrial employment and provincial GDP by industry. In China, most employment is concentrated in the primary industries, mainly in agriculture.

6. There are significant differences and disparities in the economic and spatial structure of Quebec and Xinjiang. Sub-provincial disparity is larger than provincial and broader regional disparities.

Quebec is territorially the largest province in Canada while Xinjiang is also the largest administrative region in China. Each region has its own distinctive spatial structure and economic linkages. In most aspects they are different, but there are similarities in other respects. Their spatial structures are mostly affected by their geographical nature, society and economy; politics is also an inescapable component of the formation of these complex regional patterns. Quebec has a more complex spatial economic structure than Xinjiang. Quebec is one of the economic centres, not only of Canada, but also in North America, while Xinjiang is only a peripheral region in China. They both have ethnically and/or culturally stronger identities than the other provinces. Quebec has more political and economic bargaining power in relation to the central government than Xinjiang. Xinjiang has a greater population and more in-migrants than Quebec. Economic activities in Quebec are more centred in the south, while in Xinjiang they are centred in the north (in itself not a significant factor). The environment of Xinjiang is more vulnerable compared to Quebec.

Each of them has one very large urban area, Montreal in Quebec, Urumqi in Xinjiang that are substantially greater than the next largest urban area. Quebec has a more advantageous geographic location than landlocked Xinjiang. Quebec's main energy resource is water power while water-scarce Xinjiang has huge natural gas and oil resources, and consumes substantial amounts of coal (57.5% of energy consumption) which is partly responsible for its environmental pollution. Quebec has a much higher per capita GDP than Xinjiang and Quebec's average annual GDP growth rate was 2.3% between 1981 and 2006 (Marcel 2007), compared to the 10.3% for Xinjiang between 1977 and 2005.

One similarity in spatial structure between two regions is that economic activity and population are centred in a limited number of specific economic centres. Economic activities and population in Quebec are heavily centred in the Montreal metropolitan area. In contrast, economic activities and population in Xinjiang are centred in Urumqi. Quebec's abundance of natural resources gives it a favourable position in the national global economy. Quebec accounts for almost a fifth of the Canadian economy. Over the last decade, Quebec has had a strong economic performance albeit with gradual shrinkage of its national share. In many indicators, such as per capita GDP, personal income, provincial average weekly earnings and per capita disposable income, Quebec has stayed close to but below the national levels. Variations in per capita income and economic structure among the administrative regions of Quebec demonstrate clearly the province's core-periphery spatial structure. Each administrative region differs from the others with regards to its geography, natural resources, habitable land, economy and industrial activities.

The σ-Convergence analysis of regional per capita GDP in Quebec shows slow convergence from 1998 to 2003, and then followed by slight divergence again from 2003 to 2008. From the analysis of regional σ-Convergence and Gini coefficients for Quebec, it can be concluded that regional per capita GDP disparity is greater than per capita personal disposable income. The absolute beta convergences for per capita GDP and per capita personal disposable income showed a weak annual divergence in per capita GDP and there is not a very significant convergence of per capita personal disposable income.The SEM, SLM and SCM Models showed a weak convergence of regional per capita disposable income.

Xinjiang is rich in mineral resources, especially oil and natural gas that makes it a major player in generating rapid economic growth in the western part of China and in the changing geo-strategic and geo-economic environment in Central Asia. The natural, ethnic, economic and territorial landscapes combine in layers to make up the complex and diverse landscape of Xinjiang. Xinjiang had for long been characterized by an underdeveloped infrastructure, inconvenience of transport and slow economic development. This is at least in part related, to its basic geomorphologic structure. The distribution of natural resources, the great distances between the oases, and the degree of polarization and the province's relative economic independence are all factors that underlie the differences in regional characteristics of the Xinjiang economy. The ethnic minority dominated regions have the higher proportion of agricultural population while the reverse is true for the Han-dominated regions. In fact, the main factor underlying the changing pattern of regional economic development was the differential progress of industrialization between regions. Geographical as well as historical factors, long-term policy, and a phenomenon of localized economic development and prosperity have also emerged as factors that have marginalized the minorities of Xinjiang to a great extent. The new regional development policy of the 'West Development Strategy' has increased the investment share in the energy industry of Xinjiang, mostly concentrated in Urumqi, Karamay and Bayingolin. The number of state-owned enterprises is still very high, amounting to 75% of all enterprises (mainly oil, gas industries) in Xinjiang. The dominant role of state-controlled heavy extractive industries and the underdevelopment of light industries are the major weaknesses of Xinjiang's resource-based economy.

The Gini coefficient, the Theil index and the σ-convergence coefficient have all decreased since 1978, and show weak convergence for the whole period. The SEM, SLM and SCM models indicate a weak sign of convergence in regional per capita GDP and all the results are significantly consistent with the σ-Convergence and Moran's I analyses of per capita GDP.

Xinjiang has experienced great changes in regional development since 1950. However, the rankings in terms of per capita GDP and per capita disposable income have lowered its ranking in the 31 provinces of China even though these indicators increased at a high speed. After six decades of development, there are still acute disparities between per capita annual income of urban and rural households in Xinjiang.

7. Urbanization (metropolitan and cities) was found to be the most active factor contributing to the regional economy in large territories.

Cities play very important roles in countries with large territories in supporting and encouraging increase in urban population, centralization and distribution of economic activities. They have become the economic engines of a territory. Nonetheless, the rural economy cannot be ignored.

There are sharp differences in the nature of the urban system, urban size, definition, the number of urban centres at different hierarchical levels and their regional distribution between Canada and China due to differences in population size and economic activities. However, economic outputs are mostly based on the cities in both countries. China's rural-urban inequalities are much greater compared with Canada. Canada has 80% urban population while China had only 45.7% in 2008. As expected, the most urbanized regions have the highest per capita income in both economies. Thus, one could conclude that the level of urbanization is positively associated with the level of economic development among the regions. Canada's urban regions have been growing relatively fast. However, the rate of urbanization differs greatly between provinces. Immigrants to Canada have been strongly concentrated in the country's largest urban areas. The different characteristics and experiences of urbanization in both countries make generalization about urbanization processes and their relationships to economic conditions difficult. The sharp urban-rural income difference in China reflects the early stages of a Hirschman-type concentrated development. It also can be explained by Myrdalian dynamics of cumulative causation and so-called backwash and spread effects between core and periphery. In China, the backwash effects dominate in the early stages of development, so there is increasing urban-rural disparity which underscored divergence. In Canada, it seems spread effects dominate and there has been a decreasing gap between core and periphery which is translated into convergence. However, there are differences between regions in each country.

During the last few decades urbanization in China has been accelerating. The rate of urbanization measured by the proportion of urban population of the total population has grown from 17.9% in 1978 to 45.7% in 2008, a 27.8 percentage points shift. However, due to the institutional constraint inherited from the planned economy and the household registration system (*hukou*) system, the rate of urbanization in China is lower compared not only to the developed economies but also to other countries at the same level of development. There are great disparities in urbanization between the Eastern, Central and Western provinces in China.

Urban-based economic activities are highly concentrated in urban areas and account for the greater part of the corresponding regional share of GDP. But the concentration rate differs greatly in both countries. In Canada, most of the principal CMAs have a leading share of the GDP in their provinces. Investment is extremely concentrated in capital cities but there is some rural investment. It is a well-known fact that the urban-rural income gap has widened in China. In China, the strong influence of government on urban development and China's long term centralization 'China policy' certainly helped the concentration of urban economic activities into the cities directly controlled by the state and provincial capital cities. The Western provinces have higher GDP concentration rates than that of the Central and Eastern provinces of China. All of the cities in China have increased very fast in population and GDP in recent years. The smaller cities had high growth rates while the larger cities had somewhat lower growth rates. Shanghai had the highest wage of $7044 while Wuchang City had the lowest at $186.5. The disparity is 37.7 times. Shanghai

($174 billion), Beijing ($134 billion) and Guangzhou ($102 billion) are the top three cities by total GDP in 2007. They have been the key players in the development of the Chinese economy as Guangzhou is the manufacturing hub for China as well as the logistics hub for Hong Kong; Shanghai is China's commercial and service hub while Beijing has been gaining immensely in status as the political hub of the country.

Montreal is the second largest metropolitan centre in Canada. Economic activities and population in Quebec are heavily centred in the Montreal metropolitan area. The data show the strong core performance of Montreal in almost any type of industry in Quebec except for some agriculture related industries. In Xinjiang, the urbanization of the rural population and net interprovincial migration are the main causes of increasing urban population in recent years. The south and east parts of Xinjiang do not have a fully developed urban hierarchy and the cities there cannot play the central role of economic centre due to the huge distance between urban and urban, and even between urban and rural. Like other parts of China, widening urban-rural income disparity has been the main source of inequalities in Xinjiang during the reform period. Furthermore, the centralized development plan has reinforced intra-regional disparities in Xinjiang. Ürümqi is a core industrial, economical, cultural and political centre and the largest consumer centre in Xinjiang. The higher economic performance for Urumqi noted earlier further confirms its hub city position in Xinjiang's economy. The most "inland" city in the world has become a major economic centre not only in western China but it has also become one of the largest cities in central Asia countries.

8. Openness has played a significant role in the economies of both countries.

Trade openness is closely related with convergence or divergence of spatial income disparity across regions in large territories. China has just moved from a lesser developed economy to a lower-middle-income economy on the basis of per capita GDP along with the transformation of the Chinese economy from the centrally planned system to a more market-oriented system since the onset of economic reform and opening policy. The reforms included the liberalization of prices and the process of fiscal decentralization. China's integration into the world economy has been astonishingly rapid. It is estimated that exports represent some 20% of China's GDP growth while exports account for nearly 45% of Canada's GDP. China also opened its economy to the world only for the eastern provinces for the purposes of trade and attracting direct foreign investment. The role played by China in international trade has also increased and the world's most populous economy has benefited from global trade and investment after it joined the World Trade Organization (WTO) in 2001. As a result, the Chinese economy has been boosted by FDI and international trade giving rise to an increase in regional disparity. But China has been criticized for not permitting a more flexible currency exchange rate of Yuan, which is viewed as artificially cheap, boosting the competitiveness of Chinese exports and accumulating a vast amount of foreign-exchange reserve since 1990.

Canada has had a much more open economy than China. Trade accounts for roughly a third of Canada's GDP. Canada has signed two agreements with the US – the 1989 US-Canada Free Trade Agreement (FTA) and the 1994 North American Free Trade Agreement (NAFTA), which has brought about a trade boom for Canada. The US and Canada have the world's largest trading relationship and the US absorbs more than 85% of Canadian exports. In 2008, the country also agreed to a Canadian-European free trade association that has further developed its economy. The most important indicator of openness could be the Economic freedom[1] indicator of countries. Based on the 2010 statistics of the Heritage Foundation, China's economic freedom score is 51, making its economy the 140th 'freest' in the 2010 Index. Its overall score is lower than the global and regional averages. Canada's economic freedom score is 80.4, making its economy the 7th 'freest' in the 2010 Index rankings. Its overall score is almost unchanged from the previous year. Canada is ranked 1st out of the three countries in the North America region on this index. It can be concluded

[1] Note: The Economic Freedom score is calculated based on the 10 economic freedoms of countries, i.e. business freedom, trade freedom, fiscal freedom, government spending, monetary freedom, investment freedom, financial freedom, property rights, and freedom from corruption and labour freedom. For more information see http://www.heritage.org/index/Country/

from this that it may be better for the future of China’s economy if China had a more open economy than is currently the case.

9. Migration is a major factor in boosting the economy in both countries but in different ways.

It is well-known that migration has often been an important factor in regional economic development. Migration is mainly linked to large income disparities, employment opportunities and unemployment and other social, political and natural problems. The major trend is from poorer regions to richer ones, the so-called migration from periphery regions to core regions. Mobility of the labour force is usually considered as one of the key pre-conditions for regional convergence and growth. It can be argued that interregional migration equalizes differences and factor prices across regions and lead to more even regional development, although cumulative processes of growth and decline can complicate this substantially. Canada is a country that receives a large number of immigrants compared to its small population. Internally, migration tends to occur from poorer provinces with high unemployment to rich regions with low unemployment in both countries. In Canada, the increase in international immigrants and interprovincial migrants shows a high correlation with the increase in total GDP in the provinces. The recent three decades of development in Ontario, Alberta and British Colombia have attracted more international and interprovincial migrants than Quebec and the other provinces. It seems it has spurred the convergence of the western provinces.

In the case of China, China does not accept immigrants. On the contrary, millions of people (including students) have emigrated to other countries such as the USA, Canada, Australia and various European countries[2]. In China, the relationship between migration and regional development has become stronger over time, with migration flows from the Central and Western regions to the Eastern region increasing dramatically from the beginning of the new reform era. It can be concluded that

[2] People's Daily Online, January 04, 2009. For example, since the opening-up of overseas study 30 years ago, a total of 1.36 million Chinese students have studied abroad. Of these students, only 370,000 returned to China after completing their studies.

migrant workers have played a substantial role in the urban labour market. This cheap labour force moving to the coastal provinces of China has been a main factor in attracting FDI and foreign assembly line enterprises to China in recent decades. However, the mobility and direction of inter-provincial and urban-rural migration is still controlled in China. For the coastal provinces, limitations on in-migration are much stricter than inland provinces. Restraints on the transfer of labour out of agriculture could be expected to slow down in per capita income convergence. Thus, in this event it is reasonable to suggest that migration restraints induce a divergence in terms of the increase in per capita GDP in China.

SC.3 The Limitations of this Research

The lack of high-quality and comparable cross-section data has always constituted a major barrier in the study of cross-country and multiregional economic issues. Comparing regional development performance between Canada and China poses a challenge because of differences in governmental systems and data collection processes. The differences in the classification systems of economic activity between the two countries pose a challenge in terms of data comparability. In Canada, the sectors of the economy can be regrouped to form five largely goods-producing industries (NAICS[3] 11 to 31-33) and fifteen services-producing industries (NAICS 41 to 91) (see Appendix 2.1). But, in China, the sectors of the economy are divided into three industries by the standard of industrial classification of the Material Product System (MPS): Primary industry - agriculture (including farming, forestry, animal husbandry and fishery); Secondary industry - industry (including mining and quarrying, manufacturing, production and supply of electricity, water and gas) and construction; and Tertiary industry - all other industries not included in primary or secondary industry such as telecommunications and commerce. This ignores many so-called "non-material" service activities which were considered "non-productive".

[3] Note: The North American Industry Classification System (NAICS) was a new industry classification system that was introduced in the North American countries (U.S.A, Canada and Mexico) in the 1990s to more fully represent industry sectors, especially the service sector.

In this study, the primary and secondary industries of China can be compared with the goods producing industries of Canada without difficulty. However, the tertiary sector cannot be fully compared due to the difference in the statistical systems between the two countries.

Since the mid-1980s, China has started compiling national income statistics according to the United Nations System of National Accounts - 'SNA'. Many theoretical and practical problems on how to adopt the SNA to Chinese economic accounting, however, still remain unsolved. For instance, the sum of the regional GDPs may not equal the national GDP published by the State Statistical Bureau (SSB), the reason for which is that the statistical data compiled by the SSB are derived from the records of the various ministries in charge of their related sectors whereas the regional statistical data are compiled by the regional statistical offices.[2]

In 1992, these Soviet-style MPS measures were dropped in favour of SNA principles, showing slower growth. There have been various adjustments following industrial and service censuses. The most recent adjustment was made in 2006 after the First Economic Census in 2004 (Madison and Xu 2006). Madison and Xu (2006) argued that the MPS standard of industrial classification is agriculture, industry, construction, (production-side) transportation and telecommunications, and commerce. Such a grouping is consistent with Marxian theory and common in the practice of centrally planned economies.

Contrary to the common theoretical perception, the MPS does not completely ignore the contribution by "non-material services". In calculating Non-Material Product (NMP), those "non-material services" that are used (and paid) by the material sectors[5] are kept together with newly added value by "material production", e.g. banking or financial services, which were of course insignificant under central planning, and (enterprise-level) educational, medical and housing services for employees. Note that the "non-material services[4]" that are consumed by the material

[4] "Non-material Services"- In the old Soviet-style national accounts "non-material services" were excluded from "material product". These are banking, insurance, housing services, administration of real estate, social services, health, education, entertainment, personal services, R & D activities, the

sectors are only a small part of the total "non-material services" of the economy, which means that the majority of "non-material services" is ignored in the national accounting process under MPS. Another example is given by Holz (2007) who argued that National GDP should equal the sum of provincial GDP (provincial gross value added). But prior to the 2006 benchmark revision, the sum of provincial GDP routinely exceeded national GDP in China. The discrepancy between the sum of provincial GDP and the NBS's national GDP figure increased continuously from 1996 through 2004. By 2004, the sum of provincial GDP was 19% larger than the national value reported by the NBS. The national values are consistently lower than the sum of the provincial values in the secondary and tertiary sector[5].

Thus, this 'third' industry data of China and the goods producing industries of Canada must be analyzed independently except for the national case. Another difficulty of data comparability is in the personal income data. In China, there is no personal tax reporting system, so it is difficult to measure personal income. The only way is through official urban or rural disposable income data or the average wage of staff and workers. Hong Kong and Macao are not included in this research due to missing data for earlier years. The Xinjiang Production and Construction Group in Xinjiang is under the direct control of central government of China. The economic data of this group are not included in this study independently because their data are included in Xinjiang's regional economic data.

For China, in addition, some care must be taken when one uses official data to estimate and compare China's economic performances for the pre- and post-reform periods during which different statistical systems were employed (Rongxingguo 2007). Many problems therefore still exist when one tries to apply the officially published data to compare the Chinese economy multi-regionally. However, the Statistical Bureau of China has tried to meet the international statistical standards

armed forces, police, government and party organizations. They are now incorporated in the Chinese accounts, but the estimates are not shown explicitly. Official estimates show an estimate for the "tertiary" sector as a whole, and a breakdown for two component sub-sectors (transport and commerce). The estimate for non-material services is a residual which the reader has to derive for him or herself.

[5] The China Quarterly, March 2008.

since 1990. The research data environment has been increasingly improved since the release of complete sets of data on regional economic performances such as the FAO Database, the UNSD Database, the World Bank Database, the IMF Database, the UNDP Human Development Report and the Penn Data Table.

The accessibility of official statistical data in China is relatively easy and most of the recent statistical data are published online. However, there is still some debate about China's statistical data. Rongxingguo (2007) argued that the Chinese economy could have been underestimated if the international statistical standards had been applied. For example, according to the evidence released by the State Statistical Bureau (SSB), China's actual GDP could have been over 30% larger than the current figure. There are also some other discussions about the exaggeration of Chinese GDP (Wang and Meng 2000; Madison and Xu 2006; and Scissors 2009)[6]. As for the period 1978-2003, Maddison and Wu calculated the growth rate at 7.85% per year compared with the official rate of 9.6%. As another example, according to the 2008 estimates by China's National Bureau of Statistics (NBS), the total number of the urban unemployed was 8.30 million. The country's total unemployment rate stood at 4.0%. The Chinese Academy of Social Sciences also undertook a sample survey of 7,000 people in mid-2008. Their findings were in stark contrast to the official estimates and 9.4% of the sample size was classified as unemployed[7]. However, in any case, it is true that China has become a new economic power in the world with a high economic growth rate. In contrast, in Canada accessing long term statistical data is difficult and expensive. For example, Statistics Canada does not publish related income data (GDP, personal income or other related data) of CMAs and CAs or rural areas.

In both countries, there are some difficulties in obtaining environmental data at the sub-national level. So these data are not considered in the regional and provincial cases.

In sum, there was much difficulty in performing structural analyses of regional and provincial comparisons between service producing industries of Canada and the

[6] http://www.heritage.org/Research/AsiaandthePacific/upload/wm_2238.pdf
[7] http://www.economywatch.com/world_economy/china/unemployment.html

‘third’ industry of China in this study. The lack of CMAs’ and MAs’ or rural areas’ annual economic statistical data for Canada also affected the analysis of the core–periphery structure and the spatial analysis to some degree.

SC.4 Concluding Remarks

In this study, a detailed analysis of regional growth, policy and disparity of the economies of China and Canada starting from the 1960s until the present time has been provided, mainly in a descriptive and empirical way. This study has shown the complex mosaic of regional development in both countries through comparing and contrasting the different processes and patterns of regional economic development experiences and models of these two countries. Natural resources, international trade, metropolitan area (cities) and migration are major factors that have affected both economies in different ways. Clearly, much has happened in both countries since 1960 and to provide a thorough description would require even more detailed work. It can be seen from the analyses reported in this thesis that there were more stories of success than failure in the Canadian case while the reverse was true for in China.

In brief, Canada's economy is both mature and diverse, benefiting from an advanced services sector, an abundance of natural resources and free trade agreements. Canada has enjoyed solid economic growth, and has avoided a significant widening of regional disparity, but has not been able to avoid the negative impacts of the economic recession. However, Canada has experienced greater stability, and even growth, while a global economic crisis has been affecting most economies in the world.

From an economic point of view, China is still in a marginal position when compared with Canada. The Chinese economy faces numerous economic development challenges even though it has become the second biggest economy in the world. China is still taking advantage of the growth centre strategy with some additional development strategies. However, the Central and Western regions do not seem to be catching up with the East. The Chinese economy is still not fully transformed from the centrally planned system to a market-oriented system since the onset of economic reform and the opening policy. The state still controls most economic activity. The government is struggling to manage environmental degradation, demographic pressure and an aging population, and the world's largest-ever migration from rural to urban areas, all of which contribute to social unrest. At present, more than half of the population depends on agriculture for a living. However, agriculture's contribution to GDP has remained low. Furthermore, many factors affect China's economic development seriously including a number of political, financial, social, and environmental problems (pollution, loss of arable land), as well as low labour and product costs, ethnic tensions (Tibet, Xinjiang), poverty, health care and unemployment.

In the Western provinces, minority areas have been marginalized. China's poor showing on the Human Development Index shows the economic disparity between urban China and the rural areas. Chinese minorities constitute less than 10% of the Chinese population yet they constitute 40 to 50% of the poor. It is somewhat paradoxical that the autonomous regions (where a large proportion of minorities live) are often quite rich in natural resources but their populations remain quite poor (Bhalla and Shufang Qiu 2007). The recent introduction of a 5% resource tax increased from zero % in the resource-rich Xinjiang represents the start of central government aiming to increase revenue for the local government.

The Chinese government seeks to add energy production capacity from sources other than coal and oil. The global economic downturn began to slow foreign demand for Chinese exports for the first time in many years. The government vowed to continue reforming the economy and emphasized the need to increase domestic consumption in order to make China less dependent on foreign exports for GDP growth in the future. However, developing a successful regional policy in such a populated and large territory is not an easy task. The policies of regional economic development of China are facing many conceptual, practical difficulties and new challenges. If China chooses to follow past strategies in regional economic development, and if there is no immediate action and intervention appropriate for lagging regions, the economic disparity between regions will almost certainly be enlarged. There should be more holistic and specific regional development policies and urban planning strategies accompanying the whole process of national economic development. China urgently needs further systematic reform and new regional development policies.

Despite being an affluent, high-tech industrial developed society, there are also some issues in Canada which cannot be overlooked in the current situation. Significant challenges lie ahead. Although the equalization program has played a key role in reducing or hiding regional disparity to some degree and in avoiding further divergence, regional disparity cannot be ignored. In addition, economic activities are excessively (according to many observers) concentrated in the core regions of Toronto in Canada and Montreal in Quebec and the CMAs more generally, while the other regions are seen as peripheral regions. This is also one of the reasons underlying an unbalanced regional economy. Central Canada dominates the national economy by almost any indicator. The sluggish economic performance of the Atlantic Provinces and the high costs of the Northern economy cannot be overlooked. If they are, the chances are that regional disparity will be accentuated again. Total government expenditures, including consumption and transfer payments, are relatively high in Canada. In the most recent year, government spending equaled 39.1% of GDP. It increased slightly due to the implementation of a significant stimulus package due to the economic downturn in 2008. Future Canadian economic weakness could stem from the deficits of -2.3 % in the budget, and -2.8% in the current account balance. These budget deficits will lead to net government debt rising and economic slowdown. Sustainable economic growth also requires successfully addressing the problem of climate change and environment, notably in the important energy sector. Demographic ageing is putting significant pressure on public spending mainly through rising health-care expenditures. The problem of poverty, unemployment and the income gap[8] between aboriginals and other Canadians exists also, but on a world

[8]Canwest News Service (2009) Shannon Proudfoot, aboriginals ‘astoundingly poorer’. The Gazette March 31, 2009, p. 8. Economist Pendakur says the income gap between aboriginals and other

scale they do not appear to be very significant..

SC.5 Future Research Directions

This study has tried to explain the patterns and processes of change of both economies as well as presenting case studies which illustrate and examine the differences in both economies from the national to regional and provincial scales and some urban areas. This study has focused on trying to answer the research questions presented in the Introduction to this thesis, the answers to which were summarized previously in section SC2.

Regional development is undoubtedly a complex and highly debated topic. It is affected by many factors. Explanations have to be sought in the domains of geography, economics, sociology, politics, trade, international relations, history, migration, openness…. This thesis has assessed whether government policies have succeeded in inducing regional convergence or have further widened regional disparities, thus necessarily involving an evaluation of the sustainability of regional development. This study also focused on regional disparity and regional development policy, cross-country comparisons, measuring convergence between countries and across regions including spatial analysis, identifying the most influential factors such as population, resources, policy, urbanization, migration, openness and their different roles in the economic development of large territories (in Canada and China). The empirical results and the process of convergence and divergence offered an interesting framework for examining the regional development trajectory and regional disparity in both economies.

In this study, the 'core' regions of their respective provinces have been stressed as one of the major, if not the major, reason for provincial disparities. Absolute regional equality is impossible. Regional disparity cannot be avoided, it exists almost everywhere. There is not a specific universal formula for every region.

Canadians is so wide it should trump concerns about other ethnic disparities in this country

But it appears possible for national and regional policy makers to try to keep the level of disparity at a reasonable scale to avoid social instability and to maintain national unity. It is certain that there is much more left for future research due to problems of data comparability and data availability for both of these different economic systems, especially in relation to the service sectors, and some other social and environmental indicators for sub-national spatial units at the provincial and urban (cities, municipalities) levels as well as for rural areas. Further micro economic analysis is certainly required to obtain a more detailed picture of the regional development trajectory of both economies. The comparability of service sectors of China and Canada requires further attention. Due to limited data for sub-provincial units (CMA and municipalities of Canada, county-level data of China) and rural areas, some spatial and environmental factor analyses must be left for future research.

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Appendices (Appendix A)

A.1. Table 1 Descriptive Statistics of Per Capita GDP of China

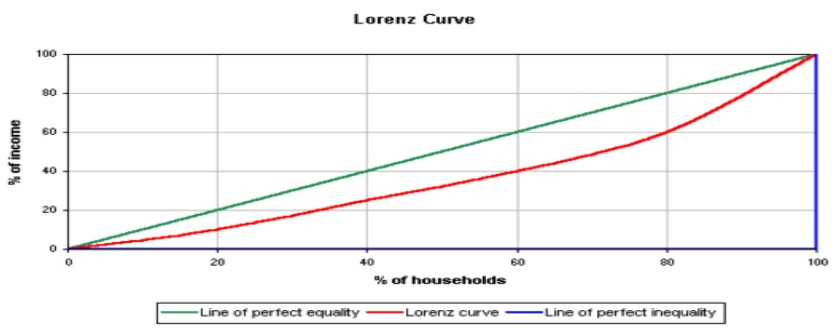
China	Valid data	Sum	Mean	Variance	Standard deviation	Variance coefficient	Standard error of mean	Upper 95% CL of mean	Lower 95% CL of mean	Geometric mean	Skewness	Kurtosis	Max	Upper quartile	Median	Lower quartile	Min	Range	Centile 95	Centile 5
1981	31	18200.1	587.1	253926.643	503.911345	0.858306	90.505149	771.936173	402.263827	492.546611	3.268667	13.893546	2813	549	450	356	242	2571	1558	294
1982	31	19709	635.77419	266113.581	515.861978	0.811392	92.651546	824.993895	446.554492	540.620606	3.174341	13.197069	2877	597	488	385	278	2599	1704	339
1983	31	21641.9	698.12581	295653.751	543.740518	0.778857	97.65868	897.571439	498.680174	597.022498	2.975811	11.71321	2963	658	538	428	302	2661	1979	363
1984	31	25335.6	817.27742	369431.359	607.808653	0.743699	109.165657	1040.22343	594.331405	703.13229	2.798001	10.571313	3259	807	640	504	371	2888	2306	399
1985	31	30181.7	973.60323	510924.72	714.789983	0.73417	128.380071	1235.79031	711.416143	839.02174	2.791149	10.626806	3855	1025	808	604	420	3435	2702	471
1986	31	33121.3	1068.429	570790.453	755.506752	0.707119	135.693018	1345.55115	791.306918	925.458612	2.631257	9.635587	4008	1168	842	684	467	3541	2953	525
1987	31	38062.8	1227.8323	696582.499	834.61518	0.679747	149.901312	1533.97158	921.692938	1069.01016	2.495508	8.955054	4396	1335	962	764	546	3850	3336	607
1988	31	46876.9	1512.1581	972927.955	986.371104	0.652294	177.15748	1873.96191	1150.354223	1325.06744	2.397057	8.477825	5161	1602	1228	909.9	683	4478	4124	770
1989	31	52049.3	1679.0097	1104074.06	1050.749286	0.625815	188.720143	2064.42763	1293.591728	1482.49479	2.321959	8.095718	5489	1808	1377	1013	750	4739	4509	927
1990	31	57094.6	1841.7613	1249339.07	1117.738374	0.606886	200.751738	2251.75104	1431.771545	1638.20206	2.350518	8.244425	5910	2028	1528	1182	810	5100	4878	1023
1991	31	64566.2	2082.7806	1768141.96	1329.714991	0.638433	238.823863	2570.52404	1595.037249	1832.92655	2.393607	8.502162	6955	2316	1647	1283	896	6059	5782	1159
1992	31	77987.3	2515.7194	2701401.81	1643.594174	0.65333	295.198228	3118.59457	1912.844145	2194.82125	2.347899	8.506547	8652	2727	1906	1477	1034	7618	6804	1384
1993	31	100911	3255.2065	4825961.22	2196.80705	0.67486	394.558194	4061.00178	2449.41112	2803.9222	2.305864	8.665991	11700	3815	2382	1867.4	1255	10445	8239	1600
1994	31	131242	4233.6194	8149028.47	2854.650323	0.674281	512.710333	5280.71355	3186.525163	3631.27893	2.232094	8.467841	15204	5355	3013	2490	1553	13651	10261	1925
1995	31	162997	5257.9613	12853151.7	3585.129245	0.681848	643.908221	6572.99731	3942.925267	4498.35112	2.236588	8.373907	18942	6787	3639	3304	1853	17089	13085	2288
1996	31	188351	6075.8516	17740189.6	4211.91045	0.693221	756.481449	7620.79284	4530.910387	5172.66851	2.263093	8.54666	22275	7730	4259	3706	2021	20254	15044	2679
1997	31	211452	6821.0355	23046014.3	4800.626448	0.703797	862.217963	8581.91948	5060.151487	5804.87418	2.381376	9.225979	25750	8725	4714	4029	2215	23535	16735	3134
1998	31	227446	7336.971	27862291.6	5278.474365	0.719435	948.041983	9273.131	5400.810939	6216.86866	2.426598	9.407378	28240	9415	5069	4319	2318	25922	18478	3456
1999	31	241610	7793.8613	33184446	5760.594239	0.739119	1034.633268	9906.86432	5680.858265	6564.77414	2.478891	9.676038	30805	10086	5350	4452	2475	28330	19846	3668
2000	31	266262	8589.0968	42469080.4	6516.830545	0.758733	1170.457318	10979.4895	6198.704032	7171.36746	2.478624	9.629554	34547	11226	5872	4839	2662	31885	22460	3838
2001	31	291125	9391.1161	51263662.6	7159.864709	0.762408	1285.949663	12017.3757	6764.856551	7826.9118	2.433957	9.208994	37382	12041	6463	5307	2895	34487	25523	4163
2002	31	320972	10353.919	61795754.8	7861.02759	0.759232	1411.882235	13237.3676	7470.471156	8630.68339	2.384153	8.856986	40646	12986	7233	5804	3153	37493	28449	4493
2003	31	367839	11865.781	82169495.2	9064.739112	0.76394	1628.075206	15190.7538	8540.807495	9862.81673	2.360978	8.72626	46718	14258	8573	6678	3603	43115	32061	5022
2004	31	433067	13969.918	103230017	10160.21736	0.727293	1824.828907	17696.7163	10243.12062	11728.2084	2.186048	7.729426	51429	16925	9704	7882	4215	47214	37058	5970
2005	31	501425	16175.006	125773443	11214.87596	0.693346	2014.251184	20288.6553	12061.35586	13741.8126	2.052402	6.904461	55307	18964.7	11356.4	9409	5206	50101	44307.54	7432.922
2006	31	578310	18655.161	150785658	12279.48118	0.658235	2205.459926	23159.3114	14151.01123	15962.1239	1.80364	5.661262	57695	21788	13313	10798	5787	51908	50467	8757
2007	31	670032	21613.936	181061434	13455.90704	0.622557	2416.752248	26549.6028	16678.2697	18728.0697	1.723905	5.462306	64592	25643.8	16087.7	12926	7204	57388	55151.26	10314.1

A.1. Table 2 Descriptive Statistics of Per Capita GDP of Canada (10 provinces)

Title	Valid data	Sum	Mean	Variance	Standard deviation	Variance coefficient	Standard error of mean	Upper 95% CL of mean	Lower 95% CL of mean	Geometric mean	Skewness	Kurtosis	Max	Upper quartile	Median	Lower quartile	Min	Range	Centile 95	Centile 5
1981	10	234812	23481.2	41509411.3	6442.77978	0.27438	2037.385857	28090.08701	18872.31299	22722.0593	0.541476	2.253227	35738	28537	23733.5	17134	16293	19445	35738	16293
1982	10	227792	22779.2	30291058.2	5503.731296	0.241612	1740.432652	26716.33219	18842.06781	22209.4803	0.581728	2.402531	33519	27420	22824.5	17410	16460	17059	33519	16460
1983	10	231389	23138.9	26064344.5	5105.325116	0.220638	1614.445556	26791.02958	19486.77042	22654.4716	0.553007	2.26872	32817	27474	22922.5	18598	16831	15986	32817	16831
1984	10	239077	23907.7	29363288.7	5418.790333	0.226655	1713.571962	27784.06909	20031.33091	23380.037	0.566342	2.339979	34217	27308	23852	18845	17277	16940	34217	17277
1985	10	247772	24777.2	36978209.7	6080.971118	0.245426	1922.971912	29127.26468	20427.13532	24140.9662	0.623535	2.493343	36760	28923	24366	19184	17540	19220	36760	17540
1986	10	250928	25092.8	31922161.1	5649.970006	0.225163	1786.677393	29134.54506	21051.05494	24538.3151	0.468995	2.261006	35517	28690	25174	20466	17638	17879	35517	17638
1987	10	257358	25735.8	33064190.6	5750.147009	0.22343	1818.356143	29849.20737	21622.39263	25177.1739	0.477164	2.195204	36190	29999	25583	21465	18285	17905	36190	18285
1988	10	263951	26395.1	39821436.8	6310.422867	0.239076	1995.530926	30909.30458	21880.89542	25766.0293	0.751226	2.447535	38776	31080	25115	21520	19430	19346	38776	19430
1989	10	267138	26713.8	37649767.5	6135.940638	0.229692	1940.3548	31103.18751	22324.41249	26124.68	0.742281	2.414737	38682	31273	25844.5	21577	20209	18473	38682	20209
1990	10	267604	26760.4	35994622.5	5999.551857	0.224195	1897.224881	31052.22085	22468.57915	26190.161	0.671109	2.534241	38742	30815	26555.5	21310	20175	18567	38742	20175
1991	10	262781	26278.1	32854693.7	5731.9014	0.218125	1812.586375	30378.45525	22177.74475	25754.9664	0.792021	2.815002	38250	30115	25594.5	21154	20215	18035	38250	20215
1992	10	262015	26201.5	31102024.5	5576.918907	0.212847	1763.576607	30190.98745	22212.01255	25707.2719	0.848683	2.952964	38013	30047	25668	21424	19897	18116	38013	19897
1993	10	267528	26752.8	37049509.1	6086.83079	0.227521	1924.824903	31107.05644	22398.54356	26186.9111	0.987926	3.34088	40213	30519	25825	22019	20062	20151	40213	20062
1994	10	276245	27624.5	41569884.9	6447.471205	0.233397	2038.869416	32236.74305	23012.25695	27018.6666	1.088998	3.553572	42190	30455	26763	22443	21127	21063	42190	21127
1995	10	281153	28115.3	41173301.3	6416.642529	0.228226	2029.120532	32705.48955	23525.11045	27535.7686	1.233418	3.845577	42976	30347	26902.5	23124	21872	21104	42976	21872
1996	10	282809	28280.9	42401672.1	6511.656633	0.230249	2059.16663	32939.05854	23622.74146	27680.2378	1.148102	3.749705	43206	30681	27334	23274	21141	22065	43206	21141
1997	10	291072	29107.2	48601365.5	6971.46796	0.23951	2204.571739	34094.28775	24120.11225	28444.516	1.196035	3.856382	45235	31909	28204	23606	21740	23495	45235	21740
1998	10	301626	30162.6	48760241.8	6982.853415	0.231507	2208.172136	35157.83241	25167.36759	29526.2415	1.270077	3.961651	46474	33285	29192	24739	23394	23080	46474	23394
1999	10	311895	31189.5	43637686.5	6605.882719	0.211798	2088.963535	35915.06382	26463.93618	30632.0968	1.215797	3.677492	46255	33444	30194.5	25989	24977	21278	46255	24977
2000	10	323511	32351.1	48541111	6967.14511	0.21536	2203.204734	37335.09537	27367.10463	31754.3126	1.214883	3.659573	48216	34552	31354	26538	26157	22059	48216	26157
2001	10	325538	32553.8	46372382.4	6809.727043	0.209184	2153.42477	37425.18527	27682.41473	31988.106	1.257165	3.796325	48219	34482	31574	27267	25843	22376	48219	25843
2002	10	335834	33583.4	39398777.8	6276.844575	0.186903	1984.912538	38073.58411	29093.21589	33116.9675	1.353799	4.102146	48324	34485	32055	28980	27028	21296	48324	27028
2003	10	342707	34270.7	39889142	6315.785146	0.184291	1997.226627	38788.74052	29752.65948	33805.1827	1.321168	4.127324	49143	36111	33106.5	29326	27511	21632	49143	27511
2004	10	349322	34932.2	44921721.7	6702.366875	0.191868	2119.474504	39726.78443	30137.61557	34424.4985	1.403333	4.301263	50950	37494	33147.5	29677	28238	22712	50950	28238
2005	10	356657	35665.7	50004054.9	7071.354531	0.198268	2236.158646	40724.2423	30607.1577	35111.1526	1.357183	4.190418	52442	38986	33509.5	30274	28548	23894	52442	28548
2006	10	364367	36436.7	53810356.9	7335.554301	0.201323	2319.705949	41684.23943	31189.16057	35863.0526	1.517182	4.678284	54403	38919	34481.5	30583	29335	25068	54403	29335
2007	10	372713	37271.3	52187847.6	7224.115694	0.193825	2284.465968	42439.12105	32103.47895	36713.6345	1.338267	4.332597	54540	39624	36175.5	31089	29785	24755	54540	29785

A2. Lorenz Curve

The Lorenz curve is a graphical representation of the cumulative distribution function of a probability distribution; it is a graph showing the proportion of the distribution assumed by the bottom *y*% of the values. It is often used to represent income distribution, where it shows for the bottom *x*% of households, what percentage *y*% of the total income they have. The percentage of households is plotted on the *x*-axis, the percentage of income on the *y*-axis. It can also be used to show distribution of assets. In this situation, many economists consider it to be a measure of social inequality. It was developed by Max O. Lorenz in 1905 for representing income distribution.



Source:

A3. Calculation of the Gini coefficient of inequality

This method calculates the Gini coefficient (G) of inequality with bootstrap confidence intervals. A Lorenz plot is produced when a single variable is specified for analysis; otherwise the summary statistics alone are displayed for a group of variables.

The Gini coefficient was developed by the Italian Statistician Corrado Gini (Gini 1912) as a summary measure of income inequality in society. It is usually associated with the plot of wealth concentration introduced a few years earlier by Max Lorenz (Lorenz 1905). Since these measures were introduced, they have been applied to topics other than income and wealth, but mostly within Economics (Cowell 1995, 2000; Jenkins 1991; Sen 1973).

G is a measure of inequality, defined as the mean of absolute differences between all pairs of individuals for some measure. The minimum value is 0 when all measurements are equal and the theoretical maximum is 1 for an infinitely large set of observations where all measurements but one has a value of 0, which is the ultimate inequality (Stuart and Ord 1994).

When G is based on the Lorenz curve of income distribution, it can be interpreted as the expected income gap between two individuals randomly selected from the population (Sen 1973).

The classical definition of G appears in the notation of the theory of relative mean difference:

$$G = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\left|x_i - x_j\right|}{2n^2\bar{x}}$$

- where x is an observed value, n is the number of values observed and x bar is the mean value.

If the x values are first placed in ascending order, such that each x has rank i, the some of the comparisons above can be avoided and computation is quicker:

$$G = \frac{2}{n^2\bar{x}}\sum_{i=1}^{n} i(x_i - \bar{x})$$

$$G = \frac{\sum_{i=1}^{n}(2i - n - 1)x_i}{n\sum_{i=1}^{n}x_i}$$

- where x is an observed value, n is the number of values observed and i is the rank of values in ascending order.

Note that only positive non-zero values are used.

The small sample variance properties of G are not known, and large sample approximations to the variance of G are poor (Mills and Zandvakili 1997; Glasser 1962; Dixon et al. 1987). therefore confidence intervals are calculated via bootstrap re-sampling methods (Efron and Tibshirani 1997).

StatsDirect calculates two types of bootstrap confidence intervals, these are percentile and bias-corrected (Mills and Zandvakili 1997; Dixon et al. 1987; Efron and Tibshirani 1997). The bias-corrected intervals are the most appropriate for most applications.

In order for G to be an unbiased estimate of the true population value, it should be multiplied by n/(n-1) (Dixon 1987; Mills and Zandvakili 1997). This corrected form of G does not appear in most of the literature, but there are few situations when it is not the most appropriate form to use.

A4. Spatial Models

A4.1 Spatial Error Model

Country	Period	Equation	δ	(R)	R^2(%)	F	P	ρ
Canada	81-07	$Log(Yit/Y_0) = 1.930208 - .418118\ LogY_0 + .040926\ W$	-0.418118	0.416351	17.334791	1.048494	0.386	0.040926
	81-90	$Log(Yit/Y0) = .506796 - .094568\ LogY0 - .00598\ W$	-0.094568	0.435476	18.963929	1.170092	0.3495	-0.00598
	91-00	$Log(Yit/Y0) = .464108 - .083692\ LogY0 - .001701\ W$	-0.083692	0.470436	22.130983	1.421039	0.2863	-0.001701
	01-07	$Log(Yit/Y0) = -.316555 + .074079\ LogY0 + .012671\ W$	-0.316555	0.652898	42.627594	3.714991	0.0622	0.012671
China	81-07	$Log(Yit/Y0) = 1.607607 - .050355\ LogY0 + .024622\ W$	-0.050355	0.383468	14.704809	2.413587	0.1079	0.024622
	81-90	$Log(Yit/Y0) = 1.099619 - .203154\ LogY0 - .007002\ W$	-0.203154	0.538294	28.975991	5.711644	0.0083	-0.007002
	91-00	$Log(Yit/Y0) = .167416 + .144622\ LogY0 + .008127\ W$	0.144622	0.364627	13.295285	2.146757	0.1357	0.008127
	01-07	$Log(Yit/Y0) = .353123 - .027899\ LogY0 + .022999\ W$	-0.027899	0.65827	43.331989	10.705296	0.0004	0.022999

A4.2 Spatial Lag Model

Country	Period	Equation	δ	(R)	R^2(%)	F	P	ρ
Canada	81-07	$Log(Yit/Y0) = 2.175499 - .476003\ LogY0 + .204891\ w*Log(Yit/Y0)$	-0.476003	.855034	73.108279	13.593083	0.0014	0.204891
	81-90	$Log(Yit/Y0) = .664743 - .146172\ LogY0 + .266215\ w*Log(Yit/Y0)$	-0.146172	.845332	71.458541	12.518376	0.0019	0.266215
	91-00	$Log(Yit/Y0) = .63049 - .127604\ LogY0 + .105087\ w*Log(Yit/Y0)$	-0.127604	.606303	36.760306	2.906427	0.1011	0.105087
	01-07	$Log(Yit/Y0) = .347684 - .071866\ LogY0 + .198671\ w*Log(Yit/Y0)$	-0.071866	.969254	93.945385	77.581632	< 0.0001	0.198671
China	81-07	$Log(Yit/Y0) = 1.379086 + .013448\ LogY0 + .023501\ w*Log(Yit/Y0)$	0.013448	.528537	27.935155	5.426948	0.0102	0.023501
	81-90	$Log(Yit/Y0) = .843991 - .132257\ LogY0 + .014701\ w*Log(Yit/Y0)$	-0.132257	.543658	29.556394	5.874054	0.0074	0.014701
	91-00	$Log(Yit/Y0) = -.309962 + .245982\ LogY0 + .038508\ w*Log(Yit/Y0)$	0.245982	.647832	41.968649	10.124891	0.0005	0.038508
	01-07	$Log(Yit/Y0) = .345673 - .017103\ LogY0 + .057646\ w*Log(Yit/Y0)$	-0.017103	.827574	68.487828	30.427278	P < 0.0001	0.057646

A4.3 Spatial Cross-Regressive Model

Country	Period	Equation	δ	(R)	R²(%)	F	P	τ
Canada	81-07	Log(Yit/Y0) = 3.680054 -.942018 LogY0 +.085691 w*LogY0	-0.942018	0.810913	65.758039	9.601967	0.0047	0.085691
	81-90	Log(Yit/Y0) = .497292 -.092583 LogY0 -.001288 w*LogY0	-0.092583	0.434079	18.842454	1.160857	0.3521	-0.001288
	91-00	Log(Yit/Y0) = .471868 -.085734 LogY0 -.000272 w*LogY0	-0.085734	0.468568	21.955613	1.406611	0.2895	-0.000272
	01-07	Log(Yit/Y0) = -2.223744 +.468023 LogY0 +.021318 w*LogY0	0.468023	0.850707	66.84429	13.096431	0.0016	0.021318
China	81-07	Log(Yit/Y0) = 1.638268 -.065913 LogY0 +.010284 w*LogY0	-0.065913	0.399338	15.947103	2.656178	0.0878	0.010284
	81-90	Log(Yit/Y0) = 1.066221 -.192486 LogY0 -.002246 w*LogY0	-0.192486	0.533571	28.469828	5.57216	0.0092	-0.002246
	91-00	Log(Yit/Y0) = -.123803 +.20297 LogY0 +.003821 w*LogY0	0.20297	0.488417	23.855101	4.385998	0.022	0.003821
	01-07	Log(Yit/Y0) = .497062 -.055646 LogY0 +.005838 w*LogY0	-0.055646	0.668214	44.651058	11.29407	0.0003	0.005838

Appendix B

B1 Differences in Statistical Methods of Both Countries

Sectors of the Canadian Economy

The sectors of the economy can be regrouped to form five largely goods-producing industries (NAICS 11 to 31-33) and fifteen services-producing industries (NAICS 41 to 91).

Goods-producing industries are primarily associated with the production of goods (e.g., growing of crops, generation of electricity, the manufacturing of computers). however, these sectors may also produce some services (e.g., pest control services, plumbing services, land subdivision, house-painting, support services for mining operations).The 20 economic sectors specified by the North American Industry Classification System (NAICS) 2002 are listed below. Links are to the official NAICS Canada 2002 definition of each sector.

Goods-producing industries

Agriculture, Forestry, Fishing and Hunting (NAICS 11)

Mining and Oil and Gas Extraction (NAICS 21)

Utilities (NAICS 22)

Construction (NAICS 23)
Manufacturing (NAICS 31-33)
Services-producing Industries
Wholesale Trade (NAICS 41)
Retail Trade (NAICS 44-45)
Transportation and Warehousing (NAICS 48-49)
Information and Cultural Industries (NAICS 51)
Finance and Insurance (NAICS 52)
Real Estate and Rental and Leasing (NAICS 53)
Professional, Scientific and Technical Services (NAICS 54)
Management of Companies and Enterprises (NAICS 55)
Administrative and Support, Waste Management and Remediation Services (NAICS 56)
Educational Services (NAICS 61)
Health Care and Social Assistance (NAICS 62)
Arts, Entertainment and Recreation (NAICS 71)
Accommodation and Food Services (NAICS 72)
Other Services - except Public Administration (NAICS 81)
Public Administration (NAICS 91)
Source: http://www.ic.gc.ca/eic/site/cis-sic.nsf/eng/h_00007.html

Sectors of the China Economy

Three Industries Industry structure has been classified according to the historical sequence of development. Primary industry refers to extraction of natural resources; secondary industry involves processing of primary products; and tertiary industry provides services of various kinds for production and consumption. The above classification is universal although it varies to some extent form country to country. Industry in China comprises:

Primary industry: agriculture (including farming, forestry, animal husbandry and fishery).

Secondary industry: industry (including mining and quarrying, manufacturing, production and supply of electricity, water and gas) and construction.

Tertiary industry: all other industries not included in primary or secondary industries.

Due to the fact that tertiary industry involves in a large variety of industries in China, it is divided into two sectors: the circulation sector and the service sector and further into four levels:

The first level: circulation sector, including transportation, storage, postal and telecommunications, wholesale and retail trade, and catering trade.

The second level: service sector providing services for production and consumption, including banking, insurance, geological survey, water conservancy management, real estates, service for residents, service for agriculture, forestry, animal husbandry, fishery, subsidiary services for transportation and communications, comprehensive technical services, ….

The third level: service sector for upgrading scientific, educational and cultural level of the people, including education, culture and arts, broadcasting, movies, television, public health, sports, social welfare and scientific research, ….

The fourth level: sector providing services for public needs, including government agencies, political parties, social organizations, military and police service.

Source :

http://www.stats.gov.cn/english/programsandindicators/currentsurveysindicators/index.htm

B2 Table: Economic Freedom Scores of China and Canada, 2010

Table1: Economic Freedom Scores of China and Canada, 2010

Freedom Indicators	Canada	China	Freedom Indicators	Canada	China
Business Freedom	96.5	49.7	Investment Freedom	75	20
Trade Freedom	88.1	72.2	Financial Freedom	80	30
Fiscal Freedom	76.7	70.2	Property Rights	90	20
Government Spending	54.1	88.1	Freedom from Corruption	87	36
Monetary Freedom	75.4	70.6	Labor Freedom	81.5	53.2

Data Source: http://www.heritage.org/index/Country/