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Essais sur le Choix du Secteur d'Emploi et

le Choix de l'Education

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Résumé

La thèse est composée de trois chapitres traitant des déterminants du choix de secteur d'emploi et de filière d'études ainsi que du chômage d'équilibre. Nous nous intéressons plus particulièrement à l'effet du salaire et de la durée de chômage sur ces choix. Dans le premier chapitre, nous développons un modèle endogène de choix de secteur d'emploi pour une économie composée de deux secteurs. Un travailleur préfère l'emploi dans le secteur qui maximise son revenu à vie actualisé. Nous montrons comment le chômage en attente d'un emploi dans le secteur à salaire élevé est une fonction croissante de l'écart salarial entre les deux secteurs employeurs, et une fonction décroissante de l'écart des durées de chômage espérées ainsi que du taux d'escompte personnel. Le résultat principal est que lorsque l'écart salarial est substantiel et/ou le taux d'escompte est faible, certains travailleurs préfèrent demeurer en chômage à la recherche d'un emploi dans le secteur qui paie les salaires élevés au lieu d'accepter l'emploi dans l'autre secteur. Nous confrontons ensuite notre modèle aux données de l'enquête marocaine sur la population active en considérant le secteur public comme étant celui qui paie les salaires élevés et le secteur privé comme étant le secteur à bas salaires. Nous utilisons les données d'un échantillon de 1609 diplômés universitaires et considérons un modèle structurel dans lequel nous estimons conjointement (1) la décision de chercher un emploi dans le secteur public vs. privé, (2) la détermination des salaires, et (3) la durée de chômage dans les deux secteurs. Les résultats empiriques principaux sont que le taux d'escompte intertemporel personnel est de l'ordre de 15% et que l'écart salarial en faveur du secteur public est très élevé (plus de 80%). Nous discutons ensuite l'implication des résultats pour des politiques visant à attirer les diplômés universitaires vers le secteur privé. Nous trouvons que les travailleurs préféreront l'emploi dans le secteur public même s'il paie le même niveau salaires que le secteur privé. Ceci résulte du fait que les travailleurs marocains sont peu sensibles aux changements de salaires et de durées de chômage lorsqu'ils choisissent un secteur d'emploi.

Dans le deuxième chapitre, nous analysons de manière détaillée la situation sur le marché de l'emploi au Maroc. Comme plusieurs autres pays en voie de développement, le Maroc connaît une montée importante du chômage des diplômés dont particulièrement ceux issus des universités. L'éducation réduit sérieusement les chances d'accès à l'emploi bien que le

niveau d'éducation de la population soit assez faible. Le taux d'analphabétisme parmi la population adulte approche 50%. En 2000, le taux de chômage agrégé était de 13.6%, mais il est était quatre fois plus élevé parmi les détenteurs de diplômes comparativement à ceux n'ayant aucun niveau d'instruction. Dans ce chapitre Nous essayons de trouver une explication valable à cette situation en se référant notamment à la littérature sur le sujet. Cependant, notre thèse est que le chômage des diplômés universitaire au Maroc est en partie un chômage d'équilibre qui s'explique par le fait que ces diplômés souvent préfèrent attendre un emploi dans le secteur public plutôt que d'en chercher dans le secteur privé. L'élément justificatif de cette thèse est que la détérioration l'emploi des diplômés universitaires s'est produite en parallèle avec la réduction de l'emploi dans la fonction publique à partir de 1983, date de mise en place du programme d'ajustement structurel. Nous exploitons alors les résultats du premier chapitre pour formuler des suggestions en vue de stimuler l'emploi des diplômés.

Dans le dernier chapitre, nous développons un modèle endogène de choix de filière d'études en utilisant les mêmes outils développés dans le premier chapitre. Dans ce modèle, le choix de filière est une fonction du revenu et de la durée de chômage espérés après la graduation ainsi que du taux d'escompte personnel. Pour l'application empirique, nous considérons cinq grandes filières et utilisons des données de l'enquête nationale canadienne auprès des diplômés. L'échantillon est constitué de 15124 individus ayant complété avec succès leur programme d'études dans un collège communautaire canadien (CEGEP au Québec) en 1990 et 1995. Durant cette période, les rendements (salaires et durées de chômage) à certaines filières comme « Santé » ont baissé relativement aux autres filières comme « Sciences ». Ceci constitue une bonne occasion pour identifier l'effet des revenus et durées de chômage sur le choix de filière d'études. Les résultats indiquent que la probabilité de choisir une filière particulière au collège dépend significativement des revenu et durée de chômage espérés dans cette filière relativement aux autres filières. Nous trouvons également que les femmes mettent moins de poids sur le revenu et la durée de chômage comparativement aux hommes. Enfin, il ressort que les personnes qui détenaient un emploi avant de commencer leurs études au collège favorisent le revenu et se soucient moins du chômage après la graduation lorsqu'elles choisissent leur filière d'études.

Mots clés: secteur public, éducation, chômage, filière d'études, revenue à vie, taux d'escompte, biais de sélection, Maroc, Canada.

Abstract

The thesis is organized in three essays on the determinants of employment sector and field of study choices. I specifically focus on the effects of earnings and unemployment duration gaps on those choices.

In the first chapter, I develop a model of endogenous choice of employment sector in an intertemporal context for a two-sector economy. A worker prefers employment in the sector that maximizes his or her discounted lifetime income. I show how unemployment duration while awaiting employment in the high-wage sector is an increasing function of the wage differential between sectors, a decreasing function of the expected differential in unemployment duration and a decreasing function of the individual discount rate. When the wage differential is substantial and/or if the discount rate is low, some workers rationally choose to remain unemployed instead of accepting employment in the low-wage sector. I test and find empirical support for this argument using data from the 1998 Moroccan labour force survey, with the high wage sector being the public sector, and the low-wage sector being the private sector. I use data from a sample of 1,609 university graduates and consider a structural model estimating simultaneously (1) the decision to work (or to seek employment) in the public versus private sector, (2) the wage equation in each sector, and (3) the unemployment duration equation in each sector. The main empirical results of this study are that the individual intertemporal discount rate is about 15%, and that the public sector pays high hourly wages (over 80% than those in the private sector). I also discuss the implications of the results for policies that could help attract university graduates to the private sector. I find that workers prefer the public sector even when it pays the same as the private sector and despite the high risk of unemployment. In fact, the probability of preferring employment in the public sector is not very sensitive to wages or unemployment durations variations. As a result, the modification of the workers' behaviour necessitates extreme changes in those variables.

In the second chapter, I present a detailed analysis of the Moroccan labor market. Like many developing countries, Morocco has experienced a significant rise in the unemployment rate among educated workers, principally among those holding university degrees. In addition, average educational achievement is very low. However, at the same

time education reduces the probability of being employed. The illiteracy rate is about 50% for the population sector aged 15 years and older, while one out of two workers has never attended school. In 2000, the aggregate unemployment rate was 13.6%, but it was four times higher among educated workers than uneducated workers. In the second chapter, I try to explain this situation in light of the literature on the subject. My thesis is that the high unemployment rate among the highly educated workers in Morocco is partly an equilibrium, since some workers prefer to wait for employment in the public sector instead of seeking employment in the private sector. An important piece of evidence supporting this thesis is that the unemployment rate of highly educated workers started to rise precisely when the public sector stopped hiring large numbers of educated workers in the 1980s. I then exploit the results from the first chapter and formulate suggestions on how to reduce the unemployment rate among university graduates.

In the last chapter, I develop a model of endogenous choice of the field of study by using methods similar to those presented in the first chapter. In this model, field choice is a function of expected earnings, unemployment duration and personal discount rate. For the empirical application, I consider five broadly defined college fields of study and use data from the Canadian Survey of Graduates of 15,124 individuals who successfully completed their programs at Canadian community colleges (CEGEPs in Quebec) in 1990 and 1995. Over this period, the returns (earnings and unemployment duration) to fields such as health declined relative to other fields such as science and engineering. This provides useful leverage for identifying the impact of earnings and unemployment duration on the choice of field of study. The results indicate that the probability of selecting a specific college field of study depends significantly on expected earnings and unemployment duration in that field relative to other fields. I also find that women put less weight on earnings and unemployment durations than men when choosing a field of study, while individuals who were employed prior to starting college put more weight on earnings but less weight on unemployment duration.

Key words: public sector, education, unemployment, field of study, lifetime earnings, discount rate, sample selection bias, Morocco, Canada.

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Dédicace

à ma femme Souad, à notre fils Othmane, à ma mère Aicha

et à la mémoire de mon père Ahmed

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Introduction Générale

Plusieurs pays en voie de développement (PVD), notamment en Afrique, connaissent une montée importante du chômage des diplômés, particulièrement ceux issus des universités. Cette situation semble se produire en parallèle avec la mise en place par ces pays de programmes d'ajustement structurel dont l'une des principales composantes était la forte réduction du recrutement dans le secteur public. Malgré ce changement dans la politique du secteur public, celui-ci demeure toujours très convoité par les diplômés à la recherche d'emploi.

L'emploi dans le secteur public est réputé pour sa stabilité, ses conditions et surtout pour ses salaires élevés comparativement au secteur privé (Smith, 1976a et 1982; Gunderson, 1979; Gaag et Vijverberg, 1988; Gelb, Knight, et Sabot, 1991 et Gunderson, Hyatt et Riddell, 2000). Cette segmentation du marché de l'emploi est plus marquée dans les PVD où fleurissent les activités informelles. Ceci suggère que le chômage des diplômés universitaires pourrait être un chômage d'équilibre. En effet, certains travailleurs peuvent rationnellement choisir de demeurer en chômage à la recherche d'un emploi dans le secteur public plutôt que d'accepter un emploi dans le secteur privé. Cet argument est similaire à celui avancé par Harris et Todaro (1970) pour expliquer le chômage urbain dans les PVD. Selon Harris et Todaro, ce chômage trouve son origine dans l'écart salarial substantiel entre les milieux urbain et rural. Ainsi, cet écart salarial attire les travailleurs ruraux vers le marché d'emploi en milieu urbain en nombre que ce marché ne peut insérer. Le taux de chômage urbain intervient comme force d'équilibre dans cette migration. Les travailleurs qui se trouvent en chômage le sont volontairement puisqu'ils refusent l'emploi dans le milieu rural.

Cependant, ce type d'explication pour le chômage n'a jamais été testé formellement pour les PVD. Pour le faire, nous développons dans le premier chapitre un modèle de choix de secteur dans une économie à deux secteurs employeurs payant des niveaux de salaires différents. Les travailleurs sont exposés au chômage dans les deux secteurs, mais le sont davantage dans le secteur à salaire élevé. Un travailleur préfère l'emploi dans le secteur qui maximise son revenu à vie escompté. Dans le modèle développé, le chômage en attente d'un emploi dans le secteur à salaire élevé est une fonction croissante de l'écart salarial

entre les deux secteurs employeurs, et une fonction décroissante de l'écart des durées de chômage espérées ainsi que du taux d'escompte personnel.

Nous confrontons ensuite le modèle théorique aux données d'un échantillon de 1,607 diplômés universitaires tiré de l'enquête marocaine sur la population active de 1998. Dans cette application le secteur public est celui qui paie les salaires élevés. Le Maroc constitue, en effet, un cas idoine pour tester notre modèle. En 2000, le taux de chômage parmi les travailleurs éduqués au Maroc (tous niveaux confondus) était de 27.5% contre 7.1% seulement parmi les travailleurs non éduqués. Depuis 1983, année de mise en place du programme d'ajustement structurel, le nombre de nouveaux postes d'emploi dans la fonction publique a été ramené à moins de 15000 par année contre 30000 à 51000 entre 1976 et 1982. Toutefois, le secteur public reste toujours très convoité par les diplômés universitaire comme en témoignent leurs manifestations presque quotidiennes réclamant ce qu'ils pensent être leur droit à l'emploi dans le secteur public.

Pour l'application empirique, nous élaborons un modèle structurel dans lequel nous estimons simultanément l'équation de sélection qui représente la décision de travailler (ou de chercher un emploi) dans le secteur public versus secteur privé, l'équation de salaire et la durée du chômage dans chaque secteur. Les résultats empiriques principaux sont que le taux d'escompte intertemporel des individus est de l'ordre de 15% et que l'écart salarial public-privé est substantiel (plus de 80%). De plus, les travailleurs sont peu sensibles aux écarts de salaire et de durée de chômage. En effet, il ressort que même si les deux secteurs paient le même niveau de salaires, les travailleurs continueront de préférer l'emploi dans le secteur public. Les travailleurs mettent plus de poids sur les facteurs non pécuniaires.

Dans le deuxième chapitre, nous analysons de manière détaillée la situation sur le marché de l'emploi au Maroc. En 2000, le taux de chômage parmi les diplômés de l'enseignement supérieur dépassait 30% (plus de 40% parmi les détenteurs d'une licence universitaire). Cette situation survient alors que ces diplômés représentent seulement 10% de la force de travail au Maroc et qu'un travailleur sur deux n'a jamais fréquenté l'école.

Plusieurs facteurs expliquent l'abondance du chômage au Maroc et dans les PVD. Les plus communément évoqués sont liés à l'accroissement démographique et à la faible performance de l'économie. Dans le cas des diplômés, d'autres facteurs s'ajoutent tels que

l'augmentation rapide du nombre de diplômés, l'inadéquation entre l'éducation et l'emploi, et surtout la réduction de l'emploi dans le secteur public. Concernant ce dernier facteur, la part des diplômés de l'enseignement supérieur dans la population urbaine en chômage au Maroc a commencé à augmenter immédiatement après la mise en œuvre du programme d'ajustement structurel en 1983. Ainsi, cette part est passée de 3,1% en 1984 à 23,2% en 1997. Cependant, en dépit de la réduction considérable de l'emploi dans le secteur public, les diplômés continuent de convoiter l'emploi dans ce secteur, ce qui n'arrange pas leur situation. En effet, certains travailleurs préfèrent demeurer en chômage en attente d'un emploi dans le secteur public au lieu d'en chercher dans le secteur privé. La préférence pour l'emploi dans le secteur public est si grande que Bougroum, Ibourk et Trachen (1999) considèrent tous les diplômés au Maroc comme demandeurs potentiels et permanents d'un emploi dans le secteur public.

Nous analysons également les politiques d'emploi poursuivies par le gouvernement marocain au cours des trois dernières décennies et montrons comment ces politiques ont contribué au comportement des diplômés en matière de recherche d'emploi.

Nous formulons ensuite des propositions visant à intéresser les diplômés à l'emploi dans le secteur privé comme solution à leur chômage. Il s'agit en premier lieu d'améliorer les opportunités d'emploi dans ce secteur pour les diplômés aussi bien quantitativement que qualitativement. Ceci requiert un niveau de croissance économique élevé qui soit générateur d'emploi dans le secteur privé formel. La croissance économique sera davantage favorisée si les diplômés s'insèrent massivement dans le secteur privé. Le secteur public a été pendant longtemps le seul employeur des diplômés universitaires qui, de ce fait, s'engagent massivement dans des emplois non productifs. Par conséquent, le taux de rendement à l'éducation est élevé pour les individus mais, en même temps, la contribution de l'éducation à la croissance économique est très faible (Orivel, 1995).

Nous suggérons également que les politiques actuelles de recrutement et de rémunération dans le secteur public soient réformées. La satisfaction des besoins réels du secteur public en travail, en quantité et en qualité, devra graduellement remplacer la politique actuelle dont l'objectif principal est la lutte contre le chômage.

Nous traitons également le problème de l'éducation au Maroc. Le faible investissement en capital humain (un adulte sur deux est analphabète) limite le développement socio-économique durable du pays. Or, l'investissement en capital humain stimule la croissance économique et par conséquent l'emploi, ce qui favorise, en retour, l'investissement en capital humain (Cahuc et Zylberberg, 1996). De plus, l'amélioration du niveau d'éducation de la population contribuera à réduire la part du secteur informel dans l'économie en faveur du secteur organisé offrant des emplois décents au niveau des aspirations des diplômés.

Dans le dernier chapitre nous étudions les déterminants du choix de filière d'études au Canada. Plusieurs études confirment l'importance des facteurs monétaires dans ce choix (Wilkinson, 1966; Weiss, 1971; Polachek, 1978; Berger, 1988 ; Paglin & Rufolo, 1990; et Montmarquette, Cannings et Mahseredjian, 2002). Cependant, ces études ignorent souvent l'effet du risque de chômage associé à chaque filière dans le choix en question. L'étude de Finnie (1999b) montre que le taux de chômage parmi les diplômés des universités canadiennes varie grandement d'une filière d'études à l'autre, ce qui, à notre avis, ne manquerait pas d'affecter le choix des étudiants.

D'autre part, nous constatons que la majorité des études sur le choix de filière d'études en Amérique du Nord utilisent des données américaines, alors que les études utilisant des données canadiennes sont souvent descriptives et/ou ignorent le biais de sélection associé au choix de filière (Wilkinson, 1966; Dodge et Stager, 1972; Vaillancourt, 1995; et Finnie, 1999b). Finnie (1999b) fournit une étude empirique détaillée sur la situation des diplômés canadiens sur le marché de l'emploi par filière d'études, mais il reconnaît que ses résultats ne peuvent servir pour élaborer des politiques. En effet, l'étude ne tient pas compte du processus de choix de filières d'études par les étudiants.

Par conséquent, le principal objectif de ce chapitre est d'utiliser des données canadiennes pour analyser les déterminants du choix de filière d'études. Pour ce faire, nous utilisons les mêmes outils du premier chapitre pour développer un modèle endogène de choix de filière d'études. Dans ce modèle, les principaux déterminants du choix sont le revenu et la durée de chômage espérés après la graduation ainsi que le taux d'escompte personnel.

Pour l'application empirique, nous utilisons des données de l'enquête nationale canadienne auprès des diplômés. L'échantillon est constitué de 15124 individus ayant réussi leur programme d'études dans un collège communautaire canadien (CEGEP au Québec) en 1990 et 1995. Notre analyse inclut également une variété de variables socio-économiques susceptibles d'influencer le choix des étudiants.

L'utilisation des cohortes 1900 et 1995 permet d'évaluer l'effet des évolutions qu'ont connues certains secteurs d'activité pendant la période séparant les deux cohortes. Par exemple, les dépenses publiques dans les services sociaux (incluant le secteur de la santé) ont significativement baissé, alors que les nouveaux secteurs technologiques (incluant le secteur de la biotechnologie) ont connu un essor important. Ces chocs sont très utiles pour l'identification des effets du revenu et du chômage sur le choix de filière d'études.

Empiriquement, l'équation de sélection est estimée en quatre étapes. Les équations de salaire corrigées du biais de sélection sont estimées en utilisant la nouvelle méthode proposée par Bourguignon, Fournier et Gurgand (2001). Cependant, les paramètres estimés de l'équation de sélection restent comparables lorsque les salaires sont estimés à l'aide de la méthode proposée par Lee (1983). Les résultats indiquent que le revenu et la durée de chômage espérés dans chaque filière d'études ont un effet significatif sur la probabilité de choisir cette filière. Les probabilités de choisir la filière « Affaires et Commerce » ou la filière « Sciences » sont les plus sensibles aux variations du revenu. A l'opposé, la probabilité de choisir la filière « Sciences Sociales » est celle qui dépend moins de ces variations. Nous trouvons également que les femmes mettent moins de poids sur le revenu et la durée de chômage comparativement aux hommes. Ce résultat concorde avec celui des études précédentes (voir par exemple, Montmarquette, Cannings et Mahseredjian, 2002). Enfin, il ressort des résultats que les personnes qui détenaient un emploi avant de commencer leurs études au collège favorisent le revenu et se soucient moins du chômage après la graduation lorsqu'elles choisissent leur filière d'études. Cependant, nos résultats montrent que les probabilités de choix associées à chaque filière d'études sont généralement inélastiques relativement au revenu et à la durée de chômage, ce qui limite l'efficacité de toute politique visant à modifier significativement la distribution actuelle des diplômés sur les filières en se basant sur des ajustements du revenu et/ou de la durée de chômage. Enfin, il ressort que d'autres facteurs sont également déterminants dans les choix des étudiants.

Chapitre 1

Employment Sector Choice in a Developing Labour Market

1.1 Introduction

Many developing countries, particularly in Africa, have experienced a significant rise in unemployment among educated workers, principally among holders of university degrees. This worsening unemployment problem appears to be linked to a slowdown of recruitment in the public sector, the principal employer for educated workers in developing countries. In Morocco, for example, the unemployment rate among educated workers in 2000 was 27.5%, as opposed to 7.1% among non-educated workers. This deterioration in employment rates is particularly important for workers with Bachelor's degrees, for whom the unemployment rate is currently above 40%. Under structural adjustment policies imposed by the International Monetary Fund, recruitment in the public sector has dropped sharply since 1983. New employment positions created in recent years do not exceed more than 15,000 annually, as opposed to between 29,000 and 51,000 in the 1970s. However, the public sector is still coveted by workers, particularly those holding university degrees, as evidenced by their almost daily demonstrations claiming their "right" to employment in the public sector. Data from the 1998 Moroccan urban labour force survey show that about half of highly educated unemployed workers desire employment exclusively in the public sector. In addition to job stability, the public sector generally offers higher wages as compared to the private sector. This suggests that the unemployment of educated workers could be an equilibrium since some workers rationally prefer to remain unemployed while waiting for employment in the public sector. A similar argument was advanced by Harris

and Todaro (1970) to explain high urban unemployment in developing countries. Because of a substantial wage differential between urban and rural areas, some rural workers choose to migrate to urban areas in search of high-wage employment. However, the number of migrants often exceeds the number of vacant employment positions in urban areas, resulting in a positive urban unemployment rate. The continuation of such migration in spite of high risk of unemployment constitutes a rational choice on the part of migrants looking to improve their economic situation. Yet this explanation for rising unemployment has not been tested formally for developing countries.

In order to test this hypothesis, we develop a model of sectoral choice in an intertemporal context for a two-sector economy, where sectors pay different levels of wages (see Section 1.3.1). Workers are exposed to unemployment in the two sectors (with high-wage sector being more exposed to unemployment than the low-wage sector), and choose their sector by maximizing the present value of their expected lifetime income. We then show that unemployment while waiting for employment in the high-wage sector is an increasing function of the wage differential between sectors, a decreasing function of the expected gap in unemployment durations and a decreasing function of the individual discount rate. The main outcome of the model is the conclusion that when the wage differential is substantial and/or the individual discount rate is low, some workers rationally choose to remain unemployed instead of accepting employment in the low-wage sector.

In order to evaluate the model empirically, we use data from a sample of 1,609 university graduates drawn from the 1998 Moroccan labour force survey (see Section 1.4), where the high-wage sector is the public sector and the low-wage sector is the private sector. We consider a structural model estimating simultaneously (1) the decision to work (or to seek employment) in the public versus private sector, (2) the wage equation in each sector, and (3) the unemployment duration equation in each sector (see Section 1.3.2).

The main empirical results of this study are that the individual intertemporal discount rate is about 15%, and that the public sector pays high hourly wages (over 80% than the private sector). Our results also indicate that the probability of preferring employment in the public sector is not very sensitive to wages and unemployment durations variations, which suggests that any policy aimed at modifying significantly the workers' behaviour will require extreme changes in those variables. As a result, workers would prefer employment

in the public sector (for non-pecuniary reasons) even if this sector paid the same as the private sector and despite the high risk of unemployment in this sector.

1.2 Brief Survey of Literature on Sector Choice

The analysis of workers' behaviour in the labour market has constituted the subject of an abundant body of literature seeking to explain phenomena such as unemployment. Several models have been developed, of which the best known is that of Harris and Todaro (1970). The Harris-Todaro model focuses on the wage gap between areas as responsible for migration in less developed countries which results in high level of urban unemployment. More precisely, according to this model, in rural areas the economy is based on the agricultural sector offering free access to employment but paying low wages, while in urban areas the manufacturing sector pays higher wages but is limited in its employment capacity. Migration from rural to urban areas is caused by the wage gap, as many rural workers seek to improve their economic situation and move to urban areas, but the number of migrants exceeds the number of vacant positions in urban areas, creating a positive urban unemployment rate. Thus, the decision to migrate depends on the wage gap and the probability of finding employment in urban areas. The employment rate in urban areas acts as a force of equilibrium in this migration, halting it when the expected wage in urban areas is equal to the wage in rural areas. When the equilibrium is reached migration stops. However, certain workers who had already migrated to urban areas remain unemployed, whereas they could have been employed in rural areas if they had stayed there. The existence of such migration in spite of a high urban unemployment rate constitutes a rational economic choice on the part of migrants looking to improve their welfare. Workers are thus "voluntarily" unemployed.

In subsequent models the urban sector is segmented into a protected modern sector, where wages are institutionally fixed above the market level and which is characterized by entrance restrictions, and a non-organized (traditional) sector, to which access is free and where wages are determined by the market (see for example Stiglitz, 1974 and 1976; Eaton & Neher, 1975; Fields, 1975 and Cole & Sanders, 1985). The same factors explaining the allocation of the labour force between urban and rural areas in the Harris and Todaro model explain the workers' choice of employment in the traditional sector or

unemployment during the search for employment in the protected sector. Moreover, fixing wages at levels significantly higher than those dictated by the market involves equilibrium with a high urban unemployment rate. Additionally, Stiglitz (1974) treats urban wages as an endogenous variable. However, his conclusions are the same as those of Harris and Todaro. Migration results mainly from a significant wage differential and not from a surplus of labour in rural areas. Stiglitz also suggests the role that the government could play in reducing this migration and consequently urban unemployment. The government, for example, could directly control the size of the public sector localized mainly in urban areas as well as the wages in this sector and in urban areas in general, thus making the public sector and urban areas less attractive for rural workers. In a mixed economy (public-private), the government could adapt the size of the public sector in urban and rural areas, its technology (intensity of labour), and the level of wages to reduce the expected urban wages for rural workers.

The principal conclusion of the above-mentioned models concerning the causes of unemployment is well summarized by Eaton and Neher (1975): *"The unemployed have 'only themselves to blame,' so to speak, in the sense that they have made a rational calculation to improve their economic position. They are voluntarily unemployed."*

There have been developed other models, known as job-search models. They generally concentrate on the process of acceptance of employment by workers. Some job seekers (employed or unemployed) reject some job offers before finally accepting employment (see for example Blau (1992) in the case of the United States). Workers generally know the wage distribution for their ability level when they receive employment offers. An offer is accepted when the wage is higher than the reserve wage. Thus, at any given moment, the probability of being employed is equal to the probability of receiving an offer times the probability of accepting this offer (i.e. the related wage is higher than the reserve wage). In general, high-wage jobs are less accessible, so workers with high reserve wages are likely to remain unemployed for a long time. However, they are generally rewarded by high wages (see for example Barnes, 1975; Maani & Studenmund, 1986, and Sandell, 1980, for empirical applications.)

Alternatively, Shapiro and Stiglitz (1984) have proposed the theory of efficient wages according to which some firms pay higher wages as compared to wages of the market in order to encourage greater effort from their workers. This policy, which also aims at retaining or attracting skilled workers, is more likely to be observed when other methods of productivity improvement - such as supervision and monitoring of workers - are expensive or inefficient. This policy involves a slowdown in the labour demand and an increase in the labour supply, and thus the appearance of involuntary unemployment. Job loss becomes costly for workers paid at efficient wages since their wages are higher as compared to those of the market. Moreover, these workers face unemployment risks if they are laid off. The higher the unemployment rate, the longer the duration of the job search and, consequently, the higher the cost of shirking. The labour market is then segmented into a primary sector which pays high wages and a secondary sector which pays low wages. This situation is similar to that represented in the Harris-Todaro model. Some workers prefer seeking or waiting for employment in the primary sector rather than working in the secondary industries. Workers' behaviour will depend on the wage gap between the primary and the secondary sectors as well as the probability of finding employment in each sector.

Lastly, many authors were particularly interested in the choice between the public sector and the private sector for employment. The public sector constitutes an important employer in all countries, developed or developing. Its share in the total employment is approximately 21% in the OECD countries and 23% in the developing countries (ILO, 1999) and its wages are, on average, higher as compared to those of the private sector. This corresponds to what is commonly known as the "wage premium" of the public sector (see for example Smith, 1976a and 1982; Gunderson, 1979; Gaag and Vijverberg, 1988; Gelb, Knight and Sabot, 1991; and Gunderson, Hyatt and Riddell, 2000). This premium is more significant in developing countries where the informal sector is important and is more profitable for women and less qualified workers (Gunderson, Hyatt and Riddell, 2000, and Orivel, 1995). In order to explain why the public sector pays high wages, Gunderson, Hyatt and Riddell (2000) argue that the government is under political pressure to act as an exemplary employer, at least with regard to compensation. Thus, the surplus of labour supply in the public sector is often seen as a consequence of the search for high wages (Gelb, Knight and Sabot, 1991); however other studies suggest that non-pecuniary factors also play a significant role in this case (Blank, 1985; Gaag and Vijverberg, 1988; Smith, 1976b; Ophem, 1993; and Stelcner, Graag and Vijverbeg, 1989). Employment in the public

sector is generally desired for its stability, which attracts risk-adverse workers (Bellante and Link, 1981). Thus, equal wages in public and private sectors will not necessarily reduce the excess of labour supply for the public sector.

1.3 Endogenous Sector Choice Model

1.3.1 Theoretical Framework

For the sake of simplicity, we assume the schooling level of workers to be exogenous (i.e. the schooling choice is independent of the sector choice). We also assume that workers have an infinite planning horizon starting when they enter the labour force. The utility level in period t depends on consumption $c(t)$ during this period. This utility is equal to $u\big(c(t)\big)$, where $u(.)$ is an increasing concave function. For ease of exposition, and with application in Section 4 in mind, we assume that there are only two employment sectors, sector 1 and sector 2. The discounted lifetime income in sector j, is equal to W_j, $j=1,2$. The discounted lifetime utility conditional on a given consumption profile is:

$$U\big(c(t)\big) = \int_0^\infty u\big(c(t)\big)e^{-\rho t}dt \quad (1)$$

where ρ is the worker's subjective discount rate.

We assume that a worker can borrow or lend freely at a fixed interest rate R [1]. Hence, the intertemporal budget constraint conditional on employment in sector j is:

$$\int_0^\infty c(t)e^{-Rt}dt = W_j \quad (2)$$

Thus, conditional on employment in sector j, the optimal consumption path maximizes:

$$H\big(c(t),j\big) = U\big(c(t)\big) + \lambda\left[W_j - \int_0^\infty c(t)e^{-Rt}dt\right] \quad (3)$$

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[1] The equivalent of this assumption for some workers in a developing country would be that these workers are sponsored by their families during their unemployment spell. Once employed, workers in return help their families.

Assuming that $u\big(c(t)\big)=ln\big(c(t)\big)$, and $\rho=R$, first order conditions imply that the optimal consumption path is $c*(t)=RW_j$. At each period t, the worker consumes a constant share of his or her discounted lifetime income. Consequently, optimal utility at each period t is constant as well: $u*\big(c(t)\big)=ln\big(W_j\big)-ln(R)$.

Since R is fixed, maximizing $u\big(c(t)\big)$ amounts to maximizing $w_j=ln\big(W_j\big)$. Therefore, a worker will prefer employment in the high-discounted-lifetime income sector.

In order to determine w_j, we suppose that workers are exposed to unemployment risks in each sector. The unemployment duration in each sector is a random variable of which the density function is well known for all workers. We also suppose that there is no income during the unemployment phase, and that the job search process is costless. Thus, for a worker with S units of schooling ($S\geq0$) and seeking employment in sector j, $j=1,2$, the log of the discounted lifetime income is given by:

$$w_j=ln\big(W_j\big)=ln\left[\int_{T_j}^{\infty}Y_j\big(S,t-T_j\big)e^{-Rt}dt\right]$$

$T_j\geq0$ is the length of unemployment prior to finding employment in sector j, $j=1,2$. $Y_j(S,t)$ is the real wage paid by sector j to a worker having completed S units of schooling and possessing t units of experience ($t\geq0$). R is the worker's discount rate.

Since the unemployment duration T_j is random, w_j is random as well. The expected value for w_j is given by:

$$E\big(w_j\big)=E\left(ln\left[\int_{T_j}^{\infty}Y_j\big(S,t-T_j\big)e^{-Rt}dt\right]\right)^2$$

The worker will prefer employment in the sector which maximizes his or her expected lifetime income. Thus, he or she will prefer employment in sector j if

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[2] In this case, the expected utility at period t is $E(u(t))=E(w_j)+ln(R)$.

$E\left(w_j\right)=max\left\{E\left(w_1\right),E\left(w_2\right)\right\}, j=1,2.$ He or she will be indifferent to employment sector if the same level of lifetime income is expected in both sectors.

We should mention that the worker's decision depends only on the unemployment durations and wage levels in the two sectors. Other factors such as job stability, monitoring, social advantages, etc. are ignored.[3]

Sector choice as presented is done at the time of entry into the labour force. However, the chances of finding a job could depend on the duration of time spent unemployed. Indeed, if the hazard rate increases over time, the chances of finding employment increase with the duration of time spent unemployed, which is not the case if that rate decreases over time. Thus, the duration of unemployment prior to funding employment could be decreasing or increasing (for example, it could be decreasing in one sector and increasing in the other one). Unemployment could also cause a depreciation of human capital, which would lead employers to prefer recruiting first among recent graduates. This would make it difficult for long-term unemployed workers to find employment. Thus, at any time t, when the worker is still unemployed the discounted lifetime income is re-calculated in relation to the duration of time spent unemployed. If at time t ($t \geq 0$) the worker is still unemployed, the expected log of this discounted lifetime income for the remainder of his or her life cycle when seeking employment in sector j, $j=1,2$, up-dated at time $t=0$ [4] is:

$$E\left(w_j \mid T_j > t\right) = E\left(ln\left[\int_{Tj}^{\infty} Y_j\left(S, u - T_j\right)e^{-Ru}du\right] \mid T_j > t\right) \qquad (4)$$

with $E\left(w_j\right) = E\left(w_j \mid T_j > 0\right).$

We define an intertemporal function $V\left(t\right)$ representing the expected-discounted lifetime income differential between the two sectors:

$$V\left(t\right) = E\left(w_1 \mid T_1 > t\right) - E\left(w_2 \mid T_2 > t\right), \; t \geq 0 \qquad (5)$$

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[3] However, in the econometric model estimated later, we control for the education level and gender and introduce a random term likely to collect the non-observed variables.

[4] Under the assumptions we formulate later in the paper, we can show that the expected discounted lifetime income gap between the two sectors is independent on the time this gap is up-dated.

This function expresses the dynamics of the worker's preference. At any time t, the worker's decision is to prefer employment in sector 1 if $V(t) > 0$, and in sector 2 otherwise. He or she will be indifferent if $V(t) = 0$.

In order to model the worker's behaviour in a more explicit way, we make the additional following assumptions.

Assumption 1: In addition to being exogenous, the worker's schooling level remains constant during the life cycle. There is no possible return to school after entering the labour force. This condition appears to be restrictive, but facts show that few people return to school after dropping out; even if they do, they remain in school for a short period of time (Card and Lemieux, 2000b). In addition, in Section 1.4 we restrict our empirical application to university graduates, who are relatively less likely to go back to school after entering the labour force as compared to other workers with below university level.

Assumption 2: Once hired, the worker keeps his or her job for the remainder of his or her life cycle. There is no risk of layoffs in this case. We also assume that workers cannot take a low-wage job while seeking employment in the high-wage sector. This assumption matches the situation of the Moroccan labour market, where employment in the public sector (high-wage sector) mainly aims at reducing unemployment among educated workers. In addition, major operations of recruitment in the public sector are often preceded by censuses of unemployed graduates. Consequently, unemployed workers looking for their first jobs are more likely to be hired as compared to workers who already have a job in the private sector. This is, therefore, about an institutional constraint.

Assumption 3: The log of wages is an additive and separable function of education and years of experience in each sector:

$$Y_j(S,t) = f_j(S)h_j(t) \quad j = 1,2 \,, \, t \geq 0 \,, \, h_j(0) = 1 \quad (6)$$

So: $y_j(S,t) = ln(Y_j(S,t)) = ln(f_j(S)) + ln(h_j(t))$.

Assumption 4: Wages grow at a constant rate $g_j \geq 0$: $h_j(t) = e^{g_j t}$, $t \geq 0$. In order to ensure that the log of discounted lifetime income is finite, we impose $g_j < R$.

Under these assumptions, the expected log of the discounted lifetime income in sector j, $j=1,2$, simplifies to:

$$E\left(w_j \mid T_j > t\right) = ln\left(\frac{f_j(S)}{R - g_j}\right) - R.E\left(T_j \mid T_j > t\right) \qquad (7)$$

The quantity $ln\left(\dfrac{f_j(S)}{R - g_j}\right) = ln \int_0^\infty y_j(S,t) e^{-Rt} dt$ is the log of the discounted lifetime income in sector j when the worker does not experience unemployment, i.e. when access to employment is ensured for all workers seeking employment in this sector ($T_j = 0$).

Therefore, the quantity $R.E\left(T_j \mid T_j > t\right) \geq 0$ represents the expected loss in the log of the discounted income due to unemployment. This loss increases with the discount rate and the duration of time spent unemployed ($\partial R.E\left(T_j \mid T_j > t\right) / \partial R \geq 0$ and $\partial E\left(T_j \mid T_j > t\right) / \partial t \geq 0$).

The discount rate plays a significant role, since it represents the weight allocated by workers to the unemployment factor. Indeed, for a worker with a high-discount rate, the discounted lifetime income drops quickly as the unemployment duration increases. Then, the worker's first concern will be minimizing this loss while making haste to find employment. On the other hand, for a low-discount rate worker, starting date of employment does not matter much, since his or her expected lifetime income is only slightly affected by it. The worker could wait until he or she finds high-paid employment.

In the same way, by regarding R as the interest rate, the above results imply that workers with easy access to credit (or from affluent families) can endure long periods of job search and can hold out for high-paying employment. On the other hand, those who cannot get financial help have no choice but to accept any job, regardless of remuneration.

The expected log of discounted lifetime income differential between sector 1 and sector 2 at time t, given by the function $V(t)$, becomes:

$$V(t) = ln\left(\frac{f_1(S)}{R-g_1}\right) - ln\left(\frac{f_2(S)}{R-g_2}\right) - R\left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right]$$

$$= ln\left(\frac{f_1(S)}{f_2(S)}\right) - ln\left(\frac{R-g_1}{R-g_2}\right) - R\left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right] \quad (8)$$

The discount rate allows workers to arbitrate between well-paying employment with possible longer unemployment duration and low-paid employment with possible shorter unemployment duration.

Some important remarks should be formulated at this point.

Remark 1: The worker can make a choice between (or have a preference for) the two sectors only if his or her probability of finding employment in each sector is higher than nil. In other words, if a worker has no chance to be hired in one or both sectors, there is no choice to be made. Indeed, if the probability of finding employment in sector j is equal to zero, the unemployment duration T_j is infinite, and consequently the discounted lifetime income W_j is simply equal to zero. Sector choice is thus allowed only for workers who are potentially "employable" in both sectors.

Remark 2: Although the expected discounted lifetime income differential $V(t)$ depends on the personal discount rate, this rate affects the worker's preference (or more precisely the sign of $V(t)$) only if the high-wage sector is that which is more exposed to unemployment of the two. This occurs when $ln\left(\frac{f_1(S)}{R-g_1}\right) - ln\left(\frac{f_2(S)}{R-g_2}\right)$ and $\left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right]$ have the same sign. In the case where the high-wage sector is that in which the access to employment is easier than in the low-wage sector, the worker will always prefer employment in this sector, whatever the value of his or her discount rate. Indeed, if $ln\left(\frac{f_1(S)}{R-g_1}\right) > ln\left(\frac{f_2(S)}{R-g_2}\right)$ and at the same time $E(T_1 \mid T_1 > t) < E(T_2 \mid T_2 > t)$, then $V(t) > 0$ for any value of the discount rate R.

The following remarks are minor, but deserve to be mentioned.

Remark 3: Unemployment has no effect on sector choice if a worker's discount rate is equal to zero. In this case, the worker seeks high-paying employment for any unemployment duration. All future incomes have the same present value regardless of time when they are received.

Remark 4: Unemployment has no effect on sector choice if the distribution of unemployment duration is the same in both sectors. In this case, sector choice is determined by the wage differential, regardless of the value of the discount rate.[5]

Taking into account these remarks, we assume that a worker is potentially "employable" in both sectors, and remuneration in sector 1 is better; however, sector 1 is more exposed to unemployment than sector 2. This is included in the following additional assumptions:

Assumption 5: $0 < T_j < \infty, j=1,2.$

Assumption 6: $ln\left(\dfrac{f_1(S)}{R-g_1}\right) > ln\left(\dfrac{f_2(S)}{R-g_2}\right).$

These two assumptions make it possible for the function $V(t)$ to take positive as well as negative values, according to t and the personal discount rate value.

Since the second term of $V(t)$, that is $[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)]$, depends on t, the worker's preferred sector could change over time. In the example when the variables T_1 and T_2 have exponential density functions, the worker will, however, prefer employment in the same sector during his or her entire unemployment spell.

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[5] In this case, we have $E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t) = 0$, and therefore

$$V(t) = log\left(\dfrac{f_1(S)}{R-g_1}\right) - log\left(\dfrac{f_2(S)}{R-g_2}\right).$$

Indeed, if $T_j \sim Exp(\lambda_j)$, $\lambda_j > 0$, $j=1,2$, then $E\left(T_j \mid T_j > t\right) = \dfrac{1}{\lambda_j} + t$, and

$$E\left(T_1 \mid T_1 > t\right) - E\left(T_2 \mid T_2 > t\right) = \frac{1}{\lambda_1} - \frac{1}{\lambda_2}.$$ $V(t)$ is constant, since it does not depend on t.

It is important to discuss the relationship between sectoral preference and job search. In the Harris-Todaro model (Harris and Todaro, 1970) this relationship is obvious since the two employment sectors are located in different geographical areas. Rural workers who prefer a job in urban areas must move to those areas to seek employment. In other words, workers can seek employment in one and only one sector at any one time, depending on their physical location. In our model, the situation is different (and also more complicated) since the two employment sectors could be located in the same area. If we assume that workers seek employment only in the sector they prefer, this will greatly simplify the situation since the sector where a worker seeks employment will be exactly the preferred one. This also means that for employed workers, the current employment sector is that one they preferred prior to employment (i.e. while unemployed).[6] In such a context, we construct the empirical model presented in Section 1.3.2 with some adjustments to take into account some specificities of the labour market in Morocco, where the public sector is strongly coveted by all unemployed workers. Indeed, given the huge wage gap between the public and private sectors as well as the institutional constraint mentioned in the assumption 2 above (workers who accept employment in the private sector may not be eligible to employment in the public sector), we assume that workers preferring employment in the public sector seek employment in that sector only. On the contrary, workers preferring employment in the private sector will focus their search on this sector, but they will also never miss an occasion of finding employment in the public sector. They will thus constantly keep an eye on this sector as well.

Now, let us suppose that instead of searching for employment opportunities, workers receive job offers from the two sectors, including from the one that they do not prefer. If at a moment t of the unemployment spell, the worker receives an offer from sector j, the unemployment duration for this sector becomes known (i.e. not random any more, $T_j = t$).

The lifetime income in this sector becomes determined, and the value of the function $V(t)$

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[6] Alternatively, we could suppose that workers focus their job search on the sector they prefer and, consequently, are more likely to find jobs in this sector and less in the opposite sector.

is modified. In all, one of the four following situations can arise at any moment t while the worker is still unemployed:

- The worker does not receive any offer of employment. In this case, the mode of calculation of $V(t)$ does not change.

- The worker receives an offer of employment only from sector 1. Thus $T_1 = t$, $T_2 > t$

  and $V(t) = ln\left(\dfrac{f_1(S)}{R-g_1}\right) - ln\left(\dfrac{f_2(S)}{R-g_2}\right) - R\left[t - E(T_2 \mid T_2 > t)\right]$.

In fact, when the offer emanates from sector 1, unemployment does not have any effect on sector choice. The worker will not hesitate to accept the offer since it maximizes his or her discounted lifetime income ($ln\left(\dfrac{f_1(S)}{R-g_1}\right) > ln\left(\dfrac{f_2(S)}{R-g_2}\right)$).

- The worker receives an offer only from sector 2. Thus, $T_1 > t$, $T_2 = t$ and

  $V(t) = ln\left(\dfrac{f_1(S)}{R-g_1}\right) - ln\left(\dfrac{f_2(S)}{R-g_2}\right) - R\left[E(T_1 \mid T_1 > t) - t\right]$.

- The worker receives an offer of employment from both sectors at the same time. Thus,

  $T_1 = T_2 = t$ and $V(t) = ln\left(\dfrac{f_1(S)}{R-g_1}\right) - ln\left(\dfrac{f_2(S)}{R-g_2}\right) > 0$.

The worker will prefer employment in sector 1 when the sign of $V(t)$ is positive. Otherwise, he or she will prefer employment in sector 2.

We can thus derive some important results relating to worker's behaviour during his or her unemployment spell.

Result 1: At any moment during unemployment, if a worker receives an offer from the preferred sector solely, he or she will certainly accept the offer. However, if he receives offers from both sectors at the same time, he or she will prefer employment in sector 1 even if he or she would prefer sector 2 to unemployment.

Indeed, let us suppose that at the moment t the worker prefers sector 2:

$$V(t) = ln\left(\frac{f_1(S)}{R - g_1}\right) - ln\left(\frac{f_2(S)}{R - g_2}\right) - R\left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right] < 0.$$

If at this same moment, the worker receives an offer of employment only in sector 2, then he   or   she   will   accept   it,   since

$$V(t) = ln\left(\frac{f_1(S)}{R - g_1}\right) - ln\left(\frac{f_2(S)}{R - g_2}\right) - R\left[E(T_1 \mid T_1 > t) - t\right] < 0.$$ This   rises   from:

$$E(T_2 \mid T_2 > t) > t.$$

If the worker receives offers of employment from both sectors at the same time, he or she will choose employment in sector 1 even if he or she previously preferred sector 2

$$(V(t) = ln\left(\frac{f_1(S)}{R - g_1}\right) - ln\left(\frac{f_2(S)}{R - g_2}\right) > 0).$$ This implies result 2 below.

Result 2: The worker will never refuse employment in sector 1 even if he or she does not prefer it when unemployed. The worker's objective is always to maximize his or her lifetime income.

Result 3: A worker who prefers employment in sector 1 could accept an offer of employment in sector 2. Indeed, since the worker prefers sector 1, we have $V(t) > 0$. If the job   offer   emanates   from   sector   2,   it   will   be   accepted   only   if

$$V(t) = ln\left(\frac{f_1(S)}{R - g_1}\right) - ln\left(\frac{f_2(S)}{R - g_2}\right) - R\left[E(T_1 \mid T_1 > t) - t\right] < 0.$$ This   occurs   when

$$R\left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right] < ln\left(\frac{f_1(S)}{R - g_1}\right) - ln\left(\frac{f_2(S)}{R - g_2}\right) < R\left[E(T_1 \mid T_1 > t) - t\right].$$

In this case the expected unemployment duration in sector 1 is too high as compared to the income advantage in this sector.

Result 4: A worker who at time t prefers employment in sector 1 could rationally prefer unemployment to accepting employment in sector 2. This happens when $ln\left(\dfrac{f_1(S)}{R-g_1}\right)-ln\left(\dfrac{f_2(S)}{R-g_2}\right) > R\left[E(T_1|T_1>t)-t\right]$, i.e. when the log of discounted income differential is very high, when the worker's discount rate is very low, or when the worker expects to find employment in sector 1 soon. The worker can thus lengthen his or her unemployment duration in hopes of finding a high-wage job. This is a rational choice resulting in voluntary unemployment.

These results can be illustrated using as example log-normal distributions for the unemployment durations: $T_1 \sim LN(6, 1.2)$ and $T_2 \sim LN(2, 1)$. Figure 1.1 depicts the functions $\left[E(T_1|T_1>t)-E(T_2|T_2>t)\right]$ and $\left[E(T_1|T_1>t)-t\right]$. By defining the quantity $\Delta = \dfrac{ln\left(\dfrac{f_1(S)}{R-g_1}\right)-ln\left(\dfrac{f_2(S)}{R-g_2}\right)}{R}$, a worker prefers employment in sector 1 each time $\Delta > \left[E(T_1|T_1>t)-E(T_2|T_2>t)\right]$ and refuses employment in sector 2 each time $\Delta > \left[E(T_1|T_1>t)-t\right]$.

In Figure 1.1, workers with $\Delta < \Delta_1$, always prefer sector 2 and will always accept employment in this sector as long as they do not receive any offer from sector 1. On the other hand, workers for whom $\Delta_1 < \Delta < \Delta_2$, initially prefer employment in sector 2, followed by employment in sector 1. They prefer employment in sector 2 later as well, and they will always accept an offer from sector 2 as long as they do not receive any offer from sector 1. Workers satisfying $\Delta > \Delta_3$ start by preferring employment in sector 1, and it is only after a long period of unemployment that they prefer employment in sector 2. In the same way, those whose $\Delta > \Delta_4$ accept employment in sector 2 only after having spent a long time seeking employment in sector 1 without success.

1.3.2 Econometric Specifications

The theoretical model presented above is used to specify the selection equation making it possible to assign workers to the two employment sectors. This equation involves wages and unemployment duration equations. We start by presenting all these equations and late develop the first one.

a. Wage equations:

We retain the standard "Mincerian" equation for log of wages:

$$y_j = X\beta_j + \varepsilon_j, \; j=1,2 \quad (9)$$

y_j is the log of the hourly wage in sector j, X is a vector of covariates (education level, experience, experience square, sex, etc.), and ε_j is a random component. We should mention that for the sake of simplification we have ignored the experience quadratic term in the theoretical model, which means that log of wages were assumed to increase (linearly) with years of experience. This is not the case in reality, since wages tend to increase with years of experience at a deceasing rate. However, the discounted lifetime income is mainly determined by income during first years of employment (i.e. when wages are on the increase). Thus, the log linear relation between wages and experience assumed in the theoretical model should not significantly affect the calculation of the discounted lifetime income.

Estimating wage equation without taking into account the possible endogenous nature of sector choice would produce biased results. We take y_j^0 to be the starting wage, i.e. when the worker does not have any work experience:

$$y_j^0 = X^0\beta_j + \varepsilon_j, \; j=1,2 \quad (10)$$

$X^0 = X \,|\, experience = 0.$

Finally, we assume that $(\varepsilon_1, \varepsilon_2)' \sim N(0, \Sigma_\varepsilon)$, where: $\Sigma_\varepsilon = \begin{bmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ & \sigma_2^2 \end{bmatrix}$.

ρ is the correlation coefficient between ε_1 and ε_2.

b. Duration equations:

Let T_j represent the unemployment duration in sector j, $f_j(t)$ its density function and $S_j(t) = Pr(T_j > t)$ its survival function. We assume that T_1 and T_2 have lognormal distributions (i.e. $T_j \sim LN(\mu_j, \pi_j^2)$). In this case we have:

$$f_j(t) = \frac{\phi\left(\dfrac{ln(t) - \mu_j}{\pi_j}\right)}{t\pi_j}, \ t > 0, \qquad S_j(t) = 1 - \Phi\left(\frac{ln(t) - \mu_j}{\pi_j}\right), \ t > 0$$

$$E(T_j) = e^{\mu_j + \frac{\pi_j^2}{2}} \quad \text{and} \quad E(T_j \mid T_j > t) = E(T_j) \frac{\Phi\left(\pi_j - \dfrac{ln(t) - \mu_j}{\pi_j}\right)}{1 - \Phi\left(\dfrac{ln(t) - \mu_j}{\pi_j}\right)}, \ t > 0$$

(cf. Appendix 1.1)

ϕ and Φ are the standard normal density and distribution functions respectively. We control for observed heterogeneity by assuming that in each sector, μ_j is a linear function of some observed characteristics: $\mu_j = \lambda_j + H\varphi_j$. λ_j is a constant and H is a vector of observed characteristics, while φ_j is the corresponding vector of coefficients.

In order to control for unobserved heterogeneity, we adopt the non-parametric method suggested by Heckman and Singer (1984) by supposing this heterogeneity to be a discrete random variable. For the sake of simplicity, we consider only two supporting (mass) points for this variable: $\lambda_j \in \{\lambda_{j1}, \lambda_{j2}\}$, $Pr(\lambda_{j1}) = p_j = 1 - Pr(\lambda_{j2})$, $0 \le p_j \le 1$.

Let C_j be a dummy variable which takes the value 1 if the unemployment episode is completed (uncensored observations) and the value 0 otherwise (censored observations). When the selection bias due to the sector choice is ignored, the parameters $\lambda_{j1}, \lambda_{j2}$, p_j, φ_j and π_j are estimated separately for each sector j by maximizing the likelihood:

$$L_j = \prod_i \left[p_j f_j\left(t \mid \lambda_j = \lambda_{j1}\right) + \left(1 - p_j\right) f_j\left(t \mid \lambda_j = \lambda_{j2}\right) \right]^{C_i} \left[p_j S_j\left(t \mid \lambda_j = \lambda_{j1}\right) + \left(1 - p_j\right) S_j\left(t \mid \lambda_j = \lambda_{j2}\right) \right]^{(1-C_i)}$$

Finally, we assume that T_1 and T_2 are mutually independent, and are independent of ε_1 and ε_2 (random terms in the wage equations).

c. Selection equation:

As a worker's preference could change over time during the unemployment phase, the theoretical model presented above is dynamic. Thus, the same worker can be observed at different times, each time expressing preference for one of the two employment sectors. The empirical model would thus be useful for the treatment of panel data. However, it should be mentioned that workers are observed only when they are unemployed. The last possible point of observation for a worker is when he or she accepts an offer of employment.[7] Consequently, the sample is not necessarily balanced (the number of observations is not necessarily the same for all workers.)

Let $V_j^*(t)$ be the level of indirect utility corresponding to employment in sector j at time t, expressed as a linear relation of the log of the discounted lifetime income in this sector w_j, the expected unemployment duration $E(T_j \mid T_j > t, Z)$, a vector of observed individual characteristics Z (including a constant) and an unobserved random term τ_j:

$$V_j^*(t) = \alpha w_j + \delta E\left(T_j \mid T_j > t\right) + \theta_j Z + \tau_j \quad [8] \qquad (11)$$

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[7] The model can be generalized to take account of preferences while employed. Indeed, an employed worker could re-evaluate his or her preference at any time by taking into account his or her acquired experience, for example.

[8] See Dolton, Makepeace and Klaauw (1989) for a similar approach. They estimate an occupational choice model where the indirect utility from each alternative depends on the log of the expected lifetime income.

The coefficients α and δ are assumed to be the same for both sectors. We expect a positive sign for α and a negative sign for δ. The vector θ_j, however, is specific to each sector. Furthermore, we suppose that sector 1 is the high-income sector, i.e. $w_1 > w_2$.

$V_j^*(t)$ is not observed. Rather, we observe the worker's preference given by a variable $d(t)$ as follows:

$d(t)=1$, if $V_1^*(t) \geq V_2^*(t)$: at time t, the worker prefers employment in sector 1

$d(t)=0$, otherwise: at time t, the worker prefers employment in sector 2

In the case of cross-sectional data, all the workers are observed at the same time (and only one observation per worker is available). In this case, the level of indirect utility in sector j at the time of investigation becomes:

$$V_j^* = \alpha w_j + \delta E\left(T_j \mid T_j > t\right) + \theta_j Z + \tau_j \quad (12)$$

For unemployed workers, t is the duration of time spent unemployed until the moment of the observation (censored unemployment episode), whereas for employed workers, t corresponds to the duration of unemployment before access to employment (uncensored unemployment episode).

In the previous section, it was shown that $w_j = y_j^0 - \ln\left(R - g_j\right)$ (12-bis), with y_j^0 being the starting wage in sector j, R being the worker's discount rate, and g_j being the return to experience in sector j. R is not observable and specific to each worker. As shown earlier, it plays a decisive role in sector choice since it represents the weight put on unemployment (this weight corresponds to the coefficient δ in the indirect utility equation). Thus, the coefficient δ may be different from a worker to another. As written, the equation (12) supposes an average discount rate for all workers, but this is likely to affect the quality of the model if workers show dispersed values in the personal discount rate (see for example

Card, 1995 and 2000, for the analysis of a similar situation for estimating the return to education). It would be more suitable to consider the same personal discount rate by a group of individuals having some common characteristics correlated to this rate. For example, with reference to the endogenous schooling models, investment in education is strongly determined by the personal discount rate. Workers who achieve the same level of education are likely to have close values of the individual discount rate. Equation (12) can then be estimated for homogeneous groups of workers.

For a given homogeneous group, equation (12) is then written as follows, using Equations (10) and (10-bis):

$$V_j^* = \alpha\left[X^0\beta_j + \varepsilon_j - \ln\left(R - g_j\right)\right] + \delta E\left(T_j \,|\, T_j > t\right) + \theta_j Z + \tau_j$$

$$= \omega_j + X^0\alpha\beta_j + \delta E\left(T_j \,|\, T_j > t\right) + \theta_j Z + \eta_j \quad (13)$$

where $\omega_j = -\alpha \ln\left(R - g_j\right)$ is a constant, and $\eta_j = \alpha\varepsilon_j + \tau_j$.

Then, the indirect utility differential between sectors 1 and 2 is:

$$E^* = V_1^* - V_2^*$$

$$= \omega_1 - \omega_2 + X^0\alpha\left(\beta_1 - \beta_2\right) + \delta\left[E\left(T_1 \,|\, T_1 > t\right) - E\left(T_2 \,|\, T_2 > t\right)\right] + \left(\theta_1 - \theta_2\right)Z + \eta_1 - \eta_2$$

$$= X^0\alpha\left(\beta_1 - \beta_2\right) + \delta\left[E\left(T_1 \,|\, T_1 > t\right) - E\left(T_2 \,|\, T_2 > t\right)\right] + \theta Z + \xi \quad (14)$$

where $\theta = \theta_1 - \theta_2$, and $\xi = \eta_1 - \eta_2 = \alpha\left(\varepsilon_1 - \varepsilon_2\right) + \tau_1 - \tau_2$. The term $\omega = \omega_1 - \omega_2$ is added to the constant of the model.

E^* is not observed. A related dummy variable d is observed instead:

$d = 1$, if $E^* \geq 0$: the worker prefers employment in sector 1

$d = 0$, otherwise: the worker prefers employment in sector 2

We assume that $\tau_1 - \tau_2 \sim N(0, 1)$ and is independent of all other variables $(T_1, T_2, \varepsilon_1$ and $\varepsilon_2)$. Thus, ξ, T_1 and T_2 are mutually independent while $\left(\varepsilon_1, \varepsilon_2, \tau_1 - \tau_2\right)'$ is a normal vector: $\left(\varepsilon_1, \varepsilon_2, \tau_1 - \tau_2\right)' \sim N(0, \Sigma)$ where:

$$\Sigma = \begin{bmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 & 0 \\ & \sigma_2^2 & 0 \\ & & 1 \end{bmatrix}.$$

ρ is the correlation coefficient between ε_1 and ε_2. The terms ε_j and $(\tau_1 - \tau_2)$ are uncorrelated (so they are independent); however, ε_j and $\eta_j = \alpha\varepsilon_j + \tau_j$ are correlated if $\alpha \neq 0$ (i.e. when workers self-select into sectors).

If the theoretical model reflects the real behaviour of workers regarding sector choice, the individual discount rate could be estimated by the ratio of weights put, respectively, on unemployment and log of wages gap: $\hat{R} = \hat{\delta} / \hat{\alpha}$. As shown before, this rate indicates the length of unemployment period that a worker can bear while seeking employment in the high-wage sector for each additional unit in the log wage gap. The lower this rate, the longer the potential unemployment duration to bear.

Finally, we mention that wages are censored at least for one sector. They are censored for one sector for employed workers and for two sectors for unemployed workers.

d. Estimate:

The structural model is composed of five equations: one selection equation, two wage equations and two unemployment durations equations. In order to estimate the parameters consistently, we simultaneously estimate all five equations by maximum likelihood.

In the particular case of labour market in Morocco, stylized facts show that all workers wish to obtain employment in the public sector. Those who prefer employment in the private sector seek to minimize their unemployment duration, but are at all times potential candidates for employment in the public sector. In addition, facts show that many unemployed workers seeking employment in the public sector refuse employment in the private sector. Since the data used in this study does not provide information on the preferred sector before employment for employed workers, we will assume that all public sector workers were preferring and seeking employment only in the public sector, whereas workers employed in the private sector were preferring employment in the private sector

when they were unemployed, but were also seeking employment in the public sector without success. Concerning unemployed workers, the data provides information on the preferred employment sector. The same as for employed workers, we assume that those preferring employment in the public sector seek employment only in this sector, whereas those preferring employment in the private sector seek employment in both sectors.

Our model concerns sector choice during the unemployment phase. However, if a worker accepts a job offer in a sector at time t, our assumption holds immediately before the making of the job, say at the moment $t - \varepsilon$, with ε being enough small so that $t - \varepsilon \approx t$.

In Appendix 1.2, we present the likelihood function for estimating all the parameters of the structural model simultaneously. Two cases are considered. In the first one, the unobserved heterogeneity in the unemployment durations equations is ignored, while in the second case that heterogeneity is controlled for. Additionally, sector 1 refers to the public sector, and sector 2 refers to the private sector.

1.3.3 Switching Model (SWM)

This model is used when agents' behaviour is described by two regression equations, and when there is a criterion function determining which of these two equations is applicable. The model aims at correcting the selection bias induced by the workers' behaviour. In the case of the estimate of wage equation per sector, the SWM is presented as follows (see Maddala, 1983):

Wage equation in sector 1: $y_1 = X\beta_1 + \varepsilon_1$

Wage equation in sector 2: $y_2 = X\beta_2 + \varepsilon_2$

Unobserved criterion function: $I^* = Z\pi + u$ $\qquad\qquad$ (15)

X and Z are vectors of exogenous variables, while I^* is a latent variable.

We define a dummy variable I as $I = 1$ if and only if $I^* > 0$, and $I = 0$ if and only if $I^* \leq 0$. For each worker, the wage is observed in the sector where he or she is employed

and is censored for the other sector. The observed wage is then defined as $y = y_1$ if and only if $I = 1$, and $y = y_2$ if and only if $I = 0$. By assuming that $(\varepsilon_1, \varepsilon_2, u)' \sim N(0, \Sigma)$,

where $\Sigma = \begin{bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} \\ & \sigma_2^2 & \sigma_{23} \\ & & 1 \end{bmatrix}$, the likelihood function corresponding this model is:

$$L\left(\beta_1, \beta_2, \sigma_1^2, \sigma_2^2, \sigma_{13}, \sigma_{23}\right) = \prod_i \left[\int_{-Z_i\pi}^{\infty} g(y_i - X_i\beta_1, u_i)du_i\right]^{I_i} \left[\int_{-\infty}^{-Z_i\pi} f(y_i - X_i\beta_2, u_i)du_i\right]^{1-I_i}$$

where g and f are respectively the joint densities of the pairs (ε_1, u) and (ε_2, u).

By writing $g(\varepsilon_1, u) = g(\varepsilon_1).g(u \mid \varepsilon_1)$ and $f(\varepsilon_2, u) = f(\varepsilon_2).f(u \mid \varepsilon_2)$, the likelihood function becomes:

$$L\left(\beta_1, \beta_2, \sigma_1^2, \sigma_2^2, \sigma_{13}, \sigma_{23}\right) = \prod_i \left[\frac{\phi\left(\dfrac{y_i - X_i\beta_1}{\sigma_1}\right)}{\sigma_1} \Phi\left(\frac{Z_i\pi + (y_i - X_i\beta_1)\dfrac{\sigma_{13}}{\sigma_1^2}}{\sqrt{1 - \dfrac{\sigma_{13}^2}{\sigma_1^2}}}\right)\right]^{I_i}$$

$$\times \left[\frac{\phi\left(\dfrac{y_i - X_i\beta_2}{\sigma_2}\right)}{\sigma_2} \Phi\left(-\frac{Z_i\pi + (y_i - X_i\beta_2)\dfrac{\sigma_{23}}{\sigma_2^2}}{\sqrt{1 - \dfrac{\sigma_{23}^2}{\sigma_2^2}}}\right)\right]^{1-I_i}$$

Parameter σ_{12} cannot be estimated since it does not appear in the above likelihood function.

The unemployment durations may also be involved in the selection bias, but the presence of censored data does not make it possible to use log linear equations as in the case of wages. If all observed durations were uncensored, their log would be expressed as a linear relation of explanatory variables and a random term, as follows:

Duration equation in sector 1: $\quad ln(t_1) = V\delta_1 + \tau_1$

Duration equation in sector 2: $\quad ln(t_2) = V\delta_2 + \tau_2$

$t_j > 0$ is the uncensored unemployment duration in sector j.

In this case, the likelihood function to be maximized becomes:

$$L = \prod_i \left[\int_{-Z_i\pi}^{\infty} g\left(y_i - X_i\beta_1, ln(t_i) - V_i\delta_1, u_i\right) du_i \right]^{I_i} \left[\int_{-\infty}^{-Z_i\pi} f\left(y_i - X_i\beta_2, ln(t_i) - V_i\delta_2, u_i\right) du_i \right]^{1-I_i}$$

where g and f are respectively the joint densities of the triplets $\left(\varepsilon_1, \tau_1, u\right)$ and $\left(\varepsilon_2, \tau_2, u\right)$. Some covariances are not estimable. This is the case of $cov\left(\varepsilon_1, \varepsilon_2\right)$, $cov\left(\varepsilon_1, \tau_2\right)$, $cov\left(\varepsilon_2, \tau_1\right)$ and $cov\left(\tau_1, \tau_2\right)$.

If we assume that T_1 and T_2 are mutually independent, and are independent of ε_1, ε_2 and u, we can estimate the duration equations separately and then include estimated $\left[E\left(T_1 \mid T_1 > t\right) - E\left(T_2 \mid T_2 > t\right) \right]$ as covariate in the vector Z (Equation 15). In this case, the Switching model is simply a reduced form of the structural model presented in Section 1.3.2.

1.4 Application to Moroccan Labour Market

1.4.1 Overview of the Moroccan Labour Market

In 2000, the share of the labour force among the Moroccan population aged 15 years and older was 52.9%, and its size was 10.3 million. Of the total labour force, 26.8% were women. The main characteristic of the Moroccan labour force is the preponderance of uneducated workers. Indeed, in 1999 about one out of every two workers (46%) had never attended school and 24% attended only elementary school (the first 5-6 years of schooling.) Workers with post-secondary degree represent less than 7% of the total labour force. This situation is reflected in the high rate of illiteracy, which is close to 50% in the population sector aged 15 years and older.

Table 1.1: Labour Force (Aged 15 Years and Older) by Education Level in 1999

Education Level	%
None or koranic school	46.36
Elementary, 1st stage (years 1-6)	23.83
Elementary, 2nd stage (years 7-9)	13.45
Secondary	9.51
University	6.77
Other level	0.09
Labour Force size (in millions)	10.3

In the same year, the unemployment rate was 13.6%, which means that 1.4 million people were seeking employment. In urban areas, the unemployment rate was high (21.5%), particularly among educated workers (29.7% for workers who have completed at least elementary school versus 13.1% among those who have never attended school or those who have not completed elementary school). In addition, the unemployment rate was higher among women (26.7%) than among men (19.9%).

Rural areas post a low unemployment rate (only 5%), but they are dominated by non-remunerated employment[9] which accounts for 50.9% of total employment (versus only 7.3% in urban areas).

The agricultural sector (including forestry and fishing) constitutes the most important employment sector in Morocco, providing nearly 50% of total employment. This reflects the low educational level of the Moroccan labour force. Indeed, 80% of workers in this sector do not hold any diploma and 75% are illiterate. The industrial sector (including the handicraft industry) accounts for only 14% of aggregate employment. Finally, the public sector remains an important employer, particularly in urban areas (21%) and for educated workers.

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[9] Unpaid family workers

Table 1.2: Unemployment in Morocco in 2000 by Areas

	Urban	Rural	Total
Labour Force Size (x10^3)	5 345	4 940	10 285
Unemployment Rate	21.5%	5.0%	13.6%
Male	19.9%	6.5%	13.8%
Female	26.7%	1.7%	13.0%
Uneducated or 1st stage of elementary school (1-6 years) not completed	13.1%	3.5%	7.1%
. Elementary and up[10]	29.7%	17.0%	27.5%

Two prominent facts have influenced the Moroccan labour market during the last two decades: the worsening of the unemployment rate and the decline of recruitment in the public service. The unemployment rate almost doubled between 1971 and 1994. The number of unemployed workers increased by 84% between 1971 and 1982, and by 117% between 1982 and 2000. This deterioration of employment affected urban areas in particular, where the unemployment rate has been above 20% for many years.

Table 1.3: Evolution of Unemployment between 1971 and 2000 by Area

	Urban				Rural				Total			
	1971	1982	1994	2000	1971	1982	1994	2000	1971	1982	1994	2000
Number of unemployed workers, 10^3	216	322	920	1,146	133	320	412	248	349	642	1,332	1,394
Unemployment rate (%)	15.0	12.3	20.3	21.5	5.2	9.5	10.8	5.0	8.8	10.7	16.0	13.6

The worsening of unemployment in urban areas affected mainly young people, especially educated ones, holding a secondary school or university degree (i.e. highly educated). The share of highly educated workers among the unemployed population increased continuously over time, going from 3.1% in 1984 to more than 20% in 1996 and later. In addition, since 1989 this share has been higher than the proportion of the same workers among the employed population. Among university graduates, those holding Bachelor's degree were the most affected, as is illustrated in the following table.

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[10] Having completed at least the first stage of elementary education (1-6 years)

Table 1.4: Urban Unemployment Rate among Highly Educated Workers in 1998

Degree	Total	Female
University, Below Bachelor's	36.4	43.4
University, Bachelor's	48.2	60.8
University, Above Bachelor's	5.3	19.0
Technical Schools	5.6	9.7

Note: These rates were calculated by the author based on the 1998 Moroccan Labour Force Survey data file.

In addition, workers experience long spells of unemployment. In 1999, about 72% of unemployed workers remained so for at least 12 months and 26.8% for at least 60 months.

The second phenomenon which significantly affected the labour market in Morocco and which is often quoted as one of the factors that precipitated the unemployment of highly educated workers (almost non-existent in the 1960s and 1970s), is the reduction of the number of new employment positions in the public sector.[11] Thus, because of the structural adjustment policies adopted by the Moroccan government in August 1983 under the aegis of the International Monetary Funds, there was a severe reduction in the number of new recruits to public sector. This number has oscillated between 11,000 and 17,000 after 1983, as opposed to 29,000 to 51,000 between 1976 and 1982. In 2000, the forecasts for recruitment represented only 21% of the recruitment undertaken in 1976. Moreover, the new jobs are assigned mainly to the departments of health, education and justice. In spite of this significant change in government recruitment, highly educated workers (in fact, the whole labour force) continue to express a great passion for employment in the public sector, as is testified by their daily demonstrations claiming the "right" to employment in the public sector. Data from the 1998 Moroccan urban Labour Force Survey shows that about half of unemployed workers holding university degrees desire employment exclusively in this sector.

1.4.2 Data

Data used in this study is drawn from the Moroccan Labour Force Survey (LFS) conducted in urban areas in 1998. The LFS is an annual cross-section survey aiming at collecting principal information on activity, employment and unemployment, as well as socio-demographic data. The distinctive feature of the survey is that it provides information

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[11] The public sector in Morocco includes education and health systems.

about the employment sector preferred by unemployed workers (public or private), which will largely help to identify our model. However, workers are not asked why they prefer a sector over another.

We limited our sample to workers with university degrees (including technical schools degrees) for two main reasons, both related to our theoretical model. First, these workers have the potential to be hired in both the public and private sectors. Although the public sector has reduced the number of new jobs, it nevertheless remains an essential recruiter for highly educated workers. These workers were also the ones who expressed a clear preference for one of the two employment sectors. Second, having invested a long time in getting an education, university graduates are likely to have closer discount rate values (see for example Card, 2000). This allows us to estimate our model, assuming that the same discount rate applies for this group of workers. In addition, the study retained only paid workers and unemployed workers who expressed a clear preference for one of the two sectors public and private. The Moroccan LFS provides earning only for paid workers. Self-employed are not asked about earnings. Nonetheless, the proportion of self-employed is only 7.4% among employed workers with university degrees, and 5.5% among those with technical schools degrees versus 34.5% among uneducated workers.

With regard to the durations of unemployment, information was collected from all unemployed workers and from employed workers who started working within the 5 years before the survey was taken. This probably aimed at reducing the lapses of memory which occur when people are questioned on events that occurred in the remote past. However, even for certain workers who began their employment during the 5 years prior to the survey, information about the duration of unemployment is missing from the data file. Nonetheless, the investigation provides information on the worker's age at the start of employment. Hence, we estimated the missing durations of unemployment for the concerned workers by the difference between the estimated age at graduation and the age at the beginning of employment. Finally, we kept only workers aged 64 years or younger, with a duration of unemployment (censored or not) less than 10 years.

Table 1.5 provides some descriptive statistics. The sample includes 1,607 workers. Women represent 34.5% of that sample. The four types of degrees represented are (cf. Appendix 1.3 for an overview of the system of education in Morocco):

- University degree below Bachelor's: obtained after two successful years of university studies, 8.7%.

- Bachelor's: requires four successful years of university studies, 47.4%.

- University degree above Bachelor's such as Master's and Doctorate, 7.2%.

- Technical School degree: generally obtained after five years of post-secondary studies in a technical school (engineering or specialized school, for example), 36.7%.

The unemployed constitute 23.8% of the sample, whereas the average duration of unemployment (censored or not) is 2.4 years, and is slightly higher among people working or preferring to work in the public sector. The average hourly wage is 50.9 Moroccan Dirhams (MAD),[12] and it is 20% higher in the public sector as compared to the private sector. In addition, the public sector workers accumulated more years of work experience on average than did those in private sector (about 4 years of difference). This can be explained by the fact that in the past, the public sector constituted virtually the sole employer of university graduates. The structural adjustment policies launched in 1983 have largely reduced the role of the aforesaid sector in the employment. Yet, the passion for employment in the public sector remains persistent. Indeed, more than four out of five unemployed in our sample expressed the desire to obtain employment in the public sector.

Finally, the changes in the recruitment policy for the Moroccan public sector after the implementation of the structural adjustment policies in 1983 should imply a regime change in the unemployment duration model in that year. This study did not take account of this change in the estimated model, since approximately 80% of workers in our sample entered the labour force after 1983.

1.4.3 Empirical Results

One of our objectives is to compare the estimates obtained using the structural model (STM) to those obtained using other possible models: the non-structural model (NSM) where sector choice is exogenous[13] and the Switching model (SWM). In the NSM, wage

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[12] 10 MAD ≈ 1 $US
[13] As sector choice is assumed to be exogenous, this model does not include selection equation.

equations and duration models are estimated separately for each sector. This implies biased results if workers self-select into sectors. The SWM takes this endogeneity into account but includes only exogenous variables in the selection equation. The results of the estimates are given in Tables 1.6 through 1.8.

1.4.3a Selection equation

Education level and gender are introduced as variables of control in order to reduce possible heterogeneity in employment sector choice. The endogeneity of sector choice is confirmed by all models (SWM and STM). In the Switching model (SWM), covariances between the error terms of the wage equations and that of the selection equation (σ_{13} and σ_{23}) are significantly different from zero. In the two structural models (unobserved heterogeneity either controlled or not) the coefficients α and δ are also significantly different from zero, and their signs correspond to those predicted by the theoretical model ($\alpha>0$ and $\delta<0$). This confirms the effect of the wages and the unemployment duration gaps on sector choice and leads to the rejection of the Switching model, which supposes the correlation between the wage equations and the selection equation only concern the error terms.

Similarly, the effect of the education level on the probability of preferring employment in the public sector is not the same in the two groups of models. Whereas the Switching model implies this probability to be increasing with the rise in the education level, the structural models imply the opposite [14]. Also, the variable gender does not have a significant effect in the Switching model, whereas this effect is significant in the structural models in which women are more likely to choose employment in the public service as compared to men. The first structural model, which does not take into account the unobserved heterogeneity, is also rejected, since the second structural model confirms the existence of such heterogeneity in the unemployment duration equation for the public sector (see Table 1.8). Consequently, we will mainly analyze the results of the last structural model, which we will compare with those of the non-structural model and the Switching model.

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[14] However, both models lead to same results regarding the effect of gender and education when the expected unemployment duration gap is included as a covariate in the SWM.

The constant in the selection equation is positive and significantly different from zero. It might represent non-pecuniary factors as well as factors unrelated to unemployment that make workers appreciate employment in the public sector such as job stability and the prestige of being a civil servant in a developing society. The constant is higher for women who value job stability and the working conditions in the public sector because such conditions often enable them to reconcile professional and family life. Therefore, in their desire to obtain civil servant employment women might consider risking long periods of unemployment. The constant is also high for all workers holding university degrees (below Bachelor's, Bachelor's and above Bachelor's) [15], whereas it is low for workers holding technical school degrees who relatively experience less difficulties in finding employment in both sectors.

The high fixed value allocated to employment in the public sector implies that even at equal wages and equal unemployment durations workers are likely to prefer employment in the public sector. This agrees with the results of Bellante and Link study (1981), which stipulates on the basis of American data that public sector workers are more risk-averse than private sector's workers and that same wages in public and private sectors will involve an excess of labour supply for the public sector.

The risk of unemployment counterbalances the effect of the log-wages differential and the fixed value granted to employment in the public sector. However, the estimated coefficient of the expected unemployment duration gap, expressed in years, only represents half of that of the log-wages differential and less than a quarter of the constant (cf. Table 1.6, column 3). Thus, workers seem to regard employment in the public sector as highly privileged and are ready to bear long unemployment duration to achieve it. University graduates and women are those who are potentially ready to wait longer for employment in the public sector. This could explain the intense demonstrations carried out almost daily by highly educated workers and the downright refusal by some of them to work in the private sector. This also supports the affirmation that the first concern of Moroccan educated workers is "*to reach a permanent and stable job, preferably in the public sector*" (Bougroum, Ibourk and Trachen, 1999). For Orivel (1995), this extreme preference for employment in the public sector is very common in Africa. Its consequence is the assignment of highly educated workers to non-productive employment in the public sector.

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[15] The differences between the three degrees are not significant.

It also involves a high rate of return to education for individuals, contrasted with negligible contributions of education to the economic growth.

According to the theoretical model, the personal discount rate can be estimated by the ratio of the coefficients on the log-wage differential and the expected unemployment durations gap (i.e. $\hat{R} = -\hat{\delta} / \hat{\alpha}$). However, in the theoretical model, only these two gaps drive the workers' choices, whereas in the econometric model estimated for the special case of public-private choice in Morocco, the presence of the intercept and the error term have probably modified the weights given to the aforementioned gaps. Nevertheless, if we suppose that the discount rate represents the weight of unemployment versus all other factors, this rate can be approached by the ratio $-\hat{\delta} / (\hat{\alpha} + \hat{\omega})$. This implies an estimated value of 0.15, a conclusion which is acceptable.

For the sake of easier interpretation of the effects of selected variables on the probability of preferring employment in the public sector, results from the selection equation are converted into marginal effects (see Table 1.6-bis). The marginal effect of having a university degree (Bachelor's or higher) on the probability of preferring employment in the public sector is not statistically significant. Conversely, being male or holding a technical school degree reduce that probability. In addition, when the log-wages differential increases or the expected unemployment durations gap decreases, the probability of preferring employment in the public sector augments. The changes in the log-wages and the expected unemployment durations differentials have the most significant effects on the probability of preferring employment in the public sector. In Section 1.4.4, we discuss the use of those results for policies aiming to attract university graduates to the private sector.

1.4.3b Wage equations

The estimates obtained using various models are presented in Table 1.7. In all models, it is confirmed that the public sector pays notably higher wages as compared to the private sector. The log-wage differential is high for university graduates, particularly those holding Bachelor's degrees or above. A comparison between the results obtained from the STM (when controlling for unobserved heterogeneity) and those obtained from OLS and the SWM shows that the three models produce comparable results for the public sector, whereas for the private sector wages are over-estimated by the OLS corresponding to the

sample selection bias and underestimated by the SWM, probably because of the mis-specification of the selection equation. The small size of the sample selection bias in the estimate of the public sector's wage equation could be explained by two factors. Firstly, sample selection bias in estimating the public sector's wage equation is expected to be limited since most workers in our sample are employed or prefer employment in the public sector (see Table 1.5). Secondly, salaries in the Moroccan public sector are fixed institutionally on the basis of education level. Productivity does not play a significant role in the setting of wage levels, as workers are generally treated in a homogeneous way, particularly during the first few years of employment. This makes the public sector more attractive for less productive workers. The small weight put on productivity in wage determination in this sector is also reflected by the relative small estimated standard error of the random component as compared to that obtained for the private sector (0.60 versus 0.86) and by the weak correlation between the random components of the two sectors' wages equations (0.37).

On the other hand, the drop of the selectivity-corrected wages in the private sector could be explained by the workers' behaviour during job search. Indeed, since the wage differential between the two sectors is less significant for the skilled workers, these workers are relatively more likely to seek employment in the private sector as compared to the less skilled ones. Furthermore, less skilled workers are likely to favour employment in the public sector where they expect to be paid well despite low level of abilities. This is not the case in the private sector. The private sector then attracts more productive workers, whereas the public sector attracts those who seek high wages due to their education level.

Another significant issue that emerges from the results in Table 1.7 concerns the effect of variable gender on wages. In all estimated models, this variable does not have a significant effect on wage levels in the private sector, whereas its effect is significant on wage levels in the public sector. Thereby, women seem to be treated more equitably in the private sector than in the public sector. However, as wage levels in the public sector are fixed institutionally, regardless of gender, the "apparent wage discrimination" may mirror the fact that promotions are more often given to men than women. Conversely, the private sector does not distinguish between workers with Bachelor's degrees and those with lesser university degrees (reference group) in terms of remuneration, although a Bachelor's degree requires two years of additional university studies as compared to a lesser university

degree. Consequently, people who invest in a Bachelor's degree probably have in mind employment in the public sector or perhaps they do it in order to avoid unemployment.

Finally, wages grow two times faster in the private sector as compared to the public sector, resulting in the differential between the two sectors to become narrower over the time. In Figures 1.2 through 1.7, we represent the evolution of the estimated log-hourly wage for each sector using results from three different models (OLS, SWM and STM), for men holding Bachelor's and men holding technical school degrees. As mentioned earlier, the three models differ primarily with regard to the estimate of the private sector wages. The wage differential between the two sectors is more persistent over time with the SWM, whereas it decreases in the two other models. For workers with technical school degrees, the OLS even predicts that wages will be higher in the private sector after 10 years of experience, which never occurs with the STM and the SWM.

The great preference for employment in the public sector, combined with the refusal of employment in the private sector, should logically generate a shortage of highly educated workers in the private sector, which, consequently, should cause the wages to rise in this sector. This does not occur in the Moroccan labour market, however, in particular for workers with Bachelor's degrees. This situation could be explained by the great imbalance of labour supply/demand in the private sector, which results in long unemployment durations even for the fraction of workers seeking employment in this sector (see the following Section). This imbalance also concerns the quality of labour demand, since the Moroccan economy is overshadowed by informal activities. Moreover, a significant part of the labour supply does not match the labour demand in the private sector. This is the case, for example, for graduates from some general university programs (languages, history, philosophy, literature, etc.) who do not find any employment options in the private sector.

1.4.3c Unemployment duration equations

Duration equations are first estimated separately in each sector (NSM, Table 1.8, columns 1 to 4), under the assumption that sector choice is exogenous. Table 1.8 also shows the results obtained using two structural models (columns 5 to 8). As a matter of fact, workers face a high risk of unemployment in both sectors, although this risk is relatively higher for those seeking employment in the public sector. Workers holding Bachelor's degrees or

below are the most concerned in this case. Though their situation is much less precarious, workers with technical schools degrees are also exposed to relatively long periods of unemployment. The difference between men and women is limited especially in the private sector. The probability of being hired is thus very low in the public sector, but it is also low in the private sector, which includes the informal sector supposed to be accessible for all workers who desire to work there. However, to account for the informal sector, we may suppose that highly educated workers accept employment in this sector and, if this is the case, report themselves employed. In fact, those workers generally refuse employment in the informal sector, while those who accept are likely to report themselves as unemployed in the hope of being recruited in the public sector (Bougroum, Ibourk and Trachen, 1999). Consequently, unemployment durations reported for the private sector may be inflated. Moreover, our sample does not include self-employed workers; however, their proportion in the employed labour force is very low as mentioned earlier.

Concerning unobserved heterogeneity, the STM reveals that this heterogeneity relates only to the public sector, whereas the NSM recommends that it relates to both sectors. In the public sector, the presence of this heterogeneity could have two explanations. On one hand, new recruitments to the public sector are mainly intended to meet the needs for the Departments of Health, Justice and Education. Workers who do not have profiles corresponding to these needs (in particular in terms of fields of study) have a small chance of being recruited. On the other hand, some workers can rely on personal relations (or connections) to strengthen their chances of finding a job in public sector. Concerning the private sector, the absence of unobserved heterogeneity could be explained by the insufficiency of information that workers have on this sector since their main objective is finding employment in the public sector or possibly by the fact that private employers do not provide workers with sufficient information to determine their types.

Workers holding Bachelor's degrees are not distinguished from those holding lower level degrees (reference group) regarding access to employment. The same situation occurs for wages in the private sector. Young people are not encouraged to consider a Bachelor's degree as the objective of their educational investment, particularly if they know that only the private sector would recruit them. Ironically, the Bachelor's degree is the most widely held university diploma in Morocco.

Figures 1.8 through 1.15 represent the estimated density functions of unemployment durations and the hazard rate functions for men holding Bachelor's or technical school degrees and using NSM and STM models. For the public sector, figures represent the type with the highest probability when controlling for unobserved heterogeneity. Generally, the instantaneous probability of finding employment is high in the private sector for all workers, particularly during the first few years following graduation. This probability is initially on the increase, but then begins to decrease slowly in the public sector. In the private sector, on the other hand, it increases sharply in the beginning and then drops quickly as compared to the public sector. Once again, workers holding technical school degrees experience a better situation as compared to those holding Bachelor's degrees. This advantage, combined with the wage advantage, results in many young people coveting technical school degrees. However, the access to these schools is very restricted, while access to university education is generally free for all young people who successfully complete their secondary studies.

Finally, the hazard rate in the public sector drops after correcting for the sample selection bias (Figures 1.12 and 1.14). In the private sector, the selection corrected hazard rate is higher during the first months after graduation and lower thereafter (Figures 1.13 and 1.15). The decrease in the hazard rate in the public sector is mainly due to the assumption in the structural model that all workers (preferring either the public or the private sector) are seeking employment in the public sector. Consequently, the unemployment duration in the private sector also concerns the public one. In the private sector, the change can be explained by the workers' behaviour. In fact, workers first actively seek employment in the public sector and show little interest in the private sector, which results in long unemployment duration between graduation and first employment in the private sector.

1.4.4 Policy Issues

Stiglitz (1974) stipulates that the government can reduce the wage gap between the employment sectors and adapt the extent of its recruitment to lower the unemployment rate. In the case of Morocco, employment in the public sector is very limited, so the government policy should aim at attracting university graduates to the private sector. This is not an easy task, however, due to the great fixed value allocated by workers to the employment in the public sector and due to serious difficulties in finding employment even

in the private sector. Using our results, the probability of preferring employment in the public sector which is estimated at 0.75, could be lowered by reducing the starting log wage differential between the public sector and the private sector and/or by increasing the expected unemployment durations gap between the two sectors. As indicated in Table 1.6-bis, reducing the starting log wage differential by one unit has the same effect on the probability of preferring employment in the public sector as increasing the expected unemployment durations gap by 2 units (unit = year). However, the marginal effects of those changes are minor, a finding which suggests that a significant modification of the workers' behaviour will require extreme adjustments in the variables that drive that behaviour. Indeed, our results show that the average starting log wage differential is estimated at 1.08, with all genders and degrees pooled (0.95 for workers holding technical school degrees, 1.20 for those holding Bachelor's degrees, 1.23 for those holding university degrees higher than Bachelor's degrees, and 0.82 for those holding lower than Bachelor's degrees). Therefore, if the starting log wage differential is reduced by one unit (which means that the two employment sectors will be paying almost the same wage) and holding the expected unemployment durations gap constant, the probability of preferring employment in the public sector will only decrease by 0.16, going from 0.75 to 0.59. Workers are still likely to prefer employment in the public sector even if the two employment sectors pay the same wage and despite the high risk of unemployment in the public sector. Similarly, each unit increase in the expected unemployment durations gap, estimated at 3 years on average, will reduce the probability of preferring employment in the public sector by 0.08 only.

More precisely, if we suppose that the government's objective is to reduce the probability of preferring employment in the public sector at 0.20, which is the part of the public sector in the total urban employment, the government must either increase the current expected unemployment durations gap by about 7 years while holding the log wage differential constant or remove the wage gap while at the same time increasing the expected unemployment durations gap by about 5 years. Therefore, changing the workers' behaviour requires great adjustments; the weight put on non-observed variables is very large. However, the government may still adjust the wages and employment in the public sector to lessen the pressure from employment seekers on the public sector.

A more effective policy should aim at reducing the segmentation of the labour market, focusing on wages as well as non-pecuniary factors. It should also aim at improving employment opportunities in the private sector. This necessitates a high level of economic growth and the contraction of the informal sector unfavourable to educated workers. Economic growth will be more supported if highly educated employees work in the private sector and then actively participate in development. The public sector used to be the main employer of highly educated workers, engaging them in non-productive employment in large numbers. Consequently, one can observe a high rate of return to education for individuals contrasted with the negligible contribution of education to the overall economic growth (Orivel, 1995). In 1998 (15 years after the implementation of the government adjustment policies), the public sector still employs more than 60% of university graduates living in urban areas.

Finally, it is important to emphasize that the illiteracy rate in Morocco is extremely high (48% in 1998) and that many school-age children are deprived of formal education or drop out of school prematurely. On the other hand, the high unemployment rate among university graduates suggests that there is an over-allocation of public and private resources to university education. Allocating more resources to elementary education (even to the detriment of university education) will help to improve the overall level of education of the labour force and, in return, stimulate economic growth. Furthermore, an improvement in the labour force education level will result in the tightening of the informal sector unfavourable to education, inciting educated workers to seek employment in the private sector.

1.5 Conclusion

The models developed at the end of the 1960s and in the beginning of the 1970s (for example Todaro, 1969; Harris and Todaro, 1970; Stiglitz, 1974 & 1976; Eaton and Neher, 1975 and Fields, 1975) have all stressed the role of wage differentials on employment sector choice. "Migration" from the low-wage sector to the high-wage sector will continue as long as the expected wage in the second sector is higher than in the first sector. The unemployment rate will then continue to increase until workers expect the same wage level in both sectors, thus causing the migration to stop. The unemployed are voluntarily so

since they refuse to work in the low-wage sector. Thus, *"the unemployed have only themselves to blame"* for their condition (Eaton and Neher, 1975). The efficient wage theory developed by Shapiro and Stiglitz (1984) "blames" certain firms which, while seeking to encourage their workers to make a greater effort, pay wages higher than those of the market. This policy causes a reduction in employment demand and an increase in labour supply, leading to involuntary unemployment. The labour market is segmented into two sectors: a sector which pays efficient wages but with limited access, and a sector which pays market wages with unlimited access. This affects workers behaviour, as seen in the above models.

The model developed in this chapter fits within the same framework. Workers' expectations about wages and unemployment duration determine their behaviour regarding sector choice. However, in contrast to previous studies, we suppose that the two sectors are exposed to unemployment, with lower unemployment risk in the low-wage sector. Workers face a loss of income due to unemployment as well as an opportunity cost by forgoing employment opportunities in the low-wage sector. This loss of income, which depends on unemployment duration, is weighted by the discount rate. The length of the unemployment period while waiting for employment in the high-wage sector depends on the value of this rate. A worker with a low discount rate can withstand a long duration of unemployment in order to obtain employment in the high-wage sector. He or she is likely to turn down offers in the low-wage sector. A substantial wage differential between sectors also supports this "waiting for employment" process which increases the aggregate unemployment rate.

The econometric model we estimated using Moroccan data yields estimates of parameters that drive worker behaviour. These estimates can be used to establish a clear-sighted policy aimed at reducing imbalances in the labour market. The empirical application to the choice between the public and the private sector as occupational possibilities in Morocco is motivated by the fact that in this country highly educated workers strongly prefer employment in the public sector. One interesting conjecture is that this behaviour is responsible for the excessive unemployment rate among highly educated workers. The results indicate, however, that workers experience a great difficulty in finding employment even in the private sector, which limits their choice to a large extent. The selectivity corrected public-private starting hourly wage differential is very large, ranging between 82% on average for workers holding lower than Bachelor's degrees and 123% on average

for those holding university degrees higher than Bachelors' degrees. Yet, the probability of preferring employment in the public sector is not very sensitive to wage or unemployment duration variations. Indeed, a significant modification of the workers' behaviour necessitates extreme changes in those variables. Even so, the adjustment of the remuneration policy in the public sector combined with further reduction of new employment in that sector remains presently the best way for the government to deter educated workers from remaining unemployed while waiting for employment in the public sector. A general long-term policy should also aim at improving employment opportunities and working conditions in the private sector. In this way, more importance should be given to investment in human capital in order to eradicate illiteracy, which presently affects about half of the adult population. The provision of elementary education to all children will improve the level of education of the labour force, stimulate the economic growth and reduce the share of the informal sector in the economy. Then, educated workers will be incited to seek employment in the private sector, where they will be able to find a large number of good jobs.

Table 1.5: Descriptive Statistics

Variables	Mean
# observations	1,607
Age (in years)	36 (8.3)
Female	0.345
Degree :	
. Technical School	0.367
. University, Below Bachelor's	0.087
. University, Bachelor's	0.474
. University, Above Bachelor's	0.072
Labour Force Statute :	
. Employed	0.762
. Unemployed	0.238
Employed x Sector :	
. Public	0.780
. Private	0.220
Unemployed x Preferred Sector :	
. Public	0.841
. Private	0.159
Hourly Wage (in Moroccan Dirham) [16]:	50.94 (60.43)
. Public	52.93 (58.80)
. Private	43.91 (65.52)
Years of Experience :	13.6 (8.9)
. Public	14.5 (8.6)
. Private	10.8 (9.4)
Unemployment Duration (years) :	2.4 (2.3)
. Public	2.5 (2.3)
. Private	2.1 (2.2)

Notes: - The sample is from the 1998 Moroccan Labour Force Survey, and includes workers aged 64 years or younger and for whom unemployment duration is less than 10 years. Missing unemployment durations are estimated by age at starting first job minus estimated age at graduation. In parentheses are standard-deviations.

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[16] 1 Moroccan Dirham ≈ 1$US

Table 1.6: Estimated Selection Equations

| | Switching Model (1) | | Structural Models [17] | | | |
| | | | Unobserved heterogeneity not controlled (2) | | Unobserved heterogeneity controlled (3) | |
	Coef.	S-E	Coef.	S-E	Coef.	S-E
Constant (ω)	0.2794 [b]	0.1391	0.4244 [b]	0.1871	1.7162 [b]	0.6839
Log wage differential (α)	-	-	2.0866 [a]	0.3482	0.7787 [b]	0.3940
Expected unemployment duration gap (δ)	-	-	-0.3886 [a]	0.1477	-0.3871 [a]	0.0809
Male	0.0897	0.0946	-0.3920 [c]	0.2328	-0.2949 [c]	0.1571
Technical School	0.6424 [a]	0.1415	-1.6148 [c]	0.5548	-1.2784 [c]	0.6801
University, Bachelor's	0.2326 [c]	0.1399	-1.0085	0.7333	-0.4171	0.5186
University, Above Bachelor's	0.6471 [a]	0.1913	-2.5441 [a]	0.7603	-1.1986	0.7448
σ_{13}	0.5030 [a]	0.0574	-	-	-	-
σ_{23}	-0.6724 [c]	0.3671	-	-	-	-
$-\delta/\alpha$	-	-	0.1863 [a]	0.0647	0.4972 [a]	0.2073
Mean Log-Likelihood	-1.1307		-2.9114		-2.8609	
# observations	1,216		1,607		1,607	

Notes: The reference group for education is "University, Below Bachelor's." S-E: Standard Error.
(a), (b) and (c): significant at the level 1, 5 and 10 percent.

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[17] $E^* = \omega + \alpha\left(w_1 - w_2\right) + \delta\left(E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right) + \theta Z + \xi$

Table 1.6-bis: Marginal Effects of Selected Variables on the Probability of Preferring Employment in the Public Sector

	Structural model with unobserved heterogeneity controlled	
	Marginal Effects (*)	Standard Errors
Log wage differential	0.1595[a]	0.0549
Expected unemployment durations gap	-0.0793[a]	0.0119
Male	-0.0584[c]	0.0309
Technical School	-0.2881[c]	0.1475
University, Bachelor's	-0.0860	0.1037
University, Above Bachelor's	-0.3180	0.2028

Notes : (*) The marginal effect measures the effect of a unit change in a covariate X on the probability of preferring employment in the public sector, holding all else constant ($\partial P / \partial X$). Marginal effects are evaluated at the sample means for continuous variables, and the difference in the probability between 0 and 1 for dummy variables. The reference group for education is "University, Below Bachelor's." (a), (b) and (c): significant at the level 1, 5 and 10 percent.

Table 1.7: Estimated Wage Equations

| | OLS | | Switching Model | | Structural Models (STM) | | | |
| | | | | | Unobserved heterogeneity not controlled | | Unobserved heterogeneity controlled | |
	Public (1)	Private (2)	Public (3)	Private (4)	Public (5)	Private (6)	Public (7)	Private (8)
Constant	2.3933 [a]	1.8747 [a]	2.1027 [a]	1.2235 [a]	2.5000 [a]	1.3195 [a]	2.3613 [a]	1.5793 [a]
	(0.0938)	(0.1645)	(0.1031)	(0.3952)	(0.0930)	(0.1389)	(0.0723)	(0.2004)
Male	0.1333 [a]	0.0558	0.1368 [a]	0.0052	0.1350 [a]	0.0528	0.1302 [a]	0.0581
	(0.0458)	(0.1141)	(0.0479)	(0.0511)	(0.0400)	(0.1032)	(0.0407)	(0.1017)
Technical School	0.7397 [a]	0.8276 [a]	0.8874 [a]	0.5248 [b]	0.6962 [a]	0.6533 [a]	0.7436 [a]	0.6322 [a]
	(0.0810)	(0.1665)	(0.088)	(0.239)	(0.0754)	(0.1280)	(0.0734)	(0.1568)
University, Bachelor's	0.5287 [a]	0.2412	0.5806 [a]	0.136	0.5046 [a]	0.1510	0.5356 [a]	0.1600
	(0.0818)	(0.1546)	(0.0874)	(0.1805)	(0.0742)	(0.1158)	(0.0737)	(0.1266)
University, Above Bachelor's	1.4568 [a]	1.2045 [a]	1.5619 [a]	0.8783 [a]	1.4136 [a]	1.0016 [a]	1.4615 [a]	1.0659 [a]
	(0.1010)	(0.2358)	(0.1091)	(0.3134)	(0.0922)	(0.1831)	(0.0909)	(0.1927)
Experience	0.0571 [a]	0.1166 [a]	0.057 [a]	0.1141 [a]	0.0566 [a]	0.1081 [a]	0.0569 [a]	0.1066 [a]
	(0.0079)	(0.0171)	(0.0078)	(0.0172)	(0.0070)	(0.0168)	(0.0016)	(0.0084)
Experience squared	-0.0011 [a]	-0.0022 [a]	-0.0011 [a]	-0.0021 [a]	-0.0011 [a]	-0.0019 [a]	-0.0011 [a]	-0.0019 [a]
	(0.0002)	(0.0005)	(0.0002)	(0.0005)	(0.0002)	(0.0005)	(0.00004)	(0.0003)
σ_j	0.6021	0.8208	0.6832 [a]	0.9998 [a]	0.6164 [a]	0.9310 [a]	0.6030 [a]	0.8648 [a]
			(0.025)	(0.1939)	(0.0185)	(0.0596)	(0.0128)	(0.0601)
ρ	-	-	-	-	0.9162 [a]		0.3708 [a]	
					(0.0595)		(0.0634)	
σ_{j3}	-	-	0.5030 [a]	-0.6724 [c]	-	-	-	-
			(0.0574)	(0.3671)				
Adjusted R-squared	0.30	0.42	-	-	-	-	-	-

Notes: The reference group for education is "University, Below Bachelor's." In parentheses are standard-errors. (a), (b) and (c): significant at the level 1, 5 and 10 percent.

Table 1.8: Estimated Unemployment Duration Models

	Non Structural Models (NSM)				Structural Models (STM)			
	Unobserved heterogeneity not controlled		Unobserved heterogeneity controlled		Unobserved heterogeneity not controlled		Unobserved heterogeneity controlled	
	Public	Private	Public	Private	Public	Private	Public	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant 1	1.4639 [a]	0.4242 [c]	1.7261 [a]	1.0167 [a]	1.6981 [a]	0.6438 [a]	1.9435 [a]	0.4263 [b]
	(0.1195)	(0.2353)	(0.0954)	(0.2011)	(0.1272)	(0.2262)	(0.0913)	(0.2006)
Constant 2	-	-	-1.0074 [a]	-1.4447 [a]	-	-	-0.7582 [a]	0.4270 [b]
			(0.1423)	(0.2665)			(0.1743)	(0.2174)
Male	-0.2020 [b]	0.0645	-0.1841 [a]	0.0603	-0.1152 [b]	-0.0790	-0.0792	-0.0217
	(0.0788)	(0.1736)	(0.0714)	(0.1413)	(0.0648)	(0.1200)	(0.0548)	(0.1077)
Technical School	-1.2584 [a]	-0.5848 [b]	-1.4068 [a]	-0.7710 [a]	-1.3761 [a]	-0.7034 [a]	-1.5273 [a]	-0.5865 [a]
	(0.1226)	(0.2672)	(0.0999)	(0.2245)	(0.1250)	(0.2400)	(0.1011)	(0.2082)
University, Bachelor's	-0.0761	0.1330	-0.0700	0.0390	-0.1387	0.0164	-0.1028	0.1124
	(0.1098)	(0.2396)	(0.0884)	(0.1880)	(0.1249)	(0.2321)	(0.0930)	(0.2016)
University, Above Bachelor's	-1.8653 [a]	-0.7726 [b]	-0.8975 [a]	-0.4242	-1.8684 [a]	-1.0312 [a]	-0.9801 [a]	-0.7684 [a]
	(0.1720)	(0.3926)	(0.1443)	(0.3048)	(0.1571)	(0.3680)	(0.1407)	(0.2618)
π_j [18]	1.2783 [a]	1.4182 [a]	0.8935 [a]	0.9277 [a]	1.3181 [a]	1.4721 [a]	0.9581 [a]	1.2507 [a]
	(0.0295)	(0.0615)	(0.0278)	(0.0561)	(0.0252)	(0.0413)	(0.0306)	(0.0390)
Prob(constant 1)	-	-	0.8825 [a]	0.7832 [a]	-	-	0.8832 [a]	0.6819 [a]
			(0.0118)	(0.0440)			(0.0127)	(0.0146)

Notes: The reference group for education is "University, Below Bachelor's." In parentheses are standard-errors. (a), (b) and (c): significant at the level 1, 5 and 10 percent.

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[18] $\pi_j = Var\left(log\left(T_j\right)\right)$, T_j is the unemployment duration in sector j assumed to have a log-normal distribution.

Figure 1.1: Example of Workers' Behaviour

$E(T_1| T_1>t)$- t

$E(T_1| T_1>t)$- $E(T_2| T_2>t)$

Δ_4
Δ_3
Δ_2

Δ_1

Time
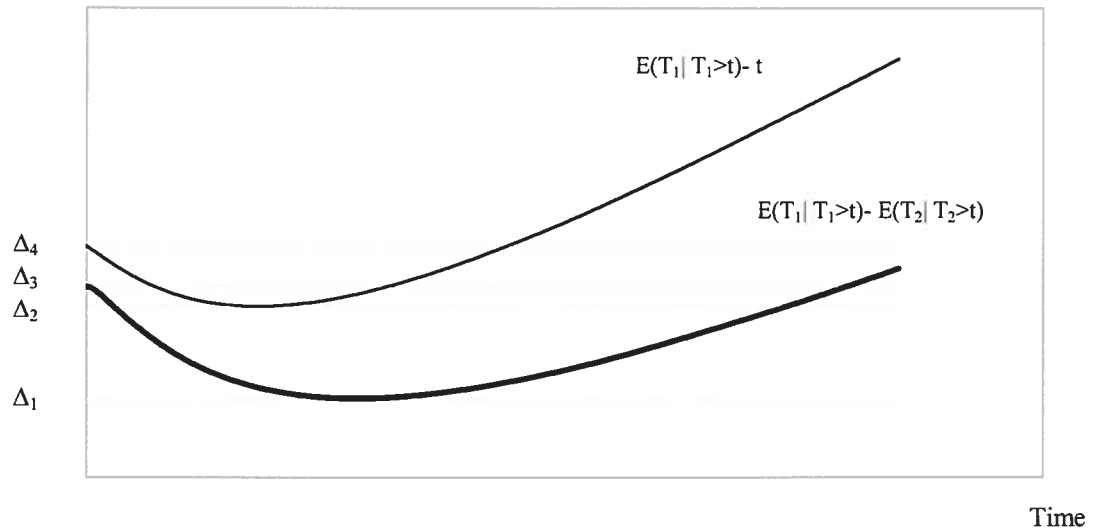
Notes: $T_1 \sim LN(6, 1.2)$, $T_2 \sim LN(2, 1)$, T_j is the unemployment duration in sector j.

$$\Delta = \frac{\log\left(\dfrac{f_1(S)}{R-g_1}\right) - \log\left(\dfrac{f_2(S)}{R-g_2}\right)}{R}$$

An unemployed worker prefers employment in sector 1 if
$\Delta > \left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right]$ and refuses employment in sector 2 if
$\Delta > \left[E(T_1 \mid T_1 > t) - t\right]$.

Figures 1.2 through 1.7: Evolution of the Estimated Log Hourly Wage by Degree Using Different Models

Figure 1.2: OLS (A Male with a University Bachelor's Degree)

Figure 1.3: SWM (A Male with a University Bachelor's Degree)

Figure 1.4: STM (A Male with a University Bachelor's Degree)

Figure 1.5: OLS (A Male with a Technical School Degree)

Figure 1.6: SWM (A Male with a Technical School Degree)

Figure 1.7: STM (A Male with a Technical School Degree)
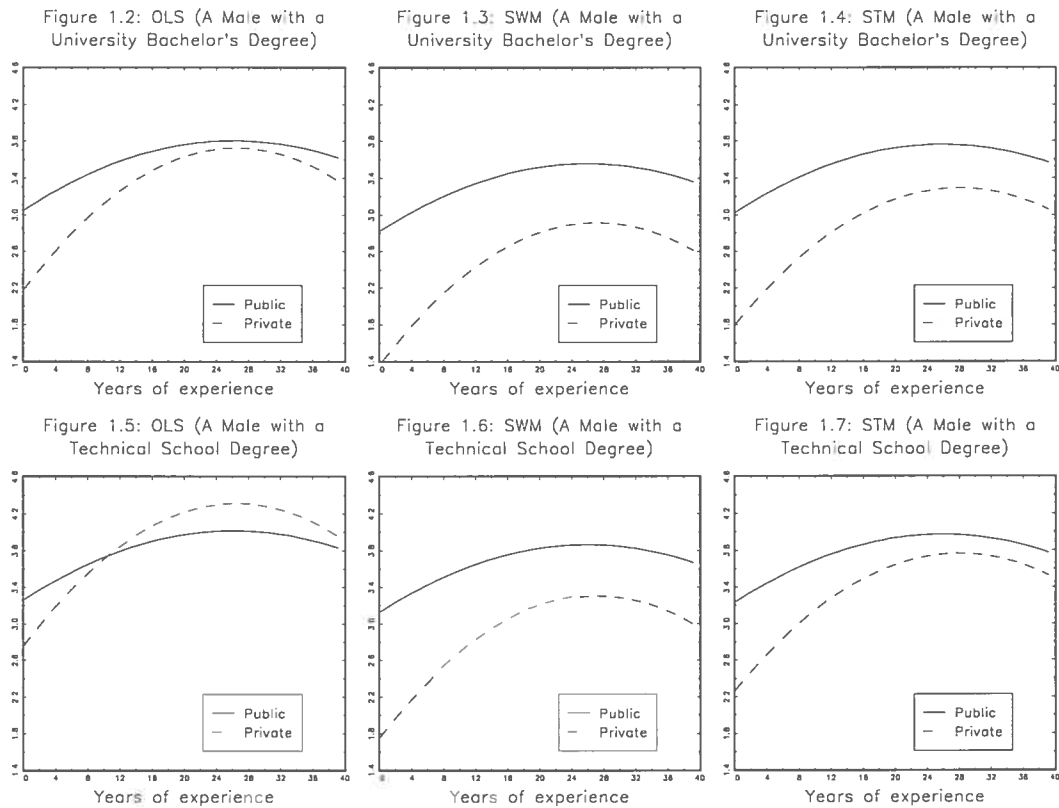
Note: OLS (Least Squares) corresponds to columns (1) and (2) in Table 1.7, SWM (Switching Model) corresponds to columns (3) and (4), and STM (Structural Model) corresponds to columns (7) and (8) in the same table.

Figures 1.8 through 1.11: Estimated Density Functions of Unemployment Duration by Sector and Degree

Figure 1.8: Public Sector
(A Male with a University Bachelor's Degree)
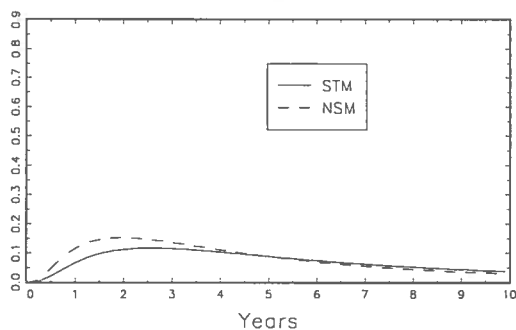
Figure 1.9: Private Sector
(A Male with a University Bachelor's Degree)
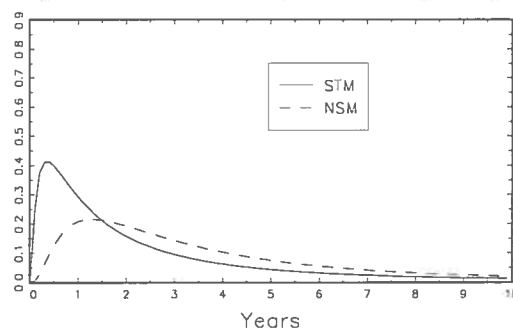
Figure 1.10: Public Sector
(A Male with a Technical School Degree)
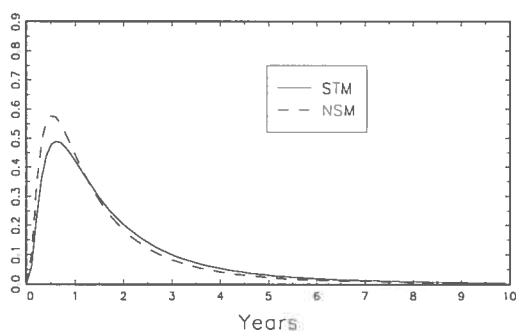
Figure 1.11: Private Sector
(A Male with a Technical School Degree)
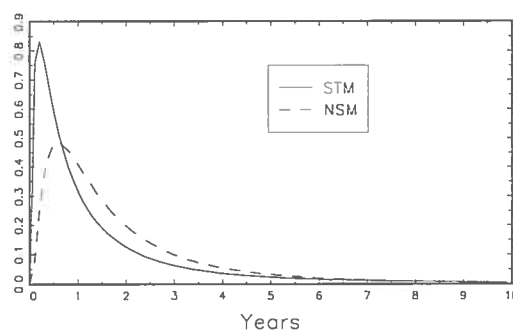
Notes: Density functions correspond to models controlling for unobserved heterogeneity, and using constant 1, which is associated with the highest probability (Table 1.8). Non structural model (NSM) corresponds to columns (3) and (4) in Table 1.8, and structural model (STM) corresponds to columns (7) and (8) in the same table.

Figures 1.12 through 1.15: Estimated Hazard Rate Functions by Sector and Degree

Figure 1.12: Public Sector
(A Male with a University Bachelor's Degree)

Figure 1.13: Private Sector
(A Male with a University Bachelor's Degree)

Figure 1.14: Public Sector
(A Male with a Technical School Degree)

Figure 1.15: Private Sector
(A Male with a Technical School Degree)
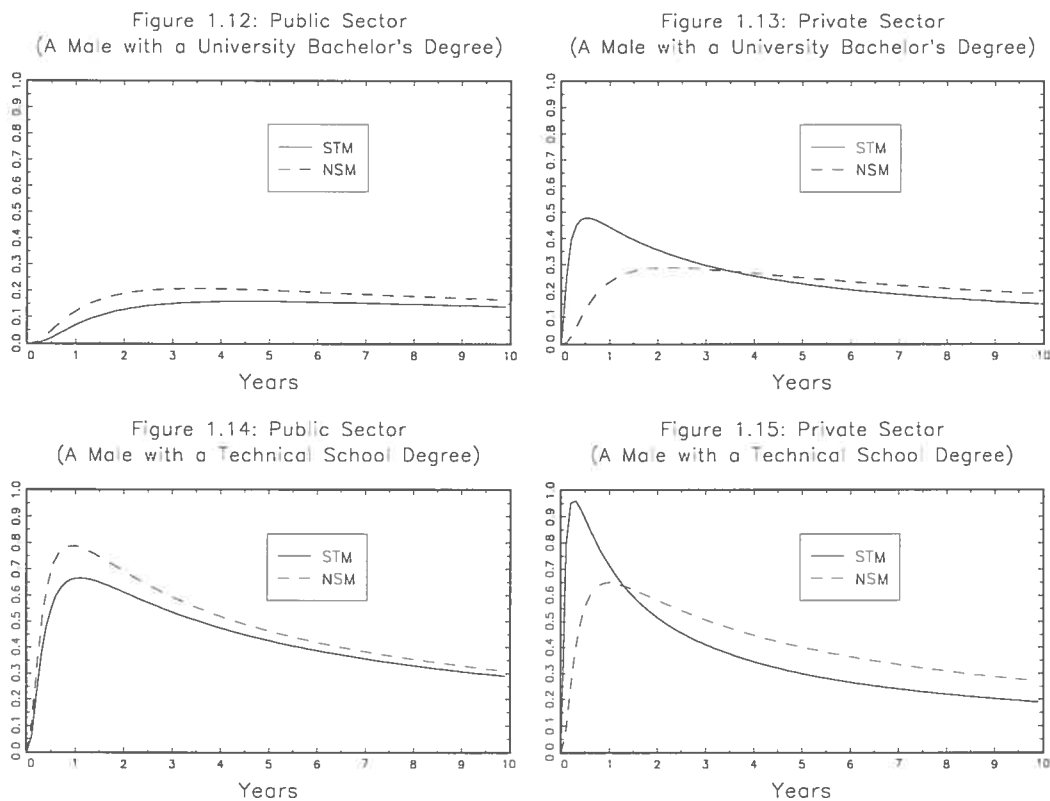
Notes: Hazard rates correspond to models controlling unobserved heterogeneity, and using constant 1, which is associated with the highest probability (Table 1.8). Non structural model (NSM) corresponds to columns (3) and (4) in Table 1.8, and structural model (STM) corresponds to columns (7) and (8) in the same table.

Appendix 1.1: Conditional Expected Duration

Let T be a random variable having a log-normal density function: $T \sim LN\left(\mu, \sigma^2\right)$.

Thus, $E\left(T \mid T > t\right) = E\left(T\right) \Phi\left(\sigma - \dfrac{\ln(t) - \mu}{\sigma}\right) / \left[1 - \Phi\left(\dfrac{\ln(t) - \mu}{\sigma}\right)\right]$ for any $t > 0$

Proof:

$$E\left(T \mid T > t\right) = \int_{t}^{\infty} \frac{x f\left(x\right)}{S\left(t\right)} dx = \frac{1}{S\left(t\right)} \int_{t}^{\infty} \frac{x \phi\left(\dfrac{\ln\left(x\right) - \mu}{\sigma}\right)}{x \sigma} dx = \frac{1}{S\left(t\right)} \int_{t}^{\infty} \frac{\phi\left(\dfrac{\ln\left(x\right) - \mu}{\sigma}\right)}{\sigma} dx$$

Let the following variable change: $y = \ln\left(x\right)$, so,

$$E\left(T \mid T > t\right) = \frac{1}{S\left(t\right)} \int_{\ln(t)}^{\infty} \frac{\phi\left(\dfrac{y - \mu}{\sigma}\right)}{\sigma} e^{y} dy \text{ . We have:}$$

$$\phi\left(\frac{y - \mu}{\sigma}\right) e^{y} = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{y - \mu}{\sigma}\right)^{2}} e^{y} = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2\sigma^{2}}\left(y^{2} + \mu^{2} - 2y\mu\right) + y} = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2\sigma^{2}}\left(y^{2} + \mu^{2} - 2y\mu - 2y\sigma^{2}\right)}$$

$$= \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2\sigma^{2}}\left(y - \mu\right)^{2} + y} = \frac{1}{\sqrt{2\pi}} e^{-\frac{\left(y - \mu\right)^{2} - 2y\sigma^{2}}{2\sigma^{2}}} = \frac{1}{\sqrt{2\pi}} e^{-\frac{\left(y - \mu - \sigma^{2}\right)^{2} - 2\mu\sigma^{2} - \sigma^{4}}{2\sigma^{2}}}$$

$$= \frac{1}{\sqrt{2\pi}} e^{-\frac{\left(y - \mu - \sigma^{2}\right)^{2}}{2\sigma^{2}}} e^{\mu + \frac{\sigma^{2}}{2}} = E\left(T\right) \phi\left(\frac{y - \mu - \sigma^{2}}{\sigma}\right) = E\left(T\right) \phi\left(\frac{y - \mu}{\sigma} - \sigma\right)$$

Therefore : $E\left(T \mid T > t\right) = \dfrac{E\left(T\right)}{S\left(t\right)} \displaystyle\int_{\ln(t)}^{\infty} \dfrac{\phi\left(\dfrac{y - \mu}{\sigma} - \sigma\right)}{\sigma} dy$.

Finally, through the following variable change $z = \dfrac{y - \mu}{\sigma} - \sigma$, we obtain:

$$E\left(T \mid T > t\right) = \frac{E\left(T\right)}{S\left(t\right)} \int_{\frac{\ln(t) - \mu}{\sigma} - \sigma}^{\infty} \phi\left(z\right) dz = \frac{E\left(T\right)}{S\left(t\right)} \Phi\left(\sigma - \frac{\ln(t) - \mu}{\sigma}\right) \text{ , and we have}$$

$$S\left(t\right) = 1 - \Phi\left(\frac{\ln(t) - \mu}{\sigma}\right).$$

Appendix 1.2: Likelihood Function

Sector 1 (high wage versus high unemployment duration) refers to the public sector, while sector 2 (low wage versus low unemployment duration) refers to the private sector.

The contribution to the likelihood depends on the worker's situation (employed or unemployed) and his or her preferred sector (sector 1 or sector 2). Therefore, four cases are possible: (a) the worker is employed in sector 1, (b) the worker is employed in sector 2, (c) the worker is unemployed and prefers employment in sector 1, and (d) the worker is unemployed and prefers employment in sector 2.

Concerning the unobserved heterogeneity in the unemployment duration equations, we consider two cases. In the first case we ignore that heterogeneity, while in the second case we control for it.

Before constructing the likelihood, we can show that $\xi \sim N(0, \sigma_\xi^2)$, where

$$\xi = \eta_1 - \eta_2 = \alpha(\varepsilon_1 - \varepsilon_2) + \tau_1 - \tau_2 \text{ (cf. Equation 14) and } \sigma_\xi^2 = 1 + \alpha^2(\sigma_1^2 + \sigma_2^2 - 2\rho\sigma_1\sigma_2).$$

In addition, $\xi | \varepsilon_j \sim N(\mu_{Cj}, \sigma_{Cj}^2), j=1,2$

where $\quad \mu_{C1} = \alpha\left(1 - \rho\dfrac{\sigma_2}{\sigma_1}\right)\varepsilon_1, \qquad \sigma_{C1}^2 = 1 + \alpha^2\sigma_2^2(1 - \rho^2)$

and $\quad \mu_{C2} = \alpha\left(\rho\dfrac{\sigma_1}{\sigma_2} - 1\right)\varepsilon_2, \qquad \sigma_{C2}^2 = 1 + \alpha^2\sigma_1^2(1 - \rho^2).$[19]

For the sake of simplification, the index i relating to the worker is omitted.

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[19] Using the result: if $(x_1, x_2)' \sim N(\mu, \Sigma)$ where $\mu = (\mu_1, \mu_2)'$ and $\Sigma = \begin{bmatrix} \Sigma_{11} & \Sigma_{12} \\ \Sigma_{21} & \Sigma_{22} \end{bmatrix}$,

then $x_2 | x_1 \sim N(\mu_c, \Sigma_c)$ where $\mu_c = \mu_2 + \Sigma_{21}\Sigma_{11}^{-1}(x_1 - \mu_1)$ and $\Sigma_c = \Sigma_{22} - \Sigma_{21}\Sigma_{11}^{-1}\Sigma_{12}.$

Model 1: Without unobserved heterogeneity

In this model we assume that there is no heterogeneity conditional on observable variables.

Case 1: the worker is a sector 1 employee; his or her wage and unemployment duration are observed. His or her contribution to the likelihood function is:

$$L_1 \quad = Pr\left(E^* \geq 0 \mid \varepsilon_1 = y_1 - X\beta_1, \ T_1 = t\right) g_{\varepsilon_1}\left(y_1 - X\beta_1\right) f_{T_1}(t)$$

We assume that the worker prefers employment in sector 1 immediately before the making of the job, say at the moment $t - \varepsilon$, with ε being sufficiently small so that $t - \varepsilon \approx t$ and $E\left(T_1 \mid T_1 > t - \varepsilon\right) \approx E\left(T_1 \mid T_1 > t\right)$. In addition, ξ, T_1 and T_2 are independent (Equation 14).

$$Pr\left(E^* > 0 \mid \varepsilon_1 = y_1 - X\beta_1, \ T_1 = t\right)$$

$$= Pr\left\{X^o \alpha\left(\beta_1 - \beta_2\right) + \delta\left(E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right) + \theta Z + \xi > 0 \mid \varepsilon_1 = y_1 - X\beta_1\right\}$$

$$= Pr\left\{\xi \mid_{\varepsilon_1 = y_1 - X\beta_1} > -X^o \alpha\left(\beta_1 - \beta_2\right) - \delta\left(E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right) - \theta Z\right\}$$

$$=$$

$$\Phi\left\{\frac{X^o \alpha\left(\beta_1 - \beta_2\right) + \delta\left[E(T_1 \mid T_1 > t) - E(T_2 \mid T_2 > t)\right] + \theta Z + \alpha\left(1 - \rho\dfrac{\sigma_2}{\sigma_1}\right)\left(y_1 - X\beta_1\right)}{\sqrt{1 + \alpha^2 \sigma_2^2\left(1 - \rho^2\right)}}\right\}$$

and: $g_{\varepsilon_1}\left(y_1 - X\beta_1\right) = \phi\left(\dfrac{y_1 - X\beta_1}{\sigma_1}\right) / \sigma_1$ and $f_{T_1}(t) = \phi\left(\dfrac{\ln(t) - \mu_1}{\pi_1}\right) / t\pi_1$.

ϕ and Φ are the standard normal density and distribution functions, respectively.

Case 2: the worker is a sector 2 employee; his or her wage and unemployment duration are observed. His or her contribution to the likelihood function is (following the same reasoning as for case 1):

$$L_2 \quad = Pr\left(E^* < 0 \,|\, \varepsilon_2 = y_2 - X\beta_2, \; T_1 > t, \; T_2 = t\right) g_{\varepsilon_2}\left(y_2 - X\beta_2\right) S_1(t) f_{T_2}(t)$$

$$=$$

$$\Phi\left\{\frac{-X^\circ \alpha\left(\beta_1 - \beta_2\right) - \delta\left[E(T_1 | T_1 > t) - E(T_2 | T_2 > t)\right] - \theta Z - \alpha\left(\rho \dfrac{\sigma_1}{\sigma_2} - 1\right)\left(y_2 - X\beta_2\right)}{\sqrt{1 + \alpha^2 \sigma_1^2 \left(1 - \rho^2\right)}}\right\}$$

$$\times \; \frac{\phi\left(\dfrac{y_2 - X\beta_2}{\sigma_2}\right)}{\sigma_2}\left[1 - \Phi\left(\frac{ln(t) - \mu_1}{\pi_1}\right)\right]\frac{\phi\left(\dfrac{ln(t) - \mu_2}{\pi_2}\right)}{t\pi_2}.$$

Case 3: the worker is unemployed and prefers employment in sector 1. His or her wage and unemployment duration are censored. His or her contribution to the likelihood function is:

$$L_3 \quad = Pr\left(E^* \geq 0 \,|\, T_1 > t\right) S_1(t)$$

$$= \Phi\left\{\frac{X^\circ \alpha\left(\beta_1 - \beta_2\right) + \delta\left[E(T_1 | T_1 > t) - E(T_2 | T_2 > t)\right] + \theta Z}{\sqrt{1 + \alpha^2\left(\sigma_1^2 + \sigma_2^2 - 2\rho\sigma_1\sigma_2\right)}}\right\}\times\left[1 - \Phi\left(\frac{ln(t) - \mu_1}{\pi_1}\right)\right]$$

Case 4: the worker is unemployed and prefers employment in sector 2. His or her wage and unemployment duration are censored. His or her contribution to the likelihood is:

$$L_4 \quad = Pr\left(E^* < 0 \,|\, T_1 > t, \; T_2 > t\right) S_1(t) S_2(t)$$

$$= \Phi\left\{\frac{-X^\circ \alpha\left(\beta_1 - \beta_2\right) - \delta\left[E(T_1 | T_1 > t) - E(T_2 | T_2 > t)\right] - \theta Z}{\sqrt{1 + \alpha^2\left(\sigma_1^2 + \sigma_2^2 - 2\rho\sigma_1\sigma_2\right)}}\right\}\times$$

$$\left[1 - \Phi\left(\frac{ln(t) - \mu_1}{\pi_1}\right)\right]\left[1 - \Phi\left(\frac{ln(t) - \mu_2}{\pi_2}\right)\right]$$

The parameter ρ appears in the likelihood function, so it can be estimated; however, data does not make it possible to identify this parameter, since for the employed workers the wage is observed only for one sector. Its estimated value should not be of great importance in terms of interpretation.

Model 2: Unobserved heterogeneity controlled

Since there are two different types of workers for each sector, four different types of workers are involved when the two sectors are combined. The worker can for example be of type 2 in sector 1, of type 1 in sector 2, and so on.

For a sector 1 employee, the contribution to the likelihood becomes:

$$L_1 = \sum_{i=1}^{2}\sum_{k=1}^{2} p_{1i}p_{2k}\, Pr\left(E^* \geq 0 \,|\, \varepsilon_1 = y_1 - X\beta_1,\; T_1 = t,\; \lambda_1 = \lambda_{1i},\; \lambda_2 = \lambda_{2k}\right) \times$$

$$g_{\varepsilon_1}\left(y_1 - X\beta_1\right) f_{T_1}\left(t \,|\, \lambda_1 = \lambda_{1i}\right)$$

where $p_{ji} = Prob\left(\lambda_j = \lambda_{ji}\right)$ and $\sum_{i=1}^{2} p_{ji} = 1$, $j=1,2$.

Similarly, the contribution to the likelihood of a worker employed in sector 2 is:

$$L_2 = \sum_{i=1}^{2}\sum_{k=1}^{2} p_{1i}p_{2k}\, Pr\left(E^* < 0 \,|\, \varepsilon_2 = y_2 - X\beta_2,\; T_2 = t,\; T_1 > t,\; \lambda_1 = \lambda_{1i},\; \lambda_2 = \lambda_{2k}\right) \times$$

$$g_{\varepsilon_2}\left(y_2 - X\beta_2\right) S_{T_1}\left(t \,|\, \lambda_1 = \lambda_{1i}\right) f_{T_2}\left(t \,|\, \lambda_2 = \lambda_{2k}\right)$$

In the same way, the contribution to the likelihood of an unemployed worker preferring employment in sector 1 is:

$$L_3 = \sum_{i=1}^{2}\sum_{k=1}^{2} p_{1i}p_{2k}\, Pr\left(E^* \geq 0 \,|\, T_1 > t,\; \lambda_1 = \lambda_{1i},\; \lambda_2 = \lambda_{2k}\right) S_{T_1}\left(t \,|\, \lambda_1 = \lambda_{1i}\right)$$

Finally, the contribution to the likelihood of an unemployed worker preferring employment in sector 2 is:

$$L_4 =$$

$$\sum_{i=1}^{2}\sum_{k=1}^{2} p_{1i}p_{2k}\, Pr\left(E^* < 0 \,|\, T_1 > t,\; T_2 > t,\; \lambda_1 = \lambda_{1i},\; \lambda_2 = \lambda_{2k}\right) S_{T_1}\left(t \,|\, \lambda_1 = \lambda_{1i}\right) S_{T_2}\left(t \,|\, \lambda_2 = \lambda_{2k}\right)$$

By considering a dummy variable d which takes value 1 if the worker prefers sector 1 and value 0 otherwise and a dummy variable C which takes value 1 if the unemployment spell is uncensored and value 0 otherwise, the likelihood function to be maximized is:

$$L = \prod_i L_1^{d_i C_i} L_2^{(1-d_i)C_i} L_3^{d_i(1-C_i)} L_4^{(1-d_i)(1-C_i)} \quad (1)$$

Appendix 1.3: The Structure of Education in Morocco

1- <u>Pre-school</u>:

We distinguish two types of establishments:

- Koranic schools, which constitute the most frequent form of pre-school. They provide a traditional education in a modern way.

- Nursery schools and kindergartens, which provide education on the basis of modern methods.

2- <u>Fundamental Education</u>:

Composed of two cycles:

- A first stage of six years length where enrolment starts at the age of 6 years.
- A second stage of 3 years length, which receives pupils who finished the first cycle.

At the end of the second cycle, pupils are oriented either towards general and technical secondary education or towards vocational training. Those who do not reach the second cycle of fundamental education could be oriented towards vocational training (specialisation level, see below).

3- <u>Secondary Education</u>:

This three-year cycle receives pupils who succeed in fundamental education and who are oriented to continue their studies in a general or technical field. It leads to obtaining the "Baccalaureate" certificate, which allows access to university or some higher vocational training.

4- <u>Higher Education</u>:

Students who obtain the "Baccalaureate" certificate continue their higher studies in:
- Universities.
- Technical schools (called also higher institutes and schools).
- Teachers' schools, or
- Universities and schools abroad.

5- <u>Vocational Training</u>:

The system of vocational training is organized in 4 levels:

- Specialised technician: this two-year training program is accessible, after competition or testing, to students holding the "Baccalaureate" certificate.

- Technician: a two-year training program, which is accessible after competition to students having entirely followed the last year of secondary education (without necessarily obtaining the "Baccalaureate" certificate).

- Qualification: accessible, after competition, to pupils from the 9th year of fundamental education, 1st or 2nd year of secondary education. The length of training is generally 2 years.

- Specialisation: accessible, after competition, to pupils from the 7th and 8th year of elementary education or those who successfully complete the first stage of elementary education. The length of training depends on the program, but most programs are 2 years in length.

Chapitre 2

The Unemployment of Highly Educated Workers in Morocco

2.1 Introduction

Theoretically, a high level of education improves the chances of employment and the economic situation of individuals. Indeed, Mincer (1991) stipulates that the major benefit of education is the higher the educational level the lower the risk of unemployment. Moreover, employed educated workers enjoy three additional advantages as compared to less educated ones: high wages, great ascending mobility and job stability. This positive relationship between education and employment is observed in the developed countries, and had been consolidated during the 1980s and 1990s. This period was marked by a modification in the structure of the labour demand putting at a disadvantage of the least skilled workers. Indeed, the use of new technologies and the increasing competition from the low-wage countries have stimulated the demand for highly qualified workers in the developed ones, consequently reducing the demand for less qualified workers.

However, the above situation is not always the case. Some developing countries, particularly in Africa, have experienced an alarming rise in unemployment among their educated workers, principally among those holding university degrees. Uneducated workers continue to benefit from great employment possibilities, particularly in rural areas. Morocco constitutes a typical example of such a country. The unemployment rate is high (13.6% in 2000), particularly in urban areas (21.5%), and it concerns mainly educated workers. The unemployment rate among educated workers reached 27.5% in 2000 (29.7%

in urban areas) versus only 7.1% among non-educated workers (3.5% in rural areas), each group representing about half of the Moroccan labour force. In 2000, the unemployment rate exceeded 30% among workers holding secondary or university degrees and 40% among those holding Bachelor's degrees. This situation occurred despite the fact that only 10% of the Moroccan labour force has university degrees.

Several factors can be used to explain this situation in Morocco and other developing countries. The most commonly evoked factors are related to the high growth of the population and the weak performance of the economy. In the case of educated workers, additional factors are also quoted, such as the rapid increase in the size of the educated population and the imbalance of education and labour market needs. Likewise, in some countries the slowdown in recruitment in the public sector seems to be a significant factor in the deterioration of the employment of highly educated workers. Indeed, this deterioration parallels the reduction of the number of new positions in the public sector under structural adjustment policies imposed by the International Monetary Fund. In Morocco, the number of new positions has dropped dramatically since 1983. It ranges now between 10,000 and 15,000 new positions per year, as compared to 29,000 and 51,000 new positions between 1976 and 1982. Consequently, the share of highly educated workers in the urban unemployed labour force has been increasing steadily, growing from 3.1% in 1984 to 23.2% in 1997. In 1990, the share of those workers in the urban unemployed labour force exceeded their share in the employed labour force. This change of structure has been continuing, making the unemployment of highly educated workers a real social phenomenon and a political puzzle in Morocco.

Admittedly, the private sector has not been able to absorb all the workers that the public sector cannot recruit. However, certain distortions related to the workers' behaviour with regard to job search contribute to the maintenance of the unemployment rate at a high level (Rama, 1998; Bougroum, Ibourk and Trachen, 1999). In 1998, four out of ten unemployed workers with university degrees living in urban areas admitted seeking employment exclusively in the public sector. As a result, many of them decline job-offers in the private sector.

The public sector generally offers job stability, high wages and good employment conditions, whereas the private sector, dominated by informal activities, generally offers working conditions that do not meet the educated workers' aspirations with regards to remuneration and the nature of employment (Orivel, 1995; Gaude, 1997; Combarnous, 1999). Indeed, in the informal sector wages are low. In addition, the human capital characteristics do not have a significant effect on wage determination, the possibilities for promotion are very limited, and the monitoring is personalised and arbitrary (Orr, 1997). This segmentation of the labour market in the public and private (mainly informal) sectors, which is very strong in the developing countries, contributes to the worsening of the unemployment, particularly in urban areas. Harris and Todaro (1970) argue that the substantial wage differential between urban and rural areas provokes a movement of workers from rural to urban areas in a number that urban areas cannot absorb. This results in a positive urban unemployment rate, which is an increasing function of the wage differential between rural and urban areas. Thus, some rural workers seeking to improve their economic situation find it rational to quit their employment in rural areas to seek well-paid employment in urban areas even though such a move is associated with a high risk of unemployment. The same logic applies when trying to explain the situation of highly educated workers in Morocco. As those workers strongly covet employment in the public sector, some of them prefer to remain unemployed while waiting for employment in this sector, and they do not intensively search for employment in the private sector. In addition, those who accept "unsatisfactory" employment in the private sector are likely to report themselves unemployed at the time of the labour force surveys. Consequently, the real unemployment rate is overestimated. Such behaviour is so significant that Bougroum, Ibourk and Trachen (1999) consider Moroccan educated workers as potential and permanent seekers of employment in the public sector.

We have empirically tested the idea of "unemployment while waiting for employment in the public sector" for workers with university degrees using data from the 1998 Moroccan labour force survey (see Chapter 1). The results confirm the strong segmentation of the Moroccan labour market in the public sector on the one hand and the private sector on the other hand. The significant starting wage differential between the two sectors is very high (estimated at over 80% to the advantage of the public sector), and the unemployment durations are much higher in the public sector. However, workers seem to put great weight on non-pecuniary factors such as job stability, working conditions, prestige in being a civil

servant in a developing country, etc. Consequently, the preference for employment in the public sector is less sensitive to wage and unemployment duration changes. The unemployment of highly educated workers in Morocco seems to result from the scarcity of good employment opportunities in the private sector. Hence, policies aimed at fighting unemployment should focus on improving employment opportunities in the private sector both quantitatively and qualitatively. This could be done through encouraging a high level of economic growth and, by concurrently creating firms dissociated from the informal sector. Economic growth will be more favourable if the private sector takes advantage of highly qualified workers. For a long time, the public sector has been the exclusive employer of graduates, who in this way engage massively in non-productive employment. Consequently, one could at the same time observe a high rate of return to education for individuals, as contrasted with negligible contributions of education to the economic growth (Orivel, 1995). In 1998 (that is to say 15 years after the implementation of structural adjustment policies), the public sector still employs over 60% of university graduates and more than 70% of technical schools' graduates living in urban areas.

Obviously, the public sector needs to continue recruiting new workers to ensure the high quality of its services and to replace those who retire. However, the improvement of the quality of those services (which concern the private sector directly or indirectly) requires that the government reform its recruitment and remuneration policies. The labour needs should be clearly identified and satisfied by skilled workers for the public sector exactly as this would be done in a private company. The dependence upon the diploma levels in recruitment and remuneration in the public sector must be enfeebled in order to put more weight on competence and productivity. At the same time, the recruitment policy in that sector should aim at filling the real needs of the public sector, quantitatively and qualitatively, as the replacement for the present policy mainly aimed at fighting unemployment. Also, the actual remuneration system should be reformed in order to attract and retain skilled workers in the public sector and incite them to be productive. Furthermore, since many young people relate their investment in education to employment in the public sector (Bougroum, Ibourk and Trachen, 1999), the above-mentioned policies would help to remedy this socially inefficient behaviour.

Finally, it is important to remember that fighting against unemployment in Morocco remains a very complicated exercise due to some aberrant facts that slow down any durable social and economic development. For example, weak government investment in education is a problem. The rate of illiteracy among the adult population is far too high (48% in 1998), and yet many children of school-going age do not attend formal school or drop out of school prematurely. Many studies highlight the benefits of education for economic and social development. Investment in human capital stimulates economic growth and thus employment, which in return encourages investment in human capital itself. Conversely, a weak investment in human capital has a negative impact on economic growth, and low economic growth does not improve employment. This maintains investment in human capital at a low level (Cahuc and Zylberberg, 1996). Allocating additional resources to elementary education (even to the detriment of university education) will help to improve the overall level of education of the labour force, stimulating economic growth. In addition, an improvement in the labour force education level will result in the tightening of the informal sector (unfavourable to education), inciting educated workers to seek employment in the private sector.

The outline of this chapter is as follows. In Section 2.2, we present some key figures on Morocco. We then describe the situation of weak investment in human capital. In Section 2.3, we expose the evolution of the employment outlook and particularly stress the unemployment of educated workers. Section 2.4 focuses on governmental employment policies during the last few years, whereas Section 2.5 analyzes the unemployment of university graduates as a result of the behaviour of these workers with regard to job search, and presents some solutions for this unemployment. Section 2.6 concludes the study.

2.2 Investment in Education in Morocco

"A weak investment in human capital has a negative effect on growth; and weak growth does not improve employment, which, in return, contributes to the reduction of investment in human capital. The economy can thus fall into a "trap door" of unemployment and stagnation, where unemployment maintains the stagnation that itself maintains unemployment." Cahuc & Zylberberg (1996)

2.2.1 Overview of the Moroccan Economy

In 2000, the size of the population in Morocco (sized 710,850 km^2) was 28.7 million. The population sector aged 15 years and younger represented 32.3% of the total population, as compared to 7.3% of population sector aged 60 and older. The percentage of children aged 18 years or less was 37.4% in 2002, as compared to 43.6% in 1990. The share of the urban population has grown significantly during the last few decades, increasing from 35% in 1971 to 42% in 1982 and to approximately 55% in 2000. The life expectancy has also improved substantially, increasing from 59.1 years in 1980 to 69.5 years in 1999. The death rate among young people, which exceeded 20% at the beginning of the 1960s, fell to 6% at the end of the 1990s. The fertility rate remains relatively high, although it has dropped considerably over the last three decades, from 6.97 in 1970 to 3.1 in 1997. Consequently, the population rate of growth has dropped from 2.6% on average (yearly) between 1960 and 1982 to 2.06% on average (yearly) between 1982 and 1994[20] and to 1.66% between 1998 and 1997. Finally, the average size of a Moroccan household was 5.5 persons in 2000.

In 2001, the gross domestic product (GDP) was about 390 billion Moroccan Dirhams (MAD). One US dollar is worth approximately ten MADs. The agricultural sector (including forestry and fishing), which is a very important sector in the Moroccan economy, represents 15.8% of the GDP and employs more than 40% of the total labour force. The country strongly depends on the climatic conditions, since positive and high growth rates of the GDP are often related to years with good crops.

Morocco is one of the major producers and exporters of phosphate. In addition, Morocco has two coastlines, the Atlantic and the Mediterranean, 3,500 km in length. Moroccan waters are rich in fish, and the fishing sector employs more than 200,000 people. The foreign trade of Morocco records a permanent deficit with exports covering less than 70% of imports. In 2001, the imports mainly included manufactured products (18.5%), oil (11.7%), and cereals (7%). Exports primarily consisted of clothing (21.3%), articles of hosiery (11%), fresh fish, crustaceans, molluscs and shells (7.9%), phosphoric acid (6.7%), and phosphates (5.8%).

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[20] The size of the population increased from 11.6 million in 1960 to 20.4 million in 1982 and 26 million in 1994.

Table 2.1: Structure of the GDP in 2001

	%	Variation compared to 2000
Agriculture, Forestry and Fishing	15.8	+27.3
Mines	1.9	+7.5
Energy	6.9	+8.1
Manufacturing Industries	16.9	+4.2
Construction Industry	5.1	+5.8
Trade and Taxation on Imports	19.0	+3.3
Transportation and Communications	6.9	+1.0
Other Services	12.2	+0.7
Public Administrations	15.2	+4.6
Total	100.0	+6.5

In spite of the importance of the agricultural sector to the economy, the agricultural trade balance is largely in deficit. In 1996, the value of agricultural exports represented only 54% of the value of agricultural imports.

To make up for the trade deficit, Morocco significantly depends on the remittances of its citizens working abroad, whose number exceeds 2 million. In 2001, such transfers exceeded three billion US dollars.

2.2.2 Education in Morocco

During the school year 2000-2001, Morocco counted 3.84 million pupils in the first stage of elementary education (years 1-6), 1.04 million in the second stage of elementary education (years 7-9), 484 thousand in the secondary stage (years 10-12), and 289 thousand in higher education (universities and post-secondary) (see Appendix 1.3, Chapter 1 for a short description of the educational system in Morocco). However, as compared to other countries, Morocco continues to post significant a deficiency in schooling rates, particularly at the secondary and higher education level, in rural areas and especially among girls (see Table 2.2).

The gap between boys and girls with regards to their schooling rate remains large at the level of primary education, although this gap has significantly decreased over the last few years: the gap was 23.7 points in 1995, as opposed to 43 points in 1965. Concerning secondary education, the gap between the two genders has remained constant at 11 points between 1965 and 1995, but it varied over the years (9.1 points in 1975 and 14 points in

1985, for example). This situation persists despite the fact that other countries comparable to Morocco have made spectacular progress in the area of education. For example, in Libya the gap between boys and girls with regard to schooling rate at the primary educational level decreased from 67 points in 1965 to -0.1 points in 1995. In Tunisia, the gap decreased from 51 points to 6.9 points. At the secondary level, the gap between boys and girls fell from 20 points to 6.8 points in Libya, and from 14 points to 3.6 points in Tunisia.

Table 2.2: Gross Schooling Rates by Sex in 1996 (%)

	Elementary			Secondary			Higher education		
	M+F	M	F	M+F	M	F	M+F	M	F
Morocco	*86*	*97.3*	*74.2*	*39.1*	*44.3*	*33.7*	*11.1*	*12.9*	*9.3*
World	100.9	106.0	95.5	59.4	63.1	55.6	16.9	17.5	16.3
Africa	80.7	88.0	73.4	33.4	36.6	30.2	6.5	8.1	4.9
LDC	70.7	79.6	61.6	19.0	23.1	14.8	3.1	4.6	1.7
DC	100.7	106.5	94.5	50.9	55.6	45.8	9.8	11.4	8.1
Developed Countries	102.3	102.6	101.9	99.5	98.3	100.8	51.0	47.1	55.1

Source: UNESCO statistics
Notes: M: male; F: Female; LDC: Less developed countries; DC: Developing countries.

Moroccan rural areas post a serious deficiency in schooling of children, especially girls. In 1994, the rate of schooling among girls aged 8 to 13 years hardly reached 26.6% in rural areas, as opposed to 80.4% in urban areas. Among boys, the rate of schooling was 87.5% in urban areas versus only 59.6% in rural areas. Thus, many children of school-going age still lack the right to basic education that has the potential to better their lives. The main reasons for this under-investment in education are often related to the poverty, lack of or distance to schools, particularly in remote areas, and the fact that elementary education is not yet compulsory in Morocco. The child labour, which is related to the standard of living of families, also remains an important factor for lack of schooling and high dropout rates among young children.[21] Although prohibited by law,[22] child labour is tolerated in Morocco. The 1982 general census of the population counted 46,230 employed children aged between 5 and 9 and 367,782 employed children aged between 10 and 14, including 259,303 working as unpaid family employees. The 1994 general census counted 356,530 children aged 15 or younger among the labour force, which represents 4.3% of the total

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[21] This is especially true in rural areas, where children work as unpaid family workers.
[22] The legal minimum age to work has been fixed at 12 years since 1947. The new project of a labour code aims to raise it to 15 years.

labour force and 5.1% of the employed population. Among those children, 74% live in rural areas and 7% are aged between 5 and 9 (Lahlou, 1999). In addition, detailed data from the 1999 labour force survey shows that in rural areas 92.2% of employed workers aged less than 15 years are unpaid family workers (17.4% in urban areas). This percentage is 73.1% among workers aged between 15 and 24 (14.6% in urban areas). This situation is related to poverty, but also to the failure of the educational system and the absence of legal protection for working children (Lahlou, 1999). Some socio-cultural factors also intervene. For example, the likelihood that rural children will accept agricultural employment is a decreasing function of the schooling level. Orivel (1995) argues that this is especially true in Africa, since young people who attended school are less passionate for agricultural work. They aim at employment in the formal sector, preferably in the public sector, in urban areas. Awareness of this "negative" effect of education and desire to take advantage of free labour (unpaid family workers) encourage parents to prevent their children from attending school.

Pre-schooling also remains weak in Morocco. Hardly 40% of children aged between 3 and 5 benefit from this form of education, which is far from the government's objective to increase that percentage to 96% by 2004. The age of schooling has previously been reduced to 6 years instead of 7 years, but still 48% of the children start school at 7 years of age.

The provision of elementary education to all children does not seem feasible in the short-term in Morocco. Even if enrolled, many children do not remain in school for a long time. The school dropout rate remains very high. In 1999, the dropout rate among children aged between 7 and 15 was 14.5% (21.7% in rural areas). In addition, "the life expectancy at the school" in 1999-2000 was 8.17 years (7.37 years for girls) in Morocco versus 11.52 years in Algeria (1998-1999) and 13.54 years in Tunisia (1999-2000). In addition, about 45% of students who undertake university studies drop out before obtaining a Bachelor's degree. Those who succeed, spend on average nine years studying to obtain that degree, which normally should require only four years of university study.

Table 2.3: Schooling and Reasons for Non-Schooling of Children by Area (%)

		Urban	Rural	Total
Schooling of children aged between 7 and 15	Attending school	83.7	48.0	65.4
	Dropped out of school	8.9	13.3	11.1
	Never attended school	6.4	38.3	22.8
	Unreported	1.0	0.4	0.7
Reasons of non-schooling	Distance to school, geographical difficulties	1.2	15.2	13.5
	Lack of place at school	0.6	0.1	0.1
	No school in the locality of residence	0.5	14.5	12.9
	Helping parents in their professional activities	0.4	7.1	6.3
	Obliged to work	1.5	0.3	0.4
	Lacking financial means to cover expenses related to schooling	46.9	34.4	35.9
	No interest for studies	2.0	5.4	5.0
	Attitude of parents towards school	4.8	10.1	9.5
	Family problems	2.4	1.9	1.9
	Other reasons	32.9	5.5	8.8
	Unreported	6.8	5.5	5.7
	Total	100	100	100
Children aged between 7 and 12 years who drooped out		6.6	6.5	5.1
Main reasons of dropout	Lack of financial means to cover expenses related to education	29.9	18.9	22.6
	Children are not interested in education	41.6	41.1	41.2
	Repetition of grads or failure at exams	15.1	6.2	9.3

Source: 1998-1999 National Standard Living Survey, Direction de la Statistique, Morocco.

The socio-economic factors responsible for not educating children and for a high dropout rate still persist and have even worsened in some areas. The percentage of Moroccans living in poverty grew from 13% in 1991 to 19% in 1998-99. In addition, the 1998-99 rate of poverty was more than two times higher in rural areas (27.2%) than in urban areas (12.0%). Although the rural population accounted for only 46% of the total population in 1998-99, it included 65.9% of the population living in poverty.[23] As mentioned above, it is in rural areas that the rates of schooling are particularly low.

The weak rates of schooling in the past resulted in a high rate of illiteracy among the adult population. This rate was 48% in 1998, 56% in 1995 (69% among women); and 80% in 1960. Currently, the fight against illiteracy is mainly undertaken through programs offered through the mass media, courses in mosques and actions of non governmental

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[23] Repères Statistiques, # 47, July 2000, Direction de la Statistique, Morocco.

organisations. This situation of under-investment in education seems to contrast with the financial means allocated to education by the government. The share of education expenditure in the governmental budget doubled over 20 years, growing from 12.5% in 1975 to 24.9% in 1996. In several countries comparable to Morocco, this share varied between 8% and 17% in 1992 (14.8% in Korea, 12.9% in Chile, 16.9% in Malaysia, 7.8% in Nepal), as compared to very high rates of schooling in primary education in the same year (105% in Korea, 96% in Chile, 93% in Malaysia, 102% in Nepal) .[24]

An abundant number of studies have documented the positive effect of education on the economic growth and emergence of new technologies. In Morocco, the agricultural sector still constitutes the principal employer and remains the main sector affecting the activity and employment in other sectors. The country strongly depends on its climatic conditions, since the positive growth of the GDP always follows good crop years. Over the last 25 years, the share of the agricultural sector in the GDP oscillated between 15% and 20%, whereas its share in employment, although dropping over time, still accounts for over 40% (65.7% in 1960). By way of comparison, in South Korea, which achieved remarkable levels of development, the share of the agricultural sector in the GDP fell to below 6%, whereas this share was even higher than that of Morocco before 1979. Moreover, the share of the agricultural sector in employment in South Korea dropped from 61.3% in 1960 to 18.1% in 1990. In Morocco, it fell from 65.7% to 44.7% over the same time period. In fact, South Korea has first developed successively primary education, and then secondary and university education in order to accompany its economic development. The importance of the agricultural sector in employment is closely linked with the level of education, since agricultural labour supply is supposed to decrease as the educational level increases. A piece of evidence is that over seven out of ten workers in the Moroccan agricultural are illiterate.

In 1995, the World Bank clearly pointed out that the low educational level of the population and the failures of the educational system were the main sources of the economic dysfunction in Morocco. The World Bank had then proposed that Morocco implement many reforms, among which were the development and fundamental reform of the education and vocational training systems. The strategy proposed aimed at reaching the following objectives over a 15-year period (that is to say, by 2010):

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[24] Source: World Bank Report on Morocco presented to the King of Morocco in 1995.

(i)   All children, including girls, must complete at least the first stage of elementary education (years 1-6).

(ii)   At least 75% of all children completing the first stage of elementary education must enrol in the second stage of elementary education (years 7-9), while the rate of schooling in secondary education (years 10-12) should reach at least 50%.

(iii) Vocational training should aim at teaching skills required by companies, while most of this training should be planned, financed and offered by employers (directly or through contracts). At least half of the vocational training should aim at improving the skills of the employed labour force (continuing education).

(iv)   The rate of higher education enrolment has to double.

The situation in Morocco, marked at the same time by weak investment in education and high unemployment rate (see Section 2.3), seems to match the situation described by Cahuc & Zylberberg (1996). They argue that a weak investment in human capital has a negative effect on growth and that weak growth does not improve employment, which, in return, contributes to the slowing down of investment in human capital. Consequently, the economy could fall into a cycle of unemployment and stagnation, where unemployment maintains the stagnation, while stagnation maintains unemployment. On the contrary, a high level of investment in human capital is favourable to growth, employment, and, ultimately investment in human capital.

Education also contributes to the emergence of a civic society able to take part in making good decisions. Friedman (1962) argues: "*A stable and democratic society is impossible without a minimum degree of literacy and knowledge on the part of most citizens and without widespread acceptance of some common set of values. Education can contribute to both. In consequence, the gain from education of a child accrues not only to the child or to his parents but also to other members of the society.*"

Currently, the government's actions aim at decreasing the rate of illiteracy to less than 20% by 2010 and to eradicating it completely by 2015. Unfortunately, a recent report published by UNESCO on November, 2002 entitled "*Report of Follow-Up on Education for All 2002: Is the World on the Good Way?*" mentions Morocco among 28 countries that will likely not reach (by 2015) any of the three measurable objectives laid down at the world Forum of Education held in Dakar in 2000. These objectives are primary school for all, equality between girls and boys, and reduction by half of the rate of illiteracy. According to the report, achieving these objectives in countries such as Morocco remains a dream.

2.3 Moroccan Labour Market

> "*A major benefit of education is the lower risk of unemployment at higher educational levels.*" Mincer (1991)

The principal data source on employment in Morocco is the ongoing labour force surveys carried out by the Department of Statistics. Data prior to 1999 mainly concerns urban areas.

2.3.1 Characteristics of the Labour Force

In 2000, the size of the Moroccan labour force was 10.3 million, representing 52.9% of the population aged 15 and older (56% in 1995). Of the total labour force, 26.8% were women. The share of the labour force among the population aged 15 and older was 47% in urban areas versus 61.4% in rural areas, and 78.8% for men as opposed to only 27.9% for women.

The main characteristic of the Moroccan labour force is the preponderance of uneducated workers. Indeed, in 1999, about one out of each two workers (46%) had never attended school and 24% attended only the first stage of elementary school (years 1-6). Workers with post-secondary degrees represented less than 7% of the labour force. This situation results from the high rate of illiteracy, which is close to 50% in the population sector aged 15 and older (see Section 2.2.2). In connection with the nature of jobs, uneducated workers are naturally more present in rural areas, where they represent 69.1% of the total labour force versus 24.8% in urban areas.

The level of education of the labour force is, however, improving over time. Between 1995 and 1999, the share of uneducated workers has declined by 9.5 points, while the share of workers having completed the first stage of elementary education has increased 5.7 points (see Table 2.4).

Table 2.4: Distribution of the Labour Force by Level of Education (%)

Education levels	1995	1999
None	55.9	46.4
Elementary, 1st stage (years 1-6)	18.1	23.8
Elementary, 2nd stage (years 7-9)	12.1	13.4
Secondary	9.2	9.5
University	4.7	6.8
Labour force size (in millions)	9.4	10.3

2.3.2 Unemployment

In 2000, the unemployment rate was 13.6%, corresponding to 1.4 million people seeking employment. In urban areas, the unemployment rate was higher (21.5%), in particular among educated workers (29.7% for workers who have completed at least the first stage of elementary education versus 13.1% among those who had never attended school or who had not completed the first stage of elementary education). In addition, the unemployment rate was higher among women (26.7%) than among men (19.9%). Rural areas posted a low unemployment rate (only 5%), but they were dominated by non-remunerated employment,[25] which accounts for 50.9% of total employment in these areas versus only 7.3% in urban areas. Finally, the unemployment rate among rural women was only 1.7%, a fact which could be explained by the fact that in rural areas women are often either employed or out of the labour force.

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[25] Unpaid family workers

Table 2.5: Indicators of Employment and Unemployment in Morocco in 2000 by Area

	Urban	Rural	Total
Labour force size (in thousands)	5,345	4,940	10,285
% Women	23.3%	30.5%	26.8%
Labour force participation rate	47.0%	61.4%	52.9%
Men	74.0%	85.4%	78.8%
Women	21.3%	37.5%	27.9%
Employed workers (in thousands)	4,199	4,692	8,891
Employment rate	36.9%	58.3%	45.8%
% unpaid workers	7.3%	50.9%	30.3%
Unemployed workers (in thousands)	1,146	248	1,394
Unemployment rate	21.5%	5.0%	13.6%
Men	19.9%	6.5%	13.8%
Women	26.7%	1.7%	13.0%
Uneducated or first stage of elementary education (years 1-6) not completed	13.1%	3.5%	7.1%
At least the first stage of elementary education is completed	29.7%	17.0%	27.5%

The unemployment rate almost doubled between 1971 and 1994. The number of unemployed workers increased by 84% between 1971 and 1982, and by 117% between 1982 and 2000. This deterioration in employment particularly affected urban areas where the unemployment rate has been above 20% for several years. In addition, the worsening of unemployment in urban areas involved mainly young people and especially educated ones, in particular those with a secondary or university degrees. In rural areas, the unemployment rate was almost the same in 1971 and 2000.

Table 2.6: Evolution of Unemployment between 1971 and 2000

	Urban				Rural				Total			
	1971	1982	1994	2000	1971	1982	1994	2000	1971	1982	1994	2000
Number of unemployed workers, 10^3	216	322	920	1,146	133	320	412	248	349	642	1,332	1,394
Unemploy-ment rate (%)	15.0	12.3	20.3	21.5	5.2	9.5	10.8	5.0	8.8	10.7	16.0	13.6
Men	*14.4*	*11.7*	*17.1*	*19.9*	*5.2*	*10.0*	*10.9*	*6.5*	*8.2*	*10.7*	*14.1*	*13.8*
Women	*19.1*	*14.2*	*29.6*	*26.7*	*5.3*	*6.5*	*10.5*	*1.7*	*12.1*	*10.7*	*23.1*	*13.0*

By level of education, practically all levels between elementary school and university are affected by unemployment more than uneducated workers. Those holding vocational training diplomas are the most affected, but workers with university degrees are also involved in the crisis. Therefore, investment in human capital in Morocco is challenged by a high risk of a progressive annihilation by the increasing unemployment duration, instead of being consolidated within a job. This involves a dead loss of resources and human means mobilised for this investment by the government as well as by individuals.

Table 2.7: Urban Unemployment Rate by Level of Education (%)

	1997	1998	1999
None	11.6	11.9	15.2
Elementary education	25.2	25.6	29.2
Vocational training, specialisation level	38.2	40.4	39.0
Vocational training, qualification level	38.7	34.6	34.3
Secondary	31.1	35.8	33.1
Technicians	15.7	17.1	20.1
University	29.7	30.9	31.3
Total	18.1	19.1	22.0

Aggregated data can conceal large differences within the same level of education. This is, for example, the case with university graduates. In 1998, the urban unemployment rate was close to 50% among holders of Bachelor's degrees versus only 5.3% among those holding higher university and 5.6% among those with technical school degrees (see Table 2.8).

Table 2.8: Unemployment Rate among Highly Educated Workers in 1998 (Urban Areas)

Degree	Total	Female
University, Below Bachelor's	36.4	43.4
University, Bachelor's	48.2	60.8
University, Above Bachelor's	5.3	19.0
Technical School	5.6	9.7

Note: These rates were calculated by the author based on the 1998 Moroccan Labour Force Survey data file.

Workers also experience long spells of unemployment. In 1999, about 72% of unemployed workers have been unemployed for at least 12 months and 26.8% for at least 60 months. These percentages were respectively 60.5% and 23.4% for uneducated workers versus 84.6% and 29% for highly educated ones.

Table 2.9: Unemployment Duration by Education Level in 1999 (%)

	None	Medium[*]	Higher[**]	Total
Less than 12 months	39.5	23.3	15.4	28.3
12-35 months	23.7	28.6	32.2	27.3
36-59 months	13.3	18.8	23.3	17.5
60 months and up	23.4	29.2	29.0	26.8

(*) Elementary and secondary (not completed)
(**) Secondary (graduated) and university

Finally, the agricultural sector (including forestry and fishing) constitutes the most important employment sector in Morocco, providing nearly 50% of total employment. The industrial sector (including the handicraft industry) accounts for only 14% of aggregate employment, whereas the public sector remains an important employer, particularly in urban areas (21%) and for educated workers (see Table 2.13 below).

2.3.3 Causes of Unemployment

The explanations given for the high level of unemployment in Morocco are many: demographic factors, weak growth of the economy, distortions in the labour market, etc. In the case of educated workers, other factors also contribute, such as the rapid growth in the number of educated workers (in connection with the demographic factor, but also with the governmental policy aimed at inciting young people to invest in education), the imbalance of education and labour market demand, and the reduction of employment in the public sector.

The rapid growth of the population is naturally one of the first factors blamed in developing countries for the pressure on the labour market. The population of Morocco has tripled over the last 50 years due particularly to a high birth rate and a low death rate. The latter rate has decreased from 2.5% in 1950 to 0.51% in the early 2000s, due in particular to the improvement in food quality and sanitary conditions.

The pressure on the labour market is high in urban areas, where the size of the population has increased from 3.4 million in 1960 to more than 16 million in 2001 (a total growth of 381% versus only 56% in rural areas) (see Table 2.10). In addition, since 1994, the size of the urban population has been higher than the size of the rural population. The increase in

the size of the urban population has also been reinforced by the transformation of some rural zones into urban zones, and by the strong rural exodus caused by the aggravation of climatic conditions and the deterioration of the farmers' standard of living. Lane, Hakim and Miranda (1999) argue that this high growth of the urban labour force has largely contributed to the deterioration of employment in urban areas of Morocco.

Table 2.10: Evolution of the Size of the Moroccan Population by Area (in millions)

	Urban	**Rural**	**Total**
1960	3.39	8.24	11.63
1971	5.41	9.97	15.38
1982	8.73	11.69	20.42
1994	13.41	12.67	26.07
2001	16.31	12.86	29.17
Variation between 1960 and 2001	+381.1%	+56.1%	+150.9%

In rural areas, where the unemployment rate is low in spite of a high labour force participation rate as compared to urban areas, unpaid family employment prevails, particularly among women (see Table 2.5). Detailed data from the 1999 labour force survey shows that unpaid workers constituted 52% of the employed labour force in rural areas (36.8% among men and 80.2% among women) versus only 5.6% in urban areas (5.4% among men and 6.2% among women).

The second factor usually quoted to explain the worsening of unemployment is the weak performance of the Moroccan economy. Indeed, the jagged economic growth over the last few years did not make it possible for the urban labour market to absorb the large number of newcomers. The GDP shows large variations over time (see Table 2.11), but the high growth rates are always observed for years marked by good pluviometric precipitations, which is in advantage to uneducated workers. In fact, high growth rates are mainly due to the agricultural sector, for which production oscillates in very broad amplitudes over time.

Table 2.11: Annual Growth Rate of the GDP in Morocco

Year	Annual growth rate of the GDP (%)
1992	- 4.0
1993	- 1.0
1994	+ 10.4
1995	- 6.6
1996	+ 12.1
1997	- 2.0
1998	+ 6.3
1999	+ 0.2
2000	+ 0.9
2001	+ 6.5

Additionally, some distortions on the labour market contribute to amplifying the unemployment rate. Rama (1998), who studied the labour market in Tunisia, a country comparable to Morocco, reports that high rates of unemployment result from some problems of measurement and classification of individuals according to their status (out of labour force, employed, or unemployed). For example, it is not easy to assign a label to rural women who work on family farms (employed) and take care of their households (out of the labour force) at the same time. For men, the line between being unemployed and working in the informal sector is also very thin. Rama adds that some educated workers seek employment only in the formal sector and refuse (or decline) employment in the informal sector. However, they are still classified among the unemployed, which contributes to over-estimation of the real unemployment rate. In the specific case of women in Morocco, Bougroum, Ibourk and Trachen (1999) confirm the difficulty in distinguishing between inactivity (out of labour force) and unemployment. For example, women out of the labour force for matrimonial reasons can easily re-enter the labour market, particularly when there are opportunities for employment in the public sector.

Concerning the unemployment of educated workers, which has been increasing continually since 1984, one of the explanations can be found in the rapid growth of the number of educated people since Morocco gained independence from France in 1956. The governmental policy aims at increasing the rate of schooling among children in order to reduce the illiteracy rate and ensure a qualified labour force. Similarly, the fast growth of school-going age children, and the growing interest of the parents to educate their children strongly stimulate the demand for education. Hence, the rates of schooling have significantly increased over time. The average rate of schooling in primary education

doubled between 1960 and 1995. Moreover, the rate of illiteracy among those aged 15 to 24 dropped from 66.9% in 1970 to 32.7% in 2000.

The discrepancy between the education provided in schools and the continually evolving needs of the labour market is another contributor to unemployment of educated workers, even though Lane, Hakim and Miranda (1999) reject this assumption and rather refer to the failure of the system of production (insufficiency of the labour demand). There exists in Morocco, an overwhelming perception that the Moroccan educational system does not support the economic and social development of the country. The university is regarded as a machine which merely produces civil servants instead of workers who are able to meet the needs of the private sector and to confront economic realities. Furthermore, some employers think that trainings provided in school are useless for their companies and instead provide on-the-job training to their employees. In addition, instead of thinking about the quality of education, the current educational system is based on the idea that university contributes to individual growth and is not necessarily a springboard for employment. Consequently, young people should not be deprived of education just because they will not be able to find employment in the future. Thus, universities have become a refuge for the potentially unemployed. Indeed, some young people go to university (or stay there for years) simply because they have no other option (Bougroum, Ibourk and Trachen, 1999). This behaviour is also encouraged by the facts that education in public universities is free and that students are allowed to repeat grades they fail (sometimes indefinitely). Furthermore, the increase in demand for higher education (particularly since the reform of 1987, which resulted in the increase of the rate of success at the secondary level) as well as the free access to university have caused the overpopulation of universities, the fall in the quality of graduates, and the depreciation of the value of university degrees among employers.

In addition, the switch of the language of instruction from French to Arabic in the public elementary and secondary schools implemented in the early 1980s seems to have contributed to an increase in the gap between education and employment. Indeed, Angrist and Lavy (1997) find that the language change led to a substantial reduction in return to education for young workers affected by the change.

Many employers, particularly those from the informal sector, express a strong preference for an uneducated labour force, as such workers are inexpensive, easily accept their working conditions and comply with the organisational and disciplinary norms of their companies. Indeed, illiterate or modestly educated workers easily accept any kind of employment and are less demanding concerning wages, conditions or duration of work. On the other hand, highly educated workers have high aspirations for remuneration and the nature of their work, which they cannot easily satisfy in the Moroccan labour market. Indeed, the elevation of the educational level increases the preference for protected employment (Orivel, 1995; Gaude, 1997; and Combarnous, 1999), but the prevalence of the informal sector (including agriculture) and the behaviour of some employers toward educated workers make it difficult for educated workers to find employment meeting their aspirations especially in a labour market overshadowed by informal activities. Moreover, some employers in the private sector seem to take advantage of the worsening unemployment among educated workers by lowering wages even further, which serves to repel educated workers from the private sector.

Due to all of the above factors, the slowdown of recruitment in the public sector seems to be the factor having a greatest responsibility in the worsening of unemployment of educated workers. The increased number of new positions in the public sector initially marked the will of the government to fight against the worsening of the unemployment rate revealed by the 1971 census. However, the government could not maintain this policy because of the financial crisis of the early 1980s, which continues still. In fact, because of the adjustment and austerity policies adopted by Morocco since August 1983 under the aegis of the International Monetary Funds (IMF), there was at first a cancellation of more than 19,000 new positions in the public sector predicted in the budget of 1983, followed by the limitation of recruitment for the subsequent years. In 2000, the number of new positions in the public sector represented hardly 21% of that in 1976.

Table 2.12: Number of New Positions in the Public Sector in Morocco per Year

Year	New positions
1974	14 587
1975	12 001
1976	51 416
1977	33 274
1978	29 531
1979	40 120
1980	41 173
1981	33 666
1982	45 267
1983 to 1993	10 000 to 15 000 / year
1994	17 000
1995	12 700*
1998/99	12 000*
1999/2000	11 000*
2000 (2nd semester)	13 000*

Source: Department of Finance
(*) Estimates in the budget.

The payroll (total salaries) in the public sector is considered too high and weighs heavily on the governmental budget. The labour costs absorb 65% of the functioning budget (project of the 1998-1999 budget), which the officials consider too high as compared to countries on the same level of development. It is then a question of reducing the government rate of expenditure by reducing the number of new recruitments and by creating only positions meeting the real needs of the public sector.

In a 1998 report on Morocco, the IMF made international comparisons showing that the share of the public sector's payroll in the GDP was too high in Morocco, as compared to similar countries: 6% in Egypt, 7% in Malaysia, and 6.4% in Turkey versus 11.5% in Morocco. The IMF suggested gradually bringing back this share to 9.5% by refusing any raises in salaries and by freezing recruitments except for priority fields (health, education, and justice). This contrasts with the generous salary increases granted under the previous government (1998-2002), particularly for engineers and teachers.

Regarding the size of the public sector, the number of civil servants in Morocco does not seem to be plethoric. The share of the public sector in aggregate employment is approximately 10% versus 23% on average in developing countries and 21% in the Organization for Economic Cooperation and Development (OECD). Even in urban areas this share does not exceed 21% in Morocco.

Figure 2.1: Share of Public and Private Employment by Group of Countries (Average of National Percentages)
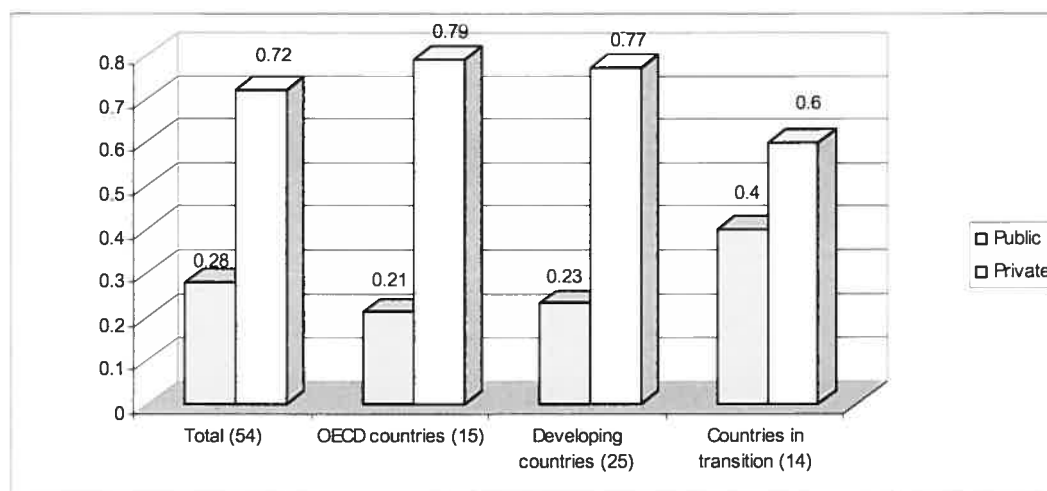
Note: In parentheses is the number of countries surveyed.
Source: International Labour Office (1999)

Despite the sharp slowdown in recruitment, the public sector still remains the main employer of highly educated workers (see Table 2.13). Moreover, educated workers are not sufficiently interested in employment in the private sector and often desire employment in the public sector exclusively even if it is associated with high risks of unemployment.

Table 2.13: Share of the Public Sector in Employment in Urban Areas in 1998

Education level (*)	% in total labour force	% employed in the public sector
None	65.23	7.83
Elementary	23.88	20.47
Secondary	2.79	46.61
University	2.15	61.33
Technical school	0.80	71.07
Total	100.00	21.43

Notes: These rates were calculated by the author based on the 1998 Moroccan Labour Force Survey data file. (*) Excluding vocational training, which is, however, included in the total

The sharp slowdown of recruitment in the public sector and the behaviour of educated workers who prefer employment only in that sector have caused the increase in the number of educated unemployed. As depicted in the following graph, the situation of highly educated workers started to worsen immediately after the implementation of structural

adjustment policies in 1983. The share of highly educated workers among the unemployed population increased continuously over time, changing from 3.1% in 1984 to over 20% since 1996. In addition, this share has been higher than the share of the same workers among the employed population since 1990 (see Figure 2.2).

Figure 2.2: Evolution of the Share of Highly Educated in the Employed and Unemployed Labour Force
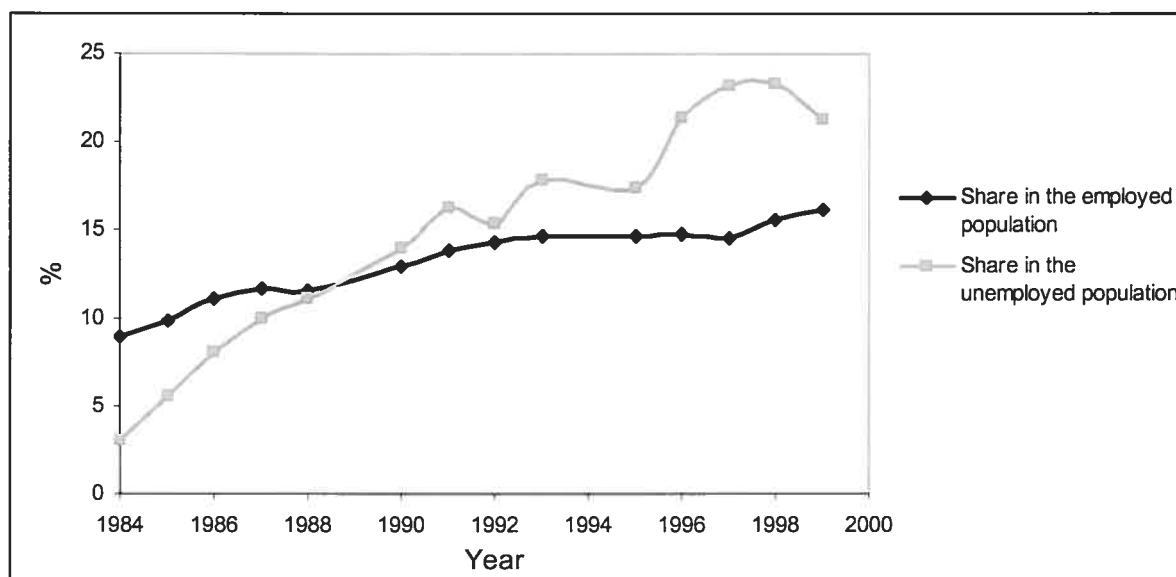
Finally, the worsening of unemployment among highly educated workers has seriously affected the image of education in society. This image is tarnished further by the speeches of politicians and the media which refer only to the case of unemployed educated workers and report extensively on their demonstrations. The society used to blame uneducated unemployed for not having invested in education, but nowadays the same society does not know what for to blame educated unemployed. Education has paradoxically become synonymous with unemployment in Morocco. Ironically, a punch line of a popular anecdote is that the day of graduation is that of admission into the "club for the unemployed."

2.4 Employment Policy in Morocco

The recruitment policy in the public sector adopted in the past has turned this sector into the exclusive employer of highly educated workers. This policy, launched shortly after the independence from France in 1956, aimed at the moroccanization[26] of the public sector, the modernisation of this sector and the accompaniment of the development in social sectors (education, health, etc.). It also aimed at making up for the large deficiency in these sectors. As a result, the demand for educated workers increased sharply, while the majority of the population was illiterate. The rate of illiteracy of young people aged between 15 and 24 years approached 70% in 1970. The demand for skilled workers was so high that all highly educated workers were for a long time guaranteed employment in the public sector, particularly in education. To meet the enormous needs of the educational system, many schools and training centres for teachers were open in all parts of the country, receiving hundreds of secondary school and university graduates. In addition, the public sector used to propose employment contracts to students from technical schools while they were still studying. However, the number of graduates desiring employment in the public sector increased at the same time, which lead the government to tighten requirements for certain positions. Nowadays, the education system is saturated and many of the teacher training schools are inactive, but they are still open and their staff is still paid by the government.

On the other hand, in order to allow the public sector to benefit from an educated labour force at a lower cost while at the same time weakening the pressure on the labour market for highly educated workers, the government instituted civic service, which obliged all university graduates to work in the public sector for 24 months right following graduation for modest salaries (approximately 50% of the ongoing salaries). The government also aimed at allowing young workers to acquire professional experience useful for finding employment in the private sector. The government also aimed at recovering a part of the funds spent in educating those graduates (The government provides free education and scholarships for all students). However, workers recruited within the framework of the civic service were generally integrated into the public sector as permanent workers on a full salary after the 24-month period of service. Workers who desire employment in the private sector must either serve the government for 24 months or undergo military service.

This obligation sometimes constituted a great constraint for those workers. This is particularly the case with doctors. The public sector had thus been made an obligatory passage for all university graduates. The civic service was abolished at the end of the 1990s due to financial difficulties experienced by the government and on recommendation of the IMF. However, in reality the government was not able to handle the increasing number of graduates who coveted the civic service with the aim of integrating into the public sector thereafter.

The above-mentioned policies (including the recruitment policy with the aim of fighting against the unemployment among highly educated workers) resulted in university graduates not being aware of any employer beside the public sector. Consequently, the public sector still remains a key employer for university graduates even 15 years later the implementation of the adjustment and austerity policies (see Table 2.13).

However, despite the slowdown of recruitment in the public sector since 1983, graduates, in particular those holding university degrees, still consider employment as a right that the government must guarantee them. Moreover, they require employment in the public sector specifically and sometimes decline offers of work in the private sector. They regularly protest continuing unemployment by any means possible (demonstrations, sit-ins, hunger strikes, etc.) to reach that objective.

In order to validate their claims, in October 1991 unemployed graduates created The National Association of Unemployed Graduates, and many other local associations of the unemployed. Those associations lay the blame of the unemployment of the educated on the government, by accusing it of not investing enough in the social sectors (particularly in education and health), where Morocco shows an obvious gap as compared to developed countries. They claim that investing in those sectors could create enough jobs for all unemployed graduates. Their objective is still employment in the public sector.

Facing these claims, the King of Morocco repeatedly emphasised that employment of young people remains his concerns, and that employment is not synonymous with being civil servant, as it is traditionally conceived. In addition, the idea that any diploma or degree guarantees employment and that employment in the public sector is a right for any

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[26] A policy designed to replace foreign workers with Moroccan workers

unemployed educated worker should be abandoned. Employment in the private sector, including self-employment, should henceforth supercede employment in the public sector. The King also intended to discourage young workers from seeking employment in the public sector, claiming that this sector does not offer good careers for ambitious and qualified workers: " *in the public sector, there is no place neither for adventure nor for imagination, as well as there is no liberty. In addition, the public sector does not offer opportunities to young workers looking for adventure and wishing to dare their capacities and to carry out their ambitions*" (King Hassan II, speech in July, 1997).

In fact, one of the aims of the structural adjustment policies implemented in August, 1983 was to assign to private companies a more important role in the economy, especially in the creation of employment. The private sector would thus substitute for the public sector with regard to recruitment of educated workers. With this purpose in mind, the Code of Industrial Investments promulgated in 1983 provided encouragement for the creation of jobs, such as grants of a premium of 5,000 MAD to industrial SME for each stable job created during their first four years of establishment. However, while great theoretically, this measure has never been applied on practice.

In the late 1980s, the government promulgated two laws aimed at interesting young graduates in self-employment. This form of employment is considered by the government as an honourable option for those who cannot find paid work. In addition, self-employment generates paid employment for others as well. The first law is Law 36/87, also known as Young Entrepreneurs' Loans and consisting of granting loans covering up to 90% of the total cost of the project at preferential interest rates to graduates who wish to start their own business. The second law was Law 16/87, which instituted tax exemptions in profit of young entrepreneurs holding vocational training diplomas. In addition, Law 16/87 listed 20 trades that could be carried out only by graduates holding vocational training diplomas or by experienced workers who succeed at professional aptitude tests. This regulation, which aimed at protecting graduates from competitiveness from uneducated workers or those trained on-the-job has never been implemented.

Years after the implementation of the self-employment project, its results are far less encouraging than what the government had expected. The yearly average number of projects financed under the Young Entrepreneurs' Loans did not exceed 1,000, whereas

less than 100 projects on average are initiated annually under Law 16/87. Paid employment obviously remains a priority for graduates.

In 1990, the Moroccan government created the National Council of Youth and Future (CNJA) [27] in 1990. The principal mission of the council was to find viable solutions capable of remedying the problem of unemployment among young workers in general and among graduates in particular. The first and famous action carried out by the CNJA was the census of the unemployed graduates. This operation aimed at determining the extent of unemployment, but it had been interpreted by most people as a recruitment campaign for the public sector, especially because of the great publicity that preceded it. Thus, the unemployed participated the census enthusiastically. In fact, some private sector workers (mainly from the informal sector) reported themselves as unemployed in the hope of obtaining a better job in the public sector. Tens of thousands of job seekers had been counted, most of them with Bachelor's degrees. Bougroum, Ibourk and Trachen (1999) notice that 8.8% of workers reported as unemployed in the census were employed in the private sector, but their employment conditions were not good enough as compared to the standards of employment in the public sector. Bougroum, Ibourk and Trachen (1999) argue that graduates are potential and permanent seekers of employment in the public sector, the fact which leads them to report themselves as unemployed to profit from the governmental actions of recruitment. The census (and similar governmental policies) might have even resulted in some women moving from out of the labour force into the labour force in the hope of being recruited to the public sector. Studies on the employment of vocational training graduates support this behaviour (*Direction de la Planification de la Formation Professionnelle*, 1998). The proportion of employed recent vocational training graduates who report themselves as unemployed ranges from 15% to 20%.

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[27] In French: Conseil National de la Jeunesse et de l'Avenir.

In 1993, a new law was promulgated to promote employment for graduates in the private sector through a program called Training for Employment. The government claimed that graduates lacked professional experience required by firms. The program aimed at helping those graduates to acquire experience through training in companies. The government exempted companies that received or employed trainees from paying employer's contributions. The trainees received modest salaries during their period of training. At the same time, 10 Orientation and Information Centres for Employment were opened in order to match the labour demand with the labour supply.

These actions did not stimulate the acquisition of permanent paid work in the private sector, a fact which drove the CNJA to reconsider the promotion of self-employment by modifying the already existing device (Young Entrepreneurs' Loans) in order to provide more incentives to educated workers to start their own businesses. A fund for promoting the employment of young workers was instituted in 1994. In addition to granting loans to young entrepreneurs and enlarging eligibility to these loans, the fund aimed at financing the construction of professional premises to benefit young entrepreneurs. It also aimed at providing more assistance for educated people in creating companies by young people. Finally, it provided further trainings (of short duration) to young educated job-seekers in order to adapt their profiles to the requirements of the labour market. One of the actions financed by this fund was training about 100 unemployed workers with Bachelor's degrees to become drivers of transportation vehicles (for goods and passengers). Many transportation companies committed to recruit the trainees at the end of the program. However, trainees experienced many difficulties integrating into their work environment, since most of their co-workers were uneducated. As a matter of fact, the selected workers were considered too educated to be teamsters. Some employers also realised that these workers did not easily accept the working conditions and tended to request many changes to their work environment. Consequently, many employers forfeited their commitment. More surprisingly, the trainees initiated many actions in order to claim jobs in the public sector. The same kind of behaviour had been observed in similar initiatives.

In 1997, the government reformed the existing program Training for Employment, with the objective of helping between 20,000 and 25,000 young workers annually (over a 4-year period) to find employment in the private sector. The idea was to facilitate the transition between school and employment for recent graduates through training for 18 months in

private companies. In the meantime, companies who receive trainees would profit from skilled labour at a lower cost. The government pays half of the salary paid to each trainee [28] as well as all expenses related to any further training in specific schools that the companies would recommend during the period of training. Moreover, companies are not obliged to recruit the trainees at the end of the program, but if they do they are exonerated from all the employers' and social loads (relating to this recruitment for a certain period of time).

Lastly, in 2000 the government created the National Agency for Promoting Employment and Competencies (ANAPEC [29]) with the principal missions of prospecting and collecting job offers from employers and matching the labour demand with the labour supply; receiving, informing, and advising job seekers; and assisting young entrepreneurs with the realization of their economic projects.

Currently, the government estimates the annual deficit of jobs to be between 30,000 and 40,000. The program of the new government appointed in November 2002 envisions making up this deficit by promoting investments and reforming the educational system, particularly the vocational training. Unemployed graduates were not long in reacting by accusing the government of not creating enough jobs in the public sector and of seeking to push them out to the private sector, where they pretend to be exploited by employers.

The pressure exerted by the unemployed on the government is sometimes successful. Many recruitment campaigns for the public sector are aimed solely at absorbing this pressure and have no connections with the real needs of the sector. In 1990 (many years after the implementation of the structural adjustment policies) and under the aegis of the CNJA, the local communities (local elected councils) had been forced to hire 30,000 graduates. This move was not backed by any economic logic. Budgets allowed to investment were converted into salaries. Currently, the over-staffing in these communities is estimated at 40,000.[30] In the mid-1990s, the government was also forced to recruit all highly educated unemployed holding degrees above Bachelor's (about 2,700 workers). The problem of unemployment in this category was temporarily solved. The recruits were often assigned to tasks not corresponding to their fields of study, but they did not seem to object, since their first objective was to obtain employment in the public sector. Thus, the educated

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[28] The allowance varies from 800 to 1,300 Dirhams, according to the level of the trainee's diploma.
[29] Agence Nationale de Promotion de l'Emploi et des Compétences

unemployed know that while forcing the government's hand is not easy, it is not impossible.

The massive recruitment of graduates unconnected to the real needs of the public sector led this sector into the paradoxical situation which it finds itself. While the public sector is over-staffed, it has a need to fill particular profiles. Moreover, any recruitment with the unique objective to fight unemployment only produces the opposite effect, since it incites other unemployed to insist upon employment in the public sector.

2.5 Adjusting the Situation

2.5.1 Understanding the Workers' Behaviour

The behaviour of highly educated workers unambiguously reflects their "extreme" preference for employment in the public sector. This is likely the source of the problem. This behaviour is the result of the governmental policies with regards to recruitment in the public sector, as well as the strong segmentation of the labour market in the public sector versus the private sector.

As mentioned earlier, the recruitment in the public sector is often aimed at fighting the unemployment of educated workers, which nourishes the workers' hope to be recruited into this sector and thus reinforces waiting for employment in the public sector. This hope is also consolidated by the promises made by the government to solve the unemployment of educated workers each time the workers protest as well as by the speeches of the politicians who, at the time of the elections, promise magical solutions to the unemployment problem. Since recruitment is often based on the level of education (or degree), with no distinction between fields of study and with limited concern for the quality of the degree, it is not surprising to see many young people seeking high diplomas/degrees regardless of their quality or subject of study. The diploma/degree is simply a prop for the public sector and has virtually no professional meaning in itself (Bougroum, Ibourk and Trachen, 1999).

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[30] The Moroccan daily newspaper, "The Economist." Electronic publishing, 6/21/2002

The labour market in Morocco suffers from a strong segmentation of the public and the private sectors. Orivel (1995) notes that salaries for certain professions, particularly in the public sector, are too high and have no correlation to productivity. For example, salaries of teachers in primary education, shortly after independence reached levels of up to 25 times the GDP per capita in Africa (versus 1 to 1.5 times in the OECD countries, less than 2 times in Asia, and 3.3 times in Latin America) (Edwards, 1985 quoted by Orivel, 1995). The main consequence of this situation is to make careers in the public sector so attractive that in several countries the public sector has long been the exclusive employer of highly educated workers. The employment in the public sector had even become a right according to the beliefs of some workers. This explains why one could at the same time observe high returns to education and negligible contributions of education to the economic growth. Highly educated workers massively engage in non-productive employment in the public sector. The public sector's wage premium seems to benefit all the categories of workers because of the weight of the informal sector and because of the unreasonable remuneration policy of the public sector. In Morocco, the nominal minimum hourly wage normally paid to uneducated workers with no experience has increased 26 times during the last 52 years, with an average increase every two years. The current minimum hourly wage is 29 times that of 1948 and 6.3 times that of 1977 (see Table 2.14). Although it is mandatory, the minimum wage is not necessarily paid even in the formal private sector (even less in the informal sector). Indeed, to meet the legal conditions on the minimum wage, some employers in this sector tend to declare full-time workers as part-time workers, while other employers simply do not declare all their staff.

Table 2.14: Evolution of the Nominal Minimum Wage (Industry, Trade and Liberal Professions)

	1948	End 1950s	1962	1977	End 1980s	1996	2000
Nominal minimum hourly wage (Dh)	0.30	0.80	0.85	1.40	4.76	7.98	8.78[*]
Number of increases of the minimum wage during the decade	...	8	1	4	7	5	1

(*) To give an idea about the evolution of the minimum hourly wage in constant MAD, we notice that the nominal minimum hourly wage increased on average 2.4% per year between 1996 and 2000, as opposed to 1.9% for the inflation rate during the same period of time (on average per year).

Many studies argue that workers also prefer employment in the public sector for nonpecuniary reasons (Blank, 1985; Gaag and Vijverberg, 1988; Smith, 1976b; Ophem, 1993 and Stelcner, Graag and Vijverbeg, 1989). Employment in the public sector is generally recognised as stable, which attracts risk-adverse workers (Bellante and Link, 1981). Even if the public sector and the private sector pay the same wages, there is an excess of labour supply in the public sector. This is more true in Morocco than elsewhere because of the weight of the informal sector and the prestige associated with the job of a civil servant. Employment in the public sector also provides some very important indirect benefits (easy access to credit, medical coverage, pension, etc.).

Significant wage differentials and differences in the working conditions motivate certain workers to remain unemployed while seeking employment in the sector where wages and working conditions are better. This argument has been advanced by Harris and Todaro (1970) and other researchers to explain the high urban unemployment rate in developing countries. The substantial wage gap between urban and rural areas involves the migration of rural workers towards urban areas in search of high-wage jobs. This migration will continue as long as the expected wage in urban areas is higher than the wage in the agricultural sector. The urban unemployment rate will increase until the expected wage in urban areas is equal to the wage in rural areas. The larger the wage differential, the higher the urban unemployment rate at its equilibrium.

The model of employment sector choice developed in the first chapter uses the same logic. We showed how the preference for employment in a high-wage sector is an increasing function of the wage differential between sectors, a decreasing function of the expected differential in unemployment durations, and a decreasing function of the individual discount rate. When the wage differential is substantial and/or the discount rate is low, some workers could rationally choose to remain unemployed instead of accepting employment in the low-wage sector. We proceeded to test this argument using data from a sample of workers holding university degrees (including technical schools) drawn from the 1998 Moroccan labour force survey. The selectivity-corrected hourly wage gap between the two sectors is extremely high (over 80% in favour of the public sector), but the unemployment durations are higher in the public sector as compared to the private sector. Yet, workers who seek employment in the private sector also experience great difficulties in finding employment in this sector. This could be partly explained by the fact that

educated workers do not necessarily accept any job offers from the private sector, especially from the informal sector. In addition, workers put more weight on non-pecuniary factors such as job stability when selecting the employment sector, which results in the modest sensitivity of the probability of preferring employment in the public sector to wages and unemployment durations. Indeed, radically modifying the current worker behaviour using wages and employment adjustments will require extreme changes in those variables. In fact, workers would prefer employment in the public sector even if this sector paid the same as the private sector, even despite the high risk of unemployment. Nevertheless, those adjustments are necessary to lessen the pressure on the public sector from job-seekers.

2.5.2 Some Suggestions

A persistent modification of the workers' behaviour could be achieved by simultaneously improving the employment opportunities and the employment conditions in the private sector, as well as adjustment of the remuneration policy in the public sector. For this purpose, it is essential to ensure a constant and high economic growth, while also reducing the share of the informal sector in the economy through the emergence of firms aware of the importance of the human capital, remunerating employees suitably and offering acceptable employment conditions to educated workers. Education will contribute more effectively to economic growth when the private sector takes advantage of the highly educated labour force.

It is important, however, to stress that it is difficult for any development policy to succeed in the Moroccan context, which is marked by weak investment in human capital. In 1998, the rate of illiteracy among the adult population was 48%. Those who receive some schooling often target non-productive employment in the public sector. In a report presented to the King of Morocco in 1995, the World Bank economists argued that investment in human capital is the most important problem for Morocco following the implementation of the structural adjustment policies. If this problem is not addressed, Morocco is unlikely to be able to compete in the world economy and will be subjected to the aggravation of social and economic conditions.

Consequently, the generalisation of the elementary education to all children (including girls) and in all areas must constitute the first national priority. This may require a re-allocation of public resources within the education system in order to put more weight on elementary education. Indeed, it seems that there is an over-allocation of public and private resources to university education.

The public sector surely needs to recruit new workers in order to continue to ensure the high quality of its services. However, the improvement in the quality of these services, which concern the private sector directly or indirectly, requires the government to reform its recruitment and remuneration policies so that labour needs can be clearly identified and filled by qualified workers exactly as in private companies. The dependence on diplomas should be stopped and focus should shift to competence and productivity. Moreover, a policy aimed at filling the real labour needs in the public sector, both in quantity and quality, should gradually take priority over the current policy aimed at creating jobs to reduce unemployment among educated workers. In addition, since for many young people the investment in education is directed mainly towards employment in the public sector, the reform of the recruitment and remuneration policies in the public sector would help stop this socially inefficient behaviour. Workers must be aware that only those possessing required skills will be recruited to the public sector. Skilled workers recruited by the public sector and assigned tasks that match their qualifications will efficiently contribute to the setting up of infrastructure and high quality services. This will contribute to the development of the private sector, which will in turn generate enough good employment capable of reducing the unemployment rate among educated workers. The following proposals may help achieve these goals:

(i) Make transparent the process of recruitment to the public sector. Workers must be clearly informed of the objectives, procedures and limits of recruitment to the public sector. The political speeches must also lie within this framework. Otherwise, the door will remain open to speculations and false hopes.

(ii) Make the access to the public sector very competitive at all levels in order to attract skilled workers. The possibility for workers to use diploma/degree as a means of being recruited in the public sector must be removed. So far, the same of diploma/degree level, even for different fields of study, ensures access to the same level of salaries without the

bond with productivity, in particular during the first years of employment. In some cases, the public sector may even require that candidates have professional experience as a prerequisite to recruitment. The phenomenon of unemployment while waiting for employment in the public sector will be thwarted if the workers are conscious that unemployment reduces their competitiveness for employment in the public sector, as is the case in the private sector.

(iii) Base the remuneration system on the output to favour highly skilled labour. This will encourage skilled workers to accept employment in the public sector and to make a continuous effort in their course of employment.

Measures (ii) and (iii) will also have the advantage of encouraging workers to use education as a means of acquiring the competency required by the labour market instead of merely obtaining an honorary title.

(iv) Reconsider the concept of permanence of employment in the public sector for undesirable workers. Workers must be aware that they are likely to lose their employment if they do not meet (or keep meeting) the requirements of competence and productivity. To date, the permanence of employment in the public sector is assured for all workers. Even if workers enter the public sector as trainees during the first year of employment, they all generally become permanent at the end of that period. Factors leading to the dismissal of workers are generally related to discipline or ethics. Even workers who are recruited on a temporary basis keep their positions indefinitely (or until they become permanent). The abolition of the permanence advantage will also reduce the gap between the public sector and the private sector, since non-pecuniary factors significantly intervene in the workers' employment sector choice.

(v) Allow the government departments to identify their own labour needs and fill these needs freely through their own recruitment system. The current policy, which consists of centralized recruitment of highly educated workers to the public sector, results in recruiting workers with qualifications that do not correspond to the real needs of those departments. In addition, the fact that workers accept employment in departments that have no connection to their field of study supports the view that young Moroccans educate themselves with the sole objective to be civil servants. It is also suitable for each public

department to have its own remuneration system. The same worker will thus not be remunerated in the same manner in all government departments, which currently occurs regularly (a commission of experts elected by the Prime Minister of Morocco recommended that the opposite measures be taken to ensure compensation equity). As the consequence, job-seekers will be aware that they are facing many public employers having different needs, so they will carefully select positions that match their skills, the same way they would do when seeking employment in the private sector.

Evidently, the proposed measures will not produce the desired effects with regard to the modification of the workers' behaviour if the government does not express firmness when executing those measures. Indeed, the government must be wholly credible, because despite the sharp slowdown in recruitment to the public sector over the last two decades, most highly educated workers still act as if the slowdown in recruitment were only temporary.

Finally, in order to help young people to choose their education field efficiently, detailed information on the labour market must be produced and widely disseminated.[31] Young people must also have more freedom in their choice of meeting the needs of the labour market. The fact that some young people are obliged to carry out some programs of study because they have no other choice maintains the gap between education and employment and makes graduates less responsible for their future employment. Likewise, universities and post-secondary schools (including vocational training centres) should have more flexibility in preparing their programs and determining the number of students per program in order to meet the needs of the labour market.

In addition, the government ought to stop some inefficient behaviour (for example, undertaking higher education or remaining in university longer than strictly necessary because of the lack of other options, or choosing fields of study associated with high risks of unemployment), which results in a waste of resources invested both by the government and the individuals. The rationalisation of resources allocated to higher education will make it possible to save human and material resources, which would be used to meet the

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[31] There are no specific studies on the labour outcomes of graduates in Morocco. There are, however, some limited studies done mainly by the Department of Vocational Training, which only concern graduates of vocational training schools. However, the results of these studies are not published.

objective of generalization of elementary education in all areas of Morocco and to improve the schooling rates in secondary education. It will thus be appropriate to limit the duration that a student can spend at university by limiting the possibility for him or her to repeat a year of study after failing. This idea, which is applied in technical schools, should be extended to universities. Lastly, the capacity of technical schools must be expanded, because graduates of these schools behave much better in the labour market than university graduates. Definitely, the entire system of post-secondary education has to be reformulated, so that it relates to the labour market better and is more effective at promoting economic growth.

2.6 Conclusion

The exorbitant unemployment of highly educated workers in some developing countries, particularly in Africa, in spite of the low level of investment in education is very worrying. This situation occurs despite the fact that the most obvious benefits of education are fast access to employment and high incomes. For a long time, university degrees had guaranteed good jobs and a title of prestige in society, but nowadays these degrees are synonymous with unemployment.

In Morocco, the worsening of unemployment of educated workers seems to parallel a sharp slowdown of recruitment to the public sector since 1983 caused by structural adjustment policies imposed by the International Monetary Fund. The public sector has always been the main employer for educated workers, particularly those holding university degrees. However, since the implementation of the adjustment policies the unemployment among educated workers has increased continuously, reaching alarming proportions and becoming a social phenomenon and a political puzzle. In 2000, the unemployment rate among educated workers (all levels aggregated) was 27.5% versus only 7.1% among uneducated workers. The graduates often believe that they have been sacrificed by the government for monetary reasons and militate to recover what they consider to be their right to employment in the public sector. They also sometimes decline employment in the private sector. Indeed, the public sector remains a coveted employer, particularly by highly educated workers, even two decades after the implementation of the structural adjustment policies. Employment in the public sector is known for its stability, high wages and good

working conditions, whereas the private sector is dominated by informal activities and precarious working conditions, which do not attract educated workers with high aspirations (Orivel, 1995; Gaude, 1997; Combarnous, 1999). This segmentation of the labour market makes it rational for some workers to remain unemployed while waiting for employment in the public sector instead of accepting employment in the private sector. The starting wage gap between the two sectors is excessive, but Moroccan highly educated workers seem to allocate great importance to non-pecuniary factors when choosing their sector of employment. Since the workers' behaviour is rational, the employment policy should target the factors that drive it. Therefore, the policy should aim at stimulating the creation of jobs in the private sector, while at the same time reducing the segmentation of the labour market. This could be done through a high economic growth rate favourable to the creation of jobs in the formal sector, but also through reforming the recruitment and remuneration policies to the public sector. The government must put more weight on productivity and less on diplomas when hiring.

It is also important for the government to remedy the inefficiency of investment in education, which does not support the economic and social development of the country. The educational policy should aim at providing elementary education to all social strata without exception as well as improving the schooling rate at the secondary level. Subsequent individual choices should aim at acquiring competency necessary to meet the needs for the labour market. Moreover, the education system should be flexible in order to make it possible for individuals to make the right choices with regards to employment.

The most important factor of change in the case of Morocco is that the government be firm and credible in all of its actions, because in spite of the change in government's behaviour with regards to recruitment over the two last decades, most young people still do not believe that the changes in attitude are permanent. On the contrary, they believe that protesting is likely to shift the government from its positions and perpetuate the cycle of irresponsible hiring.

Chapitre 3

Earnings, Unemployment and College Field of Study in Canada

3.1 Introduction

Human capital theory provides a rich set of empirical predictions about the relationship between, schooling choices and labour market outcomes by viewing schooling (or on-the-job training) as an optimal choice based on comparing cost and benefits. The basic principle is that individuals should keep investing in schooling as long as marginal benefits exceed marginal costs. A large number of studies show compelling evidence that schooling is associated with higher earnings (see Card, 1999, for a recent review). Therefore, empirical evidence strongly supports the view that investments in schooling yield positive pecuniary returns, which is a key ingredient of the human capital approach. Interestingly, however, a much smaller number of studies have directly addressed the more central principle human capital theory, namely that schooling (or other) investments are determined by a comparison of marginal returns and marginal costs.[32]

A major obstacle in studying the determinants of schooling investment is the lack of credible variation in the costs and benefits of schooling. Ideally, one would like to estimate the effect of exogenous differences in both costs (tuitions, opportunity cost, etc.) and benefits (marginal return to schooling) on schooling decision in a cross-section of individuals. While regional differences in tuitions (Kane, 1994) and other costs are arguably exogenous to the schooling decision, individual-specific rates of returns are

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[32] Willis and Rosen (1979) estimate a structural probit model that links various costs and benefits to the decision to attend college. See also Keane and Wolpin (1997) for a more recent example of structural estimation of the schooling decision.

plagued by a fundamental selection problem. The problem is that earnings are generally only observed after the schooling investment has been completed. Since earnings before schooling is completed are generally missing, the earnings gain from extra schooling (marginal return) decision cannot be measured directly. Following Willis and Rosen (1979), the standard solution to this problem is to estimate selection-corrected earnings equations for different schooling levels and use these estimates to construct a predicted return to schooling for each individual. The reliability of this econometric approach critically depends, however, on the availability of instruments that can predict differences in rates of returns across individuals without directly affecting the choice of schooling.

In this chapter, we use repeated cross-sections on the choice of field of study of Canadian college students to identify the direct impact of returns to schooling on educational choices. More specifically, we estimate how differences in returns in different fields affect decision of choosing one field over the other. From an empirical point of view, there are some important advantages in looking at choice of fields of study (intensive margin) instead of the decision to pursue more schooling (extensive margin). First, we argue below that both opportunity costs and direct costs (tuition) do not depend on field of study. The cost of studying in different fields is thus implicitly controlled for when estimating the impact of other factors on field of study. In a pure cross-section, however, the identification of the effect of return to field of study on field choice remains problematic. The problem is that observed wage differences across fields may reflect selection of workers instead of the causal effect of field of study on earnings for given individual. This is a major drawback since most U.S. data sets that contain detailed information on field of study are limited to relatively narrow cohorts of recent graduates (High School and Beyond, NLSY, etc.)

One key contribution of our study is thus to exploit multiple cross-sections (and cohorts) of young workers using the Canadian National Graduate Survey (NGS). More specifically, we use data from two cohorts who completed college in 1990 and 1995. We argue that combining cross-field and cross-time variation provides a credible source of variation in the returns to field of study. The idea is that shocks that hit sectors can change the returns to studying in a particular field and be used to see how field choice of new cohorts of students respond to these changing conditions. The first half of the 1990s is an interesting period to study since relative wage and employment prospects for different fields of study

changed substantially during this period. In particular, budget crises at the federal and provincial levels lead to dramatic cuts in health care funding starting in 1992 (Vujicic, 2003). By contrast, the labour market for graduates in science-oriented fields (computer programming, etc.) was much stronger during this period. These kinds of sectoral shocks provide useful leverage for evaluating how responsive are human capital investments (in different fields of study) to changes in labour market conditions.

Following most of the existing literature, we analyze how field choice depends on wages in different fields. Expected future earnings also depend, however, on the probability of finding a job at this given wage. We thus analyze the effect of both the duration of unemployment and wages by field on the choice of field of study.

Our focus on college students in Canada is a consequence of several factors. First, Canada has a very large fraction of college graduates as compared to most OECD countries.[33] Understanding the educational decisions at this particular level is thus essential to overall educational policies in Canada. In most cases, college graduates will have completed two or three years specialized program in a community college or a CEGEP (in Quebec). Unlike universities where most students choose the field of study (major) after a year or two of study, most college students first enrol into a specific program. Our model of choice of field study is thus particularly well suited for the college-level decision. One final advantage of studying college field of study in Canada is that relatively large samples of college graduates are available in the NGS in both the 1990 and 1995 cohorts of graduates.

The outline of the chapter is as follows. In Section 3.2, we present a brief survey of previous literature on the subject. In Section 3.3, we present a theoretical model of endogenous choice of field of study. Expected earnings and unemployment durations as well as personal discount rate are the principal determinants of that choice. We then show that the influence of unemployment duration relative to earnings is determined by the individual discount rate. In Section 3.4, we present a multi-stage econometric model for estimating in a dependent way the selection, earnings and unemployment duration equations. Selection-corrected earnings are estimated for each field of study. The estimates are then used along with estimated unemployment durations and a variety of covariates in

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[33] In 2000, this fraction was 28.1% in Canada as compared to only 6.6% in U.S. and 9.4% all OECD countries pooled (OECD, 2002).

the estimation of the probability of selecting each field of study. The latter probabilities are estimated by using a multinomial logit model. For the sake of comparison, the selection-corrected earnings equations are estimated following the new procedure suggested by Bourguignon, Fournier and Gurgand (2001) and the widely used procedure suggested by Lee (1983). Section 3.5 describes the data used in this study. The sample is drawn from the Canadian National Graduates Survey of 15,124 individuals who successfully completed their programs at Canadian community colleges in 1990 and 1995. In Section 3.6, we discuss the empirical results of the study. We find that expected earnings and unemployment durations significantly affect the choice of the college field. The probability of selecting "Business and Commerce" or "Sciences" is relatively the most sensitive to earnings and unemployment durations variations, while "Social Sciences" is the least sensitive. We also find that women are less influenced by earnings and unemployment durations relative to men, the fact which supports the results of previous studies (see for example Montmarquette, Cannings and Mahseredjian, 2002). In addition, individuals who were employed prior to starting college put more weight on earnings and less weight on unemployment when choosing their field of study. Our results also suggest that many other factors (such as parents' education, family affluence, ethnic group, spoken languages, etc.) play a significant role in this choice. Concerning the estimates of selection-corrected earnings equations, the procedure proposed by Bourguignon, Fournier and Gurgand (2001) suggests that students self-select themselves into all fields of study, while Lee's procedure (Lee, 1983) recommends that students self-select only into the fields of "Social Sciences" and "Health." This divergence has, however, a limited effect on the estimates of the selection equations, since both procedures lead to very comparable predicted earnings. Section 3.7 concludes the study.

3.2 Brief Survey of Previous Literature

Many studies support the fact that monetary motives are important determinants of field of study choice. Wilkinson (1966) shows that students tend to move into jobs and educational levels associated with the largest present value of earnings. Likewise, Weiss (1971) provides empirical evidence for the hypothesis that graduate students in the natural and social sciences attempt to maximize the present value of lifetime earnings when they select their education and occupation. In addition, Polachek (1978) argues that students looking

for high incomes tend to major in business and engineering. Also, Willis & Rosen (1979) show that expected lifetime earnings are important for the decision to attend college. In the same vein, Berger (1988), Paglin and Rufolo (1990) and more recently Montmarquette, Cannings and Mahseredjian (2002) support that field choice is consistent with an earnings-maximization problem. Furthermore, Berger (1988) suggests that the differences in discounted predicted future earnings stream between majors have more effect on the choice of a major than differences in predicted earnings at the start of the job.[34] Recently, Arcidiacono (2002) has developed a three-period dynamic model of college and major choice allowing more options for students, including the possibility of changing a major (or college) and the possibility of entering the labour force. However, the weight put on expected earnings is shown to differ according to gender and race. For example, Montmarquette, Cannings and Mahseredjian (2002) argue that females and whites are less influenced by earnings as compared to males and non-whites when they select their field of study.

Meanwhile, studies support the view that field choice also significantly depends on non pecuniary factors such as probability of success in each field of study, gender, race, individual preferences for particular fields, personal abilities, family background, etc. (Polachek, 1978; Hearn, 1980; Fiorito and Dauffenbach, 1982; Paglin and Rufolo, 1990; Montmarquette, Cannings and Mahseredjian, 2002). Polachek (1978) suggests that students with high quantitative aptitudes tend to major in quantitative fields (Math, Sciences, Engineering), while those with high verbal aptitudes tend to choose verbal fields (Humanities) over other fields. In addition, Paglin and Rufolo (1990) argue that students consider their individual attributes and typical requirements of the field of study when they make their choices. The quantitative ability is once again among the most important factors in these choices. Polachek (1978) also suggests that expected labour force participation influences the field choice. Individuals looking for intermittent labour force participation avoid some fields (such as Sciences) requiring high level of on-the-job training. Blakemore and Low (1984) advance a similar argument suggesting that young female students with higher expected fertility tend to select majors that are progressively less subject to atrophy and obsolescence.

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[34] Berger (1988) projects earnings stream over the beginning 12 years of the career assuming a discount rate of 0.05

However, while all studies confirm that the choice of study field greatly depends on expected earnings, these studies ignore the fact that before earnings there needs to be adequate access to employment. Students may not only compare earnings, but they also might consider job opportunities in each field. Finnie's study (Finnie, 1999b) shows that the unemployment rate for Canadian university graduates largely varies from one field of study to another (from 3% to 15% in 1992 for 1990 male graduates and from 2% to 26% for female graduates). Rational choice of field of study suggests that students are aware of the unemployment risk associated with each field. In the literature, unemployment is often used to explain education achievement. For instance, Card and Lemieux (2000b) found a positive relationship between the local unemployment rate and educational achievement. The higher the unemployment rate, the higher the educational achievement.

Besides, most of North American studies use American data. Studies based on Canadian data are more often descriptive, though they sometimes make connections between educational choices and earnings. For example, Wilkinson (1966) uses data from the 1961 Canadian Census and finds that the increasing enrolment in the field of study "Education" relative to the enrolment in "Engineering" between 1957 and 1961 may be partly due to the rising in the discounted returns to teachers versus those to engineers. Similarly, Dodge and Stager (1972) study the economic returns to graduate studies in science, engineering and business using data from the 1967 Survey of Highly Qualified Manpower in Canada. They argue that unless there are very large unmeasured external benefits arising from graduate studies, there was an over-allocation of public and private resources to investment in graduate training during the 1960s. Vaillancourt (1995) finds that rates of returns for college- and bachelor's-level studies are higher for women, the fact which probably implies the steady increase in the number of women carrying out studies at these levels. He also finds that rates of return to education vary across fields of university studies. The highest private rates of return are in "Health," while the lowest rates are in "Humanities." Finally, Finnie (1999b) provides an interesting empirical analysis of post-graduation outcomes by field of study based on three different cohorts of Canadian graduates (1982, 1986 and 1990). However, Finnie also emphasizes that the study is of little relevance for policies aimed at changing the observed distribution of graduates by field of study, since the of field choice process (by students and institutions alike) is not taken into account.

3.3 Theoretical Framework

The model we present below is based on the endogenous schooling model as presented in Card (2000). The model is also similar to the employment sector choice model developed by Boudarbat (2003). Students choose fields of study (instead of employment sector or level of schooling) among M competing fields. We assume a student has an infinite planning horizon starting when he or she enrols in a given field. The discounted lifetime utility corresponding to enrolment in the field m ($m=1,...,M$) and given a profile of consumption $c(t)$ is:

$$V\left(m,c\left(t\right)\right) = \int_0^{l_m}\left[u\left(c\left(t\right)\right)-\phi_m\left(t\right)\right]e^{-\rho t}dt + \int_{l_m}^{\infty} u\left[c\left(t\right)\right]e^{-\rho t}dt \qquad (1)$$

l_m is the length of studies in field m, ϕ_m is the disutility for studying in this field, and ρ is the personal discount rate.

Let $Y_m\left(t\right)$ denote the real earnings for a worker who graduated in field m and who has t units of experience, and let $p(t)$ denote earnings from a possible part time job while studying at time t. $q_m(t)$ is tuition per unit of time. When entering the labour force after graduation, workers face a risk of unemployment. Let T_m be the unemployment duration prior to finding employment with field m. We also assume that individuals can borrow and lend freely at a fixed interest rate R.

The discounted lifetime earnings conditional on enrolment in field m is given by:

$$W_m = \int_0^{l_m}\left[p\left(t\right)-q_m\left(t\right)\right]e^{-Rt}dt + \int_{l_m+T_m}^{\infty} Y_m\left(t-l_m-T_m\right)e^{-Rt}dt. \qquad (2)$$

In contrast to previous studies either in the choice of schooling or the choice of field of study, we account for the unemployment duration prior to starting the first job. This is one of the major innovations of our study.

The intertemporal budget constraint is then given by:

$$\int_0^\infty c(t)e^{-Rt}\,dt = W_m \quad (3)$$

Conditional on enrolment in field m, the individual's optimal consumption path maximizes:

$$\Omega\big(m,c(t),\lambda\big) = V\big(m,c(t)\big) - \lambda\left[\int_0^\infty c(t)e^{-Rt}\,dt - W_m\right] \quad (4)$$

Assuming that $u\big(c(t)\big) = ln\big(c(t)\big)$ and $\rho = R$, first order conditions imply that an individual's optimal consumption path is $c^*(t) = \rho W_m$. At each period t, the student consumes a constant share of his or her lifetime earnings equal to his or her personal discount rate.

Ignoring the disutility while studying $\big(\phi_m\big)$, the optimal discounted lifetime utility conditional on enrolment in the field m simplifies to:

$$U^*(m) = \frac{ln(\rho) + w_m}{\rho} \quad (5)$$

where $w_m = ln\big(W_m\big)$.

Since the personal discount rate ρ is constant, maximizing the discounted lifetime utility amounts to maximizing the log discounted lifetime earnings. Therefore, an individual will choose a major with the highest log discounted lifetime earnings. However, the discounted lifetime earnings depends, among others factors, on the unemployment duration after graduation in the chosen field (T_m), which is a random variable. Therefore, a student's decision will be based on maximizing the expected log discounted lifetime earnings $E\big(w_m\big)$.

In order to model the individual choice in a simple and explicit way, we make some additional assumptions. First, we assume that earnings in each field are an increasing function of the number of years of experience as follows:

$$Y_m(t) = a_m h_m(t) \quad m = 1,\ldots,M,\ t \geq 0,\ h'_m(t) \geq 0,\ h_m(0) = 1 \quad (6)$$

Moreover, earnings increase at a constant rate: $h_m(t) = e^{g_m t}$. We impose that $g_m < \rho$ for lifetime earnings be finite.

Second, we assume that students do not consider a possible return to school after graduation. The choice is assumed to be final.[35] In addition, workers are assumed to keep their jobs for the remainder of their life cycles. There is no risk of layoff in this case, and so the unemployment duration in our model merely concerns the first job.

Finally and for the sake of simplicity, we ignore any possible income while studying and tuitions,[36] and assume that the length of studies is the same for all fields: $l_m = l$, $m=1$ to M.

Under assumptions 1 to 4, the expected log of the discounted lifetime earnings conditional on graduation in field m simplifies to:

$$E(w_m) = ln\left(\frac{a_m}{\rho - g_m}\right) - \rho\left[l + E(T_m)\right] \quad (7)$$

Notice that $ln\left(\frac{a_m}{\rho - g_m}\right) - \rho l$ is the log of the discounted lifetime earnings without an unemployment spell (i.e. when $T_m = 0$). Therefore, $\rho E(T_m) \geq 0$ is the expected loss in the log discounted lifetime earnings due to unemployment. This loss is an increasing function of the personal discount rate and the expected unemployment duration.

The log discounted lifetime earnings gap between two different fields m and k ($m \neq k$) is:

$$V_{mk} = ln\left(\frac{a_m}{\rho - g_m}\right) - ln\left(\frac{a_k}{\rho - g_k}\right) - \rho\left[E(T_m) - E(T_k)\right] \quad (8)$$

The student's decision is to choose the field of study m that maximizes his or her expected discounted lifetime earnings (i.e. $V_{mk} \geq 0$, $k=1$ to M).

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[35] In the 1997 Canadian survey of graduates, only 5.56% of college graduates expect to return to their studies within three years.

[36] The differences between tuition amounts for various fields of study at the community colleges are small, so tuition has little effect on the choice of the field of study.

The log discounted lifetime earnings gap between two fields of study depends on both the income differential once employed and the expected unemployment duration differential prior to employment. The relative weight of each differential is determined by the personal discount rate. For a student with a high personal discount rate, the discounted lifetime income drops quickly as the expected unemployment duration increases. Indeed, for some students a month of unemployment may seem like eternity. When discounted, low incomes intervening in the short term could be preferable to high incomes intervening in the long term. In such case, some students find it rational to choose a field of study that allows fast access to employment, even if it is associated with low earnings.

In addition, since ρ also represents the interest rate, the results above also suggest that the student's ability to endure an unemployment period will depend on his or her access to credit during this period. Individuals from affluent families would thus care less about unemployment when choosing a field of study.

Finally, we show that if ρ is small enough, continuous and discrete time frameworks lead to comparable log discounted lifetime earnings. Indeed, if ρ is small enough, we have $ln(1+\rho) \approx \rho$ and then $a_m(1+\rho) \approx a_m$. Consequently,

$$E\left(ln\left[\sum_{t=0}^{\infty} a_m \frac{(1+g_m)^t}{(1+\rho)^{1+T_m+t}}\right]\right) = ln\left(\frac{a_m(1+\rho)}{\rho-g_m}\right) - ln(1+\rho)\left[1+E(T_m)\right]$$

$$\approx ln\left(\frac{a_m}{\rho-g_m}\right) - \rho\left[1+E(T_m)\right]$$

In this case, both frameworks lead to the same decision regarding the choice of the field of study.

3.4 Econometric Specifications

We define the expected level of indirect utility corresponding to the choice of each field of study as a linear function of log annual earnings in this field and the expected unemployment duration after graduation in the same field. We also control for some observed characteristics and introduce a random component. More precisely, we define:

$$U_m^* = V\theta_m + \alpha y_m + \delta E\left(T_m \mid Z\right) + \xi_m, \quad m=1,...,M \quad (9)$$

as the expected level of indirect utility if the individual chooses the field of study m, expressed as a linear relation of log annual earnings in field m $\left(y_m\right)$,[37] the expected unemployment duration after graduation in field m $\left(E\left(T_m \mid Z\right)\right)$, and a vector of controlling variables (V) as well as a random component $\left(\xi_m\right)$.

Notice that we use annual earnings instead of the lifetime earnings. Reasons for this are that the calculation of the lifetime earnings requires the value of the annual growth rate of earnings in each field and the value of the individual discount rate. The data we use in our study (see Section 3.5) does not make it possible to estimate the annual growth rate of earnings correctly, since observed earnings are from recent and young graduates. In addition, the discount rate is unknown.[38] However, we can show that log of lifetime earnings are an additive function of log earnings at the start of employment and ρ and g_m. The latter function of ρ and g_m is constant for each field.

The earnings equation in each field m is given by:

$$y_m = X\beta_m + \varepsilon_m, \quad m=1 \text{ to } M \quad (10)$$

X is a vector of covariates and ε_m is a random component satisfying $E\left(\varepsilon_m \mid X\right) = 0$ and $\varepsilon_m \sim N\left(0, \sigma_m\right)$.

T_m is a random variable representing the unemployment duration before the first job after graduation in field m. We assume that T_m has a Weibull distribution:

$$f_m(t) = \lambda_m p_m \left(\lambda_m t\right)^{p_m-1} e^{-\left(\lambda_m t\right)^{p_m}}, \quad t > 0 \quad \text{and} \quad E\left(T_m\right) = \frac{1}{\lambda_m}\Gamma\left(\frac{1+p_m}{p_m}\right), \quad m=1 \text{ to } M \quad (11)$$

Γ is the gamma function.

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[37] In the empirical application we use the log annual earnings two years after graduation.
[38] For an excellent application comparing the effect of the discounted predicted future earnings and the predicted earnings at the start of the job on the choice of field of study, see Berger (1988).

In order to account for observed heterogeneity, we formulate λ_m as a function of a vector of observed characteristics $Z : \lambda_m = e^{-Z\psi_m}$. This parameterization makes it easier to give a direction to the influence of the explanatory variables in Z on the hazard rate ($h_m(t) = \lambda_m p_m (\lambda_m t)^{p_m - 1}$). A variable with a negative coefficient increases the instantaneous probability of finding employment and vice-versa.

Finally, the coefficients α and δ in Equations (9) are the same for all fields of study, while the vector θ_m is specific to each field. We expect a positive sign for α and a negative sign for δ.

Indirect utilities U_m^*, $m=1$ to M, are not observed. We rather observe the student's choice:

$$d_m = 1, \text{ if } U_j^* = Max\left(U_1^*, U_2^*, ..., U_M^*\right), \text{ the student selects the field } m$$

$$d_m = 0, \text{ otherwise}$$

$$\sum_1^M d_m = 1$$

Hence, the choice of field of study is jointly determined by equations (9), (10) and (11), that is to say three times m equations. In order to simplify the estimation of the model we shall assume that variables T_m, $m=1$ to M, are independent of variables ξ_j and ε_j, $j=1$ to M. Thereby, unemployment equations are estimated independently from selection and earnings equations. However, unemployment durations will have an effect on the choice of the field of study if the coefficient δ (Equations 9) is different from zero. In addition, this assumption should not significantly affect our results, since most of the graduates in our sample experience very short unemployment spells. A reduced form of equation (9) that includes the vector of covariates Z instead of $E\left(T_m \mid Z\right)$ is not possible, since $E\left(T_m \mid Z\right)$ is not linear in Z (cf. Equation 11).

Stochastic terms ξ_m, $m=1$ to M, are assumed to be independent and identically Gumbell (or Type I extreme-value) distributed, which leads to the conditional logit of McFadden

(1973). The probability of choosing the field m is therefore (see, for example, Maddala, 1983, pp. 59-61):

$$P_m = Prob\left(d_m = 1 | V, \{y_s\}_{s=1 \ to \ M}, \{E[T_s]\}_{s=1 \ to \ M}\right) = \frac{exp\left(V\theta_m + \alpha y_m + \delta E[T_m]\right)}{\sum_{s=1}^{M} exp\left(V\theta_s + \alpha y_s + \delta E[T_s]\right)} \quad (12)$$

In order to identify the model, we arbitrarily set $\theta_1 = 0$. The remaining vectors of parameters θ_m, $m=2$ to M, will measure the variation relative to the first field of study. We also assume that all parameters and distributions are known to the students.

The model is estimated in four stages:

Stage 1: We estimate the duration equations separately for each field of study. We mention that for many graduates in our data file the reported unemployment durations are equal to zero, whereas duration models require the durations to be strictly positive. However, since unemployment durations are reported in months, we think that graduates likely rounded their real unemployment durations up or down. Therefore, we assume that real durations corresponding to nil reported ones likely range between 0 and 0.5 months.[39]

For each field, parameter p_m and vector of parameters ψ_m are estimated by maximizing the likelihood:

$$L_m = \prod_i F_m (0.5)^{e_i} \left[f_m (t_i)^{c_i} S_m (t_i)^{1-c_i} \right]^{1-e_i} \quad (13)$$

f_m and F_m are respectively the density and distribution functions of T_m. S_m is the survival function given by: $S_m (t) = Pr(T_m > t)$, $t > 0$. e_i is a dummy variable taking value 1 if the reported unemployment duration is equal to zero, and value 0 otherwise. c_i is a dummy variable as well which takes value 1 if the unemployment episode is completed (uncensored observations), and value 0 otherwise (censored observations).

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[39] Another way to deal with this situation is to use a split-sample model, like in Schmidt & Witte (1989). The sample is split into two groups. The first has experienced unemployment, the other has not. The duration equations are then estimated conditional on experiencing unemployment. The probability of experiencing unemployment is estimated using a probit or logit models, for example.

Stage 2: From stage 1 we obtain estimated values of $E\left(T_m \mid Z\right)$ and then estimate the reduced form of the Conditional Logit model given by equations (9) (i.e. we include X and estimated value of $E\left(T_m \mid Z\right)$ as covariates instead of y_m and $E\left(T_m \mid Z\right)$).

Stage 3: We estimate the selectivity corrected earnings equation per field (by introducing selection correction terms from stage (2) using the method suggested by Bourguignon, Fournier and Gurgand (2001). The widely used correction procedure is that proposed by Lee (1983). However, in their recent paper, Bourguignon, Fournier and Gurgand (2001) show that a consistent estimate of β_m in equations (10) should take into account all possible correlations between the disturbance term ε_m (Equation 10) and all the transformed normally distributed residuals of the selection equations (i.e. Equations 9) $\xi_s^* = \Phi^{-1}\left(G\left(\xi_s\right)\right)$, for $s=1$ to M, where $\Phi(.)$ is the standard normal distribution function and $G(.)$ is the cumulative of the Gumbell distribution function. If any of these correlations exist, the selectivity bias must be corrected.

Let ρ_{ms} be the correlation between ε_m and ξ_s^*, and v_s be the expected value of ξ_s^* conditional on field m being selected. Consistent estimate of β_m is obtained by the least squares estimation of:

$$y_m = X\beta_m + \sigma_m \rho_{m1} v_1 + \sigma_m \rho_{m2} v_2 + \ldots + \sigma_m \rho_{mM} v_M + e_m \quad (14)$$

where e_m is an independent component. v_s, $s=1$ to M, are computed from the conditional logit in stage (2).

For the sake of comparison, we also estimate the selection-corrected earnings equations by using Lee's procedure. On the other hand, one may argue that students base their choices on observed earnings instead of self-selection corrected earnings, which are unobservable. In order to test the robustness of our results to this self-selection issue, we also estimate the conditional logit model (Stage 4) using uncorrected log-annual earnings.

Stage 4: We re-estimate selection equations (9) using estimated values of the log annual

earnings ($\hat{y}_m = X\hat{\beta}_m$) obtained from stage (3).[40]

In order to identify the multi-stage model above, we use some exclusion restriction in the structural equation. Thus, some variables in the selection equation (vector V, Equations 9) are excluded from the earning equations (vector X, Equations 10) and vice-versa.[41] This problem does not arise with the duration equations, since vector Z intervenes in a nonlinear way in the selection equations.

The conditional logit coefficients (as well as those of a multinomial logit) have no simple interpretations, as it is the case in a linear regression model. Marginal effects (or derivatives of the probability function) and elasticities are, in this case, easier to interpret directly.

If the coefficient α is positive and the coefficient δ is negative, an increase in log annual earnings in a field of study while holding all else constant will increase the probability of choosing this field of study and reduce the probability of choosing any of the other fields. In contrast, increasing the expected unemployment duration in a field of study and holding all else constant will reduce the probability of choosing this field of study and increase the probability of choosing a different field. Moreover, we can show that a proportional change in the annual earnings or expected unemployment duration in a specific field of study will have exactly the same proportional effect on the probability of choosing each of the remaining fields of study ($\dfrac{\partial ln(P_m)}{\partial ln(Y_m)} = \alpha(1 - P_m) \geq 0$ and $\dfrac{\partial ln(P_m)}{\partial ln(Y_k)} = -\alpha P_k \leq 0$, $m \neq k$).

The magnitude of the elasticities is an increasing function of the weights put on earnings and unemployment durations.

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[40] Berger (1988) uses a similar approach using Lee's correction procedure (Lee, 1983), but using different specification and without accounting for unemployment durations. Indeed, Berger uses earnings instead of log-earnings as explanatory variable in the selection equations and as the dependent variable in the earnings equations.

[41] For example, V includes parents' education, province of residence before enrolment and the use of student loans. On the other hand, X includes age-squared and some variables related to the job.

3.5 Description of the Data

The data we use in this study is drawn from the Canadian National Graduates Survey (NGS, 1990 and 1995 graduates) conducted by Statistics Canada in partnership with Human Resources Development Canada. The survey concerns graduates from Canadian public post-secondary educational institutions (universities, colleges, trade schools) who have successfully completed their programs during the reference calendar year. The survey excludes graduates from private post-secondary educational institutions, completers of continuing-education programs (unless these led to a degree, diploma or certificate), part-time trade course graduates and graduates of provincial apprenticeship programs and graduates living outside of Canada at the time of the survey. The survey aims at determining such factors as the extent to which graduates of post-secondary programs had been successful in obtaining employment since graduation, the relationship between the graduates' programs of study and the employment subsequently obtained, the graduates' job and career satisfaction, the rates of under-employment and unemployment, the type of employment obtained related to career expectations and qualification requirements as well as the influence of post-secondary education on occupational achievement. NGSs were conducted in 1978, 1984, 1988, 1992 and 1997, surveying individuals from the graduating class of two years earlier. Follow-ups of Graduates Surveys are conducted three years later for the original respondents of each of the NGS (except for 1978).

For the empirical application, major groups (initially ten) are gathered into five broadly defined fields as indicated in Table 3.1.

The sample used in this study is drawn from the 1992 and 1995 NGSs and includes only graduates from community colleges (CEGEPs in Quebec). In addition, we retained people aged 65 years or younger who graduated during the reference calendar years (i.e. 1990 and 1995) and did not undertake any further studies thereafter.[42] The final sample consists of

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[42] This is in order to meet our assumption that students do not return to school after graduation and to relate the early labour market outcomes (mainly earnings and unemployment durations) to initial field choices.

6,149 observations of the 1992 NGS pooled with 8,975 observations of the 1997 NGS, for a total of 15,124 observations.[43]

Combining cross-field and cross-time variation provides a credible source of variation in the returns to field of study. The idea is that shocks that hit sectors can change the returns to studying in a particular field and be used to see how field choice of new cohorts of students respond to these changing conditions. The first half of the 1990s is an interesting period to study since relative wage and employment prospects for different fields of study changed substantially during this period. In particular, budget crises at the federal and provincial levels lead to dramatic cuts in health care funding starting in 1992 (Vujicic, 2003). By contrast, the labour market for graduates in science-oriented fields (computer programming, etc.) was much stronger during this period. These kinds of sectoral shocks provide useful leverage for evaluating how responsive are human capital investments (in different fields of study) to changes in labour market conditions. Indeed, the share of the field "Health" in the population of graduates dropped by 3.11 points, while the share of "Sciences" increased by 2.28 points between 1990 and 1995.

Descriptive statistics are reported in Table 3.2. All statistics in this chapter meet Statistics Canada's data release criteria. The average age of college graduates is 27.4 years, and it is slightly high for "Health" and "Social Sciences" graduates. In addition, female graduates are dominant in the population of graduates (59%), particularly in the fields of "Health" (83%) and "Education, Fine Arts and Humanities" (73%). In contrast, they are rare in "Sciences" (only 23%). This distribution is almost the same in 1990 and 1995. The scarcity of women in "Sciences" could be related to their anticipated labour force participation. Students looking for intermittent labour force participation or female students with higher expected fertility would avoid fields (such as science) requiring a high level of on-the-job training and tend to choose majors that are progressively less subject to atrophy and obsolescence (Polachek, 1978; Blakemore & Low, 1984).

Members of visible minorities do not seem to privilege a particular field of study, based on the fact that they are distributed in a balanced way over the five fields. Indeed, their share ranges from 8 to 10% per field of study. On the other hand, about two out of three

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[43] In each reported table we include only individuals with no missing information on any of the variables used to produce that table. Consequently, the total number of observations in some tables

graduates speak only English of the two official languages. This share is 60% or over in all fields of study. A very large fraction of graduates come from two provinces, Ontario (44%) and Quebec (23%). Students from Ontario tend to graduate mainly in "Education, Fine Arts and Humanities" and "Social Sciences," while those from Quebec privilege "Health" and "Sciences." In connection with the spoken languages, French speakers (mainly located in Quebec) are significantly present in "Health" and "Sciences." Moreover, for over 40% of the graduates, parents' education level is secondary, particularly for mothers. The second level in importance is university, especially for fathers, whereas less than 20% of graduates' parents carried out studies at the same level as their children (i.e. community college). In view of this information, the choice of college studies does not seem to be inherited from parents.

Concerning the funding of studies, student loans are reported as an important source of funding (43% of graduates) [44] especially in "Health" (50%) and "Social Sciences" (47%). We use this variable as a proxy for the family income, which is not provided by the surveys of graduates. Finally, our sample is characterized by the large fraction of graduates who were working before enrolment in their programs (42%). This fraction is high over all fields, ranging between 39% and 45%. This information is useful in examining whether working experience prior to starting college studies influences the weights put on expected earnings and unemployment durations when choosing the field of study.

The most important observation that emerges from the data is that graduates tend to confirm the view that the choice of field of study is consistent with an earnings-maximization problem. Indeed, over two thirds of graduates reported that "looking to improve the chances of a good income" was a very important factor in their choice. Only few graduates reported this factor as unimportant (see Table 3.3). There are no significant differences on this issue between genders. Moreover, "acquiring the skills needed for a particular job," which is likely to lead to high incomes, is also reported as a very important factor in the enrolment decision by about 73% of graduates. Finally, graduates express a positive opinion about their programs, since the majority of them think that they improved themselves through those programs.

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is not necessarily equal to the sample size.
[44] The 1997 NGS provides detailed information on the sources of funding including student loans, parents, employment earnings, spouse/partner, scholarships, etc., but the 1992 NGS does not.

With regard to labour market outcomes, the mean annual earnings (1997 dollars, full-time and part-time workers pooled) two years after graduation dropped by about 10% between 1992 and 1997. This drop concerned all fields of studies, but particularly "Health" (-22.61%). "Sciences" are the least affected at this point (only -0.33%). On the other hand, the extent of the fall in earnings is mainly for female graduates (-16.75% versus only -1.73% for male graduates). Focusing only on full-time workers, the drop in annual earnings is less severe (-5.32%) and concerns only females graduates. Annual earnings increased by 0.55% for males. By field of study, "Health" is again the most affected since annual earnings for full-time workers who graduated in this field decreased by 14.70%. On the other hand, those who graduated in "Sciences" were in a much better situation, since their annual earnings increased by 0.81% between 1992 and 1997. As a result, "Health", which had the highest mean annual earnings in 1992, has been downgraded by "Sciences" (see Table 3.5). The median annual earnings also dropped by 8.30% in total, but the drop is more extended for "Health" graduates and less for "Sciences" graduates. The two fields weigh around 45% in the population of graduates.

In parallel with the fall in earnings, the share of graduates in "Health" dropped by 3.11 points between 1990 and 1995, while the share of graduates in "Sciences" increased by 2.28 points (see Table 3.5). However, the change in the share of other fields does not seem to follow the same logic. For example, the share of "Business and Commerce" in the population of graduates dropped by 1.46 points, whereas the mean annual earnings for graduates in this field dropped by only 3.08%, as opposed to 5.32% on average for 1995 graduates. However, this drop is mainly due to females, for whom the mean annual earnings dropped by 4.92% versus only 1.66% for males. In addition, sub-fields show contrasted evolutions. The number of graduates in the sub-field "Management and Administration, Business and Commerce," which represents about 41% of the total number of graduates in "Business and Commerce," increased by 61.7% as compared to 35.8% for the total field and 44.75% for all fields pooled. The field "Social Sciences" shows the most contrasting evolution. The average annual earnings for full-time workers graduating in this field of study dropped by 8.18%, while its share in the population of graduates increased by 2.81 points between 1990 and 1995. The largest increases in the number of graduates are observed in sub-fields related to "Security" and "Social & Child Care Services," for which the labour demand has increased over the last years. This discordance between the evolution of earnings and the evolution of enrolment in some fields may arise from the fact

that we ignored other options. Some students may prefer those fields of study to other options, including entering the labour force or enrolling in vocational training or university programs.

The worsening in earnings for 1995 graduates parallels the deterioration in their jobs conditions as compared to 1990 graduates. In this way, the fraction of employed graduates who hold a job requiring a level of education bellow college level increased by 17.42 points between 1992 and 1997. This fraction increased by 21.26 for "Health" graduates who experienced the most significant drop of earnings. In addition, the proportion of graduates holding permanent jobs decreased by 10.91 points for "Health" graduates, as opposed to 3.65 points on average for all graduates; it remained unchanged for graduates in "Sciences." Furthermore, the mean number of weekly hours decreased by 2.41 hours for graduates in "Health," whereas it increased by 1.14 hours for graduates in "Sciences."

Parallel to the drop in annual earnings and deterioration in employment conditions, 1995 graduates also experienced longer unemployment durations as compared to 1990 graduates. The mean number of months before the first job increased from 3 for the 1990 cohort to over 6 months for the 1995 cohort. All fields of study were affected by this increase. However, "Health" is the most affected field, the fact which probably contributed to making it less attractive for students. The decline in earnings for females is contrasted with the relatively shorter unemployment duration as compared to males. Females probably make concessions on wages in order to achieve employment rapidly.

3.6 Empirical Results

All results are reported in Tables 3.7 through 3.13. Our analysis will primarily focus on the selection equations, while we will also comment on unemployment duration and wage equations.

3.6.1 Unemployment Duration Equations

Parametric estimates of the duration equation in each field assuming Weibull distributions are reported in Table 3.7. We point out that in order to identify the direction of the effect of the covariates on the hazard rate, one must consider the opposite sign of the estimated coefficients of these variables. Subjacent logic is that variables with negative coefficients increase the instantaneous probability of finding employment in each period (c.f. Equation 11). On the other hand, the parameter p determines the shape of the hazard rate function (hazard rate decreasing if $p<1$, constant if $p=1$, and decreasing otherwise).

For all fields of study the estimated value of the parameter p is far smaller than 1, ranging between 0.38 and 0.43. Consequently, for all fields of study, the hazard rate is very high right after graduation and decreases very sharply thereafter.

The results also show significant changes in hazard rates between 1992 and 1997. Indeed, most of 1997 specific coefficients (Year 1997 and Year 1997 crossed with other variables) are significant at the level 1 percent. Results also show that younger graduates have a slight advantage in finding employment as compared to older ones. This advantage increased slightly in 1997 in all fields except "Sciences." Surprisingly, female graduates generally performed well in 1997 in most fields of study and more precisely in "Sciences," where they are a minority. On the other hand, male graduates are more favoured in "Business and Commerce." Furthermore, members of visible minorities are likely to be unemployed for a longer period of time as compared to other graduates in all fields of study. In 1997, this disadvantage was eased only in "Education, Fine Arts and Humanities." Finally, bilingual workers were likely to experience shorter unemployment durations in 1992 in "Social Sciences" (probably in connection with employment in the public service) and in "Business and Commerce" (possibly in connection with the linguistic requirements of jobs in this field). Though this advantage was considerably reduced in 1997 in "Social Sciences," in the same year bilingual workers did very well in all the other fields. The ability to communicate in both official languages thus seems to widen employment opportunities for graduates in most of fields.

3.6.2 Earnings Equations

The estimated selection-corrected earnings equations using the B-F-G's procedure (Bourguignon, Fournier and Gurgand, 2001) are reported in Table 3.8, including self-selection correction terms.[45] Standard errors are bootstrapped based on 100 replications. We have included in the regression a dummy variable for 1997, crossed with a variety of other variables to account for possible changes in earnings equations between 1992 and 1997. The primary purpose of estimating earning equations is to obtain self-selection corrected log annual earning estimates, which are thereafter included in the conditional logit model (following stage). This allows estimating the weight that students put on earnings when choosing their field of study (cf. Equation 14). The estimated coefficients on the selection terms reflect the extent of self-selection in each field of study (i.e. the differences in earnings between the group of students who chose a given field of study and a group of students who would be assigned at random to the same field).

The results provide evidence for self-selection in all fields of study, since at least one of the five selection terms coefficients is significant in each field. In "Business and Commerce" and "Sciences," all five selection terms coefficients are significantly different from zero. Results also indicate that students who choose "Education, Fine Arts and Humanities," "Business and Commerce" or "Health" on average earn higher wages (+18.6%, +20.8% and +26.7% respectively),[46] as compared to students drawn at random with identical observed characteristics and assigned to the same fields of study. In contrast, students who choose "Social Sciences" or "Sciences" on average earn lower wages (-69.6% and -15.2% respectively) than identical individuals selected randomly and assigned to these fields. The self-selection bias is very large in the field "Social Sciences."

Lee's procedure (Lee, 1983) leads to different conclusions (see Table 3.8-bis). Results from this procedure suggest that there is no self-selection in the fields of "Education, Fine Arts and Humanities," "Business and Commerce" and "Sciences," whereas students self-select only into the fields of "Social Sciences" and "Health." Moreover, earnings are higher

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[45] We thank Bourguignon, Fournier and Gurgand for the program "selmlog" used in the estimation.
[46] These estimates are calculated by multiplying minus each significant selection coefficient, times the mean value of the corresponding selection variable for graduates in each field of study and summoning obtained values.

for students choosing "Health" (+32%) and lower for those choosing "Social Sciences" (-37%) as compared to identical students selected randomly and assigned to those fields. Once again, these gaps look quite large. Hilmer (1999) applies Lee's procedure to estimate self-selection corrected earnings equations for American males with baccalaureate and beyond. His results suggest that students self-select into the fields of "Social Sciences", "Engineering" and "Sciences," and do not self-select into the fields of "Education and Letters" and "Business." These findings agree with ours when using the same correction procedure. However, Hilmer finds that students who self-select into the field of "Social Sciences" earn higher wages than random students assigned to the same field, whereas we find the opposite.

In spite of the differences between Lee's and B-F-G's procedures with respect to the sample selection bias, the two procedures produce very close predicted log annual earnings by field of study. Consequently, we obtained comparable estimates of the weight that students put on earnings when choosing their fields of study by using the two methods (see the following Section and Table 3.11).

Another remark that can be made based on the results obtained by using B-F-G's procedure is that the estimated standard error of the residual term in the earnings equations (σ_m) is greater than the estimated coefficient of the correction term ($\sigma_m \rho_{ms}$ in Equation 14) in many cases. As a result, the estimated correlation coefficients between the random components in earnings equations and the random components in the selection equations (i.e. ρ_{ms} in Equation 14) are higher than 1. This may suggest a problem of specification in our model, especially with regard to the exclusion restrictions (i.e. variables included in the selection equations but excluded from the earnings equations). Another potential explanation is that correlation coefficients are not constrained between -1 and 1 in the program "selmolg" provided by Bourguignon, Fournier and Gurgand (2001). This problem does not occur when using Lee's procedure (Table 3.8-bis).

The residual standard error is slightly high in "Education, Fine Arts and Humanities," (0.43) whereas it ranges between 0.35 and 0.38 in the other fields. On the other hand, since we use data from recent young graduates, the coefficients on age and age squared do not necessarily respect the usual rules (positive coefficient for age and negative coefficient for age square, and both coefficients are significant). This is, for example, the case of age and

age squared coefficients in "Health" in 1992 and in "Social Sciences" in 1997. Lee's procedure produces the same situation.

The coefficient on "Year 1997" is either negative or insignificant, the fact which supports the downward trend of earnings between 1992 and 1997. In addition, the hypothesis that earnings equations do not change over time is rejected at the level 1 percent in each of the five fields of study. However, the decrease in annual earnings contrasts with the increase in the elasticity of annual earnings relative to weekly hours in all fields of study, particularly in "Social Sciences" and "Health." In this way, the elasticity of the annual earnings relative to weekly hours exceeds 1 in 1997 in "Social Sciences," "Business and Commerce" and "Health," while being below 1 in all fields of study in 1992. This suggests that the decline in earnings is not due to the decline in the hourly wage, but to the reduction of the volume of work and the deterioration of job conditions (see Table 3.6).

Female graduates generally earn less than male graduates in all fields of study even when controlling for the number of hours worked weekly. In 1992, the gap between males and females was 57% in "Business and Commerce" and 38% in "Health" (only 15% and 18% respectively when using Lee's procedure, and 0.15% and 0.03% when the self-selection is ignored, see Tables 3.8-bis and 3.9). This gap increased over time in "Education, Fine Arts and Humanities," "Health" and "Sciences," whereas it significantly dropped in "Social Sciences" (the share of this field in the population of female graduates increased from 10.53% to 14.18%) and slightly in "Business and Commerce." The estimated earnings-gaps between males and females are very large when using B-F-G's procedure. Once again, this raises the question whether sample selection bias was adequately corrected for. We cannot answer this question since it is not easy to identify a variable that affects the field of study choice without affecting earnings (Wooldridge, 2001)

Concerning visible minority groups, earnings advantage over other graduates in 1992 was transformed to a disadvantage in 1997 in all the fields except "Health," where the gap (in favour of visible minority groups) widened and "Education, Fine Arts and Humanities," where the gap remained insignificant.

The effect of the number of spoken languages on the earnings level is generally unstable over time. In 1992, employed graduates who speak English were disadvantaged only in

"Education, Fine Art and Humanities," but advantaged in "Social Sciences," as compared to those who speak French only. However, those gaps were nearly eliminated in 1997. Workers who speak English (in addition to French or not) generally earn more in "Business and Commerce" and "Health," as compared to those who speak French only. On the other hand, speaking French seems to be an asset in "Sciences."

Finally, earnings are higher when workers occupy jobs requiring the same level of education with which they graduated (college in our case). Jobs requiring a lower level of education are associated with low earnings, but those requiring a higher level of education do not necessarily provide higher earnings. In addition, most important changes that occurred between 1992 and 1997 concern the field of "Health," since the effect of the level of education associated with jobs in this field became highly significant in 1997, whereas it was non significant in 1992.

Table 3.9 presents estimated uncorrected field-specific earnings equations, which are useful in examining the effect of self-selection control. Generally, the effect is contrasted when comparing 1992 with 1997. Thus, limiting our analysis to some specific variables, we observe that self-selection correction reduces the return to age in 1992 but increases it in 1997. In addition, log weekly hours coefficients are underestimated in 1992 and overestimated in 1997 in uncorrected estimates as compared to selection-corrected estimates. Also, self-selection control considerably increases the gap between males and females in "Business and Commerce" and "Health," and reduces it in "Social Sciences" and "Sciences." Conversely, controlling for self-selection significantly increases the return for "Visible Minority Groups" who majored in "Business and Commerce" in 1990 or 1995 and in "Health" in 1995.

3.6.3 Determinants of College Field Choice

Table 3.10 reports the estimated conditional logit model using self-selection corrected annual earnings and expected unemployment durations estimates (Stage 4, Section 3.4). Selection equations are assumed to be stable (invariant) over time. Estimated coefficients specific to each field should be interpreted as variations relative to the field "Education, Fine Arts and Humanities."

Results from the conditional logit model are not easy to interpret directly. However, it is interesting to examine the coefficients on log annual earnings and expected unemployment durations, since those coefficients are the same for all study fields. Table 3.11 reports the estimated weights (Column 2). For the sake of comparison, Table 3.11 also reports the estimated weights when selection-corrected earnings are estimated using Lee's procedure (Column 3) and when assuming that students base their choices on observed earnings (Column 1). The signs of the estimated coefficients correspond to those anticipated: positive sign for the coefficient on log earnings and negative sign for the coefficient on the expected unemployment duration. In addition, all those coefficients are statistically significant at the level 1 percent, a fact which provides an evidence for the noteworthy effects of earnings and expected unemployment duration on the choice of the field of study. By gender, female graduates put less weight on both earnings and unemployment durations when choosing their field of study as compared to male graduates. Montmarquette, Cannings and Mahseredjian (2002) find the same results concerning the effects of earnings on the basis of American data.[47] Our results also indicate that graduates who were employed prior to starting college put more weight on earnings and less weight on unemployment duration when choosing their fields of study. The weak sensitivity to unemployment can be explained by the fact that some programs are sponsored by employers, so the concerned graduates keep their jobs while studying. In addition, having working experience and the implied information on the labour market prior to starting college may be assets in finding employment quickly after graduation. Moreover, those individuals have probably accumulated enough wealth (savings, real estate, etc.) to bear long unemployment duration while searching for high-wage employment. Concerning women, they may expect to count on the support from their partners or relatives if they encounter difficulties with finding employment, which leads them to put less weight on unemployment duration.

When selection-corrected annual earnings are estimated using Lee's procedure (Column 3, Table 3.11), the weight put on log annual earnings by students who are not working prior to college decreases slightly, while all the other weights remain almost the same as compared to those obtained when using B-F-G's procedure. Consequently, results seem to

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[47] Our results can not be directly compared to those of Montmarquette, Cannings and Mahseredjian (2002), since we use log of earnings instead of earnings in the conditional logit. Moreover, we account for the expected unemployment durations in the choice of field of study, while previous studies do not.

be robust to the correction method. On the other hand, when the selection bias is ignored in the estimation of earnings equations[48], the weight put on log annual earnings decreases significantly for graduates who were not working prior to college (going from 0.9525 to 0.6596 for males). Conversely, that weight only decreases faintly for graduates with work experience prior to college (going from 1.2317 to 1.1933 for males).

For easier interpretation, results from the conditional logit model are converted into marginal effects (cf. Table 3.12). Results should be interpreted as effect that a unit change in the independent variable has on the probability of selecting a specific field of study over other fields of study, holding all else constant. For dummy variables, the marginal effect is measured by the difference in the probability between the value 0 and the value 1. An important point that is made obvious by Table 3.12 is that most of the marginal effects are significant at the level 1 percent. In concordance with descriptive statistics, women are less likely to select "Sciences" than any of the other fields. Indeed, women only represent 23% of graduates in "Sciences." On the contrary, "Health" is likely to be the first choice for women, followed by "Education, Fine Arts and Humanities." Indeed, 83% and 73% of graduates in these two fields are women respectively. Incidentally, visible minority groups are more likely to major in "Business and Commerce" and "Sciences," where they might expect to meet less discrimination in the access to employment. This might also be explained by the fact that they are looking for a high income, since those fields of study were the less affected by the drop in earnings between 1992 and 1997. On the other hand, English speakers and bilingual students tend to major more in "Education, Fine Arts and Humanities" and "Social Sciences," as compared to French speakers. Bilingual individuals are the most likely to select "Social Sciences," possibly because they aim at employment in the public sector. Also, speaking French increases the likelihood of choosing "Health" as a field of study. Descriptive statistics show that the share of graduates speaking French only or living in Quebec is quite high among the graduates in this study field. Yet, the marginal effects of the languages spoken are not very large, though are significant. Students who are supported by student loans are more likely to select "Health" or "Social Sciences." This result might be of relevance for policies aimed at attracting more young people towards these fields. In contrast, results suggest that students who do not use student loans mainly favour "Business and Commerce" and to a lesser extent "Education, Fine Arts and Humanities." Concerning the effects of employment experience, our results suggest that

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[48] One may argue that students predict their earnings based on observed earnings per field of study

being employed prior to starting college significantly increases the preference for majoring in "Education, Fine Arts and Humanities," while significantly reducing the probability of choosing "Business and Commerce." In the latter field, on-the-job training seems to be more profitable than school training.

It would be interesting to compare parents and children with regard to the choice of the field of study. Unfortunately, the data we use does not provide information on the parents' fields of study. Moreover, as shown in Table 3.2, around 60% of graduates' parents have a general level of education (secondary or less). Nonetheless, when controlling for both parents' education level, we obtain some attention-grabbing results. There is sometimes a conflict between the mother's and father's level of education effects on the children's choices of field of study. Indeed, the likelihood of choosing "Health" or "Sciences" is low when the father's education level is university, whereas it is high when the mother has the same level of education (i.e. university). The same contrasting effect is observed for the likelihood of choosing "Social Sciences" or "Business and Commerce" for all of the parents' levels of education. The effects are the same only on the likelihood of choosing "Education, Fine Arts and Humanities." University-level education for both the father and the mother increases that likelihood, while all other levels of education decrease it. The positive effect of university-level education of both parents on the probability of selecting "Education, Fine Arts and Humanities" supports the result from "Use of Student Loans," in the way that children from affluent families tend to major in the same field (i.e. "Education, Fine Arts and Humanities"). On the other hand, low levels of parent education (elementary and secondary) often direct children towards "Business and Commerce" if related to mothers, and to "Health" or "Sciences" if related to fathers. Combining the effects of both parents' levels of education, the results suggest that the probability of choosing "Health" or "Sciences" becomes small when both parents have the same level of education, whereas the probability of choosing "Business and Commerce" remains high if both parents have secondary or lower level of education. Finally, the probability of choosing "Education, Fine Arts and Humanities" significantly increases if both of parents are highly educated (i.e. with university level).

Concerning the labour market variables (i.e. log annual earnings and expected unemployment durations), all the marginal effects of those variables are significant at the level 1 percent. Increasing the log of earnings in a specific field of study (while holding all else constant) significantly increases the probability of choosing this field and reduces the probability of choosing any of the other fields of study. Additionally, men are more influenced by earnings as compared to women. Also, individuals who were working prior to starting college are more sensitive to earning variations as compared to those who were not working. While these effects are highly significant for all fields, their extent varies across fields. The probability of choosing "Business and Commerce" is the most sensitive to log annual earning variations, both positively and negatively. Indeed, when log annual earnings increase in a specific field of study, the effect on the probability of choosing the same field is the largest in "Business and Commerce." Moreover, the probability of choosing "Business and Commerce" is the most affected when log annual earnings vary in other fields of study. "Sciences" is the second most sensitive field to earning changes. On the other end of spectrum, "Social Sciences" is the least influenced by log annual earning variations.

The expected unemployment durations, which reduce the expected lifetime earnings, have a negative effect on the probability of choosing a specific field of study. In this way, when the expected unemployment duration in a specific field increases (while holding all else constant), the probability of selecting this field of study is reduced and the probability of choosing a different field is increased. Once again, the field of study "Business and Commerce" is the most sensitive to unemployment duration variations both in this field and other fields, whereas the field "Social Sciences" is the least sensitive to those variations. Finally, students who are employed prior to college and women respond less to expected unemployment duration variations.

Lastly, results from the conditional logit are also converted into elasticities for earnings and unemployment durations. Estimated elasticities are reported in Table 3.13. The elasticity should be interpreted as the percent change in the probability of choosing a specific field of study relative to a percent change in annual earnings or expected unemployment duration.[49] So, it supplements the interpretation of the marginal effect by

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[49] Concerning earnings, the elasticities of the probability of choosing a specific field of study are relative to a percent change in annual earnings rather than a percent change in log annual earnings.

reflecting the extent of that effect relative to the initial probability of choosing each field of study. As in the case of the marginal effects, all estimated elasticities are significant at the level 1 percent. The proportional responsiveness to the increase in the annual earnings or in the expected unemployment duration, is higher for men as compared to women. Furthermore, for individuals who were employed prior to starting college the probability of choosing a field of study is more sensitive to the change in annual earnings as compared to those who were not employed. In contrast, those individuals respond little to the change in the unemployment duration, relatively to those who were not employed prior to college. These results go hand in hand with those found in interpreting marginal effects. What is more, the probability of choosing a field of study is inelastic relative to the expected unemployment duration (the proportional change in the probability of choosing a field is less than the proportional change in the unemployment duration). That probability is also inelastic relative to earnings in the case of men who were not working prior to starting college and women (working or not prior to starting college). For individuals who were employed prior to starting college, the elasticity of the aforementioned probability relative to earnings is slightly higher than 1, which confirms the high weight that those individuals put on earnings when choosing their fields of study. Finally, women who were working prior to starting college tend to respond to earnings variations in a way comparable to men who were not working prior to college. However, the two groups differ significantly with regard to responsiveness to the expected unemployment duration changes. As mentioned before, working prior to college significantly reduces the sensitivity to unemployment.

The comparison between the five fields of study is interesting when considering the effect of proportional changes in earnings or expected unemployment duration in each field of study on the probability of choosing each of the alternative fields of study. Changes in earnings or expected unemployment duration in "Sciences" produce the most significant effects. For example, a 1 percent increase in annual earnings in this field of study, holding all else constant, will reduce the probability of choosing each of the four remaining fields of study by 0.34% in the case of men who were working prior to starting college. The probabilities of choosing each field of study are also significantly sensitive to earnings and the expected unemployment duration changes in "Business and Commerce." On the other hand, earnings and expected unemployment duration changes in "Social Sciences" cause only a modest responsiveness to the probability of choosing each of the alternative fields of study.

3.7 Conclusion

In the present study, we use Canadian data to analyze the determinants of college field choice. We specifically focus on the effects of the expected earnings and unemployment durations on that choice. To this end, we develop a model of endogenous choice of field of study, where the expected earnings and unemployment durations as well as the personal discount rate are the principal determinants of that choice. The weight put on unemployment relative to earnings in the choice of field is the individual discount rate.

The econometric models we estimated thereafter using data from the Canadian National Graduates Survey for 15,124 individuals who successfully completed their programs at Canadian community colleges (CEGEPs in Quebec) in 1990 and 1995 yielded estimates of the parameters that guide student choice. Our results provide empirical evidence for our view that the choice of a college field of study depends upon both expected earnings and unemployment durations in all fields of study. In addition, it was found that women are less influenced by earnings and expected unemployment durations as compared to men. Also, individuals who were employed prior to starting college put more weight on earnings and less weight on unemployment when choosing their fields of study. We also find that the probability of selecting "Business and Commerce" or "Sciences" is relatively the most sensitive to earning and unemployment duration variations. Conversely, "Social Sciences" is the least sensitive to monetary motives, including the expected unemployment duration. While the probability of choosing each field of study significantly depends on earnings and expected unemployment duration, it is generally inelastic to those variables. This suggests that only big changes in earnings and unemployment durations are able to produce significant changes in the distribution of graduates over each field of study. In fact, the choice of a field of study also significantly depends upon many other variables (gender, parents' education, family affluence, ethnic group, etc). On the other hand, these findings are less affected by the kind of self-selection correction method used to estimate the earnings equations (the procedure proposed either by Bourguignon, Fournier and Gurgand, 2001 or Lee, 1983). However, the two procedures lead to different results as regards the presence of self-selection and its extent. The procedure proposed by Bourguignon, Fournier and Gurgand (2001) suggests that self-selection concerns all the fields of study, while Lee's procedure suggests that self-selection concerns only the fields of "Social Sciences" and "Health."

Finally, we should mention that some selection biases still persist in our estimates. On one hand, we focus only on people who choose a college field, and so we ignore those who choose other options (entering the labour force or undertaking university studies, for example). On the other hand, we assume that students who select a college field will successfully complete their program. In fact, some students drop out or fail to complete the requirements of their program.[50] In addition, we assume that the observed choices correspond to those originally (rationally) made by students, which is not always the case. In fact, some students do not end up in the fields they initially chose because they do not meet the requirements of their chosen fields of study or because the capacity in certain coveted fields (fixed quotas) is limited. Unfortunately, the data we use does not allow us to correct for these selection biases.

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[50] For a good application of the use of student's perceived probability of success, see Montmarquette, Cannings and Mahseredjian (2002).

Table 3.1: Composition of the Fields of Study

Fields groups	Sub-fields groups
Education, Fine Arts and Humanities	- "Educational, Recreational and Counselling Services", - "Fine and Applied Arts" "Humanities and Related Fields".
Social Sciences	- "Social Sciences and Related Fields"
Business and Commerce	- "Commerce, Management and Business Administration"
Health	- "Health professions, Sciences and Technologies"
Sciences	- "Engineering and Applied Sciences Technologies and Trades" - "Mathematics and Physical Sciences" - "Agricultural and Biological Sciences/Technologies"

Table 3.2: Descriptive Statistics

	Education, Fine Arts, Humanities	Social Sciences	Business, Commerce	Health	Sciences	Total
Age	26.72	28.07	26.92	28.6	27.39	27.43
(s.d)	(7.15)	(8.34)	(7.24)	(7.78)	(6.97)	(7.4)
Female	0.73	0.66	0.67	0.83	0.23	0.59
(1995 graduates)	(0.73)	(0.66)	(0.66)	(0.84)	(0.23)	(0.58)
Member of a visible minority group	0.08	0.08	0.10	0.08	0.09	0.09
Spoken languages						
English only	0.66	0.67	0.64	0.62	0.60	0.63
Bilingual	0.19	0.19	0.18	0.18	0.20	0.19
French only	0.15	0.14	0.18	0.20	0.20	0.18
Province of residence						
Quebec	0.18	0.19	0.23	0.26	0.26	0.23
Ontario	0.54	0.55	0.42	0.35	0.39	0.44
Manitoba,Saskt.	0.03	0.03	0.05	0.09	0.06	0.05
Alberta	0.10	0.09	0.13	0.09	0.14	0.12
BC	0.11	0.09	0.13	0.13	0.08	0.11
Other provinces	0.04	0.05	0.04	0.08	0.07	0.05
Father's education level (*)						
Elementary	0.13	0.15	0.18	0.19	0.17	0.17
Secondary	0.40	0.41	0.43	0.43	0.43	0.42
College	0.15	0.16	0.14	0.14	0.15	0.15
University	0.32	0.28	0.25	0.24	0.25	0.26
Mother's education level (*)						
Elementary	0.12	0.14	0.17	0.16	0.14	0.15
Secondary	0.44	0.45	0.49	0.47	0.47	0.47
College	0.18	0.20	0.16	0.17	0.17	0.17
University	0.26	0.21	0.18	0.20	0.22	0.21
Used student loans	0.43	0.47	0.39	0.50	0.43	0.43
Working prior to starting college (**)	0.43	0.41	0.39	0.45	0.43	0.42
Number of observations						
1992	887	514	1380	1142	2226	6149
1997	1398	736	1947	1102	3792	8975
Total	2,285	1,250	3,327	2,244	6,018	15,124

Notes: s.d: Standard-Deviation. (*) "Elementary" includes "No schooling". "Secondary" also includes "Vocational training". (**) Also includes those who were working and studying.

Table 3.3: The Determinants of Enrolment Decision (%)

		Very important	Somewhat important	Not very important	Not at all important
To improve chances of a good income	Male	67.41	26.85	4.89	0.85
	Female	66.79	26.41	5.58	1.21
	Both genders	67.05	26.59	5.29	1.06
To acquire the skills needed for a particular job	Male	69.32	26.73	2.93	1.02
	Female	75.2	21.21	2.74	0.85
	Both genders	72.76	23.51	2.82	0.92
To acquire an in-depth knowledge of a field of study	Male	68.74	28.2	2.72	0.33
	Female	74.41	23.32	1.93	0.34
	Both genders	72.06	25.35	2.26	0.34
To improve yourself Generally (only 1990 graduates)	Male	70.09	26.65	2.72	0.54
	Female	77.55	20.06	1.88	0.51
	Both genders	74.52	22.74	2.22	0.52

Table 3.4: Proportion of Graduates who Would Have Selected the Same Field of Study Given their Experience Since Graduation

	Gender		Year of graduation		Total
	Male	Female	1990	1995	
Same Field	73.08	69.99	74.35	69.17	71.27
Different Field	23.96	26.47	21.54	28.08	25.43
Don't know	2.96	3.54	4.11	2.74	3.3

Table 3.5: Mean Annual Earnings (Full Time Workers*), Mean Number of Months before First Job after Graduation and the Distribution of Graduates by Field of Study

		Year	Education, Fine Arts, Humanities	Social Sciences	Business, Commerce	Health	Sciences	Total
M A L E S	Annual earnings (Full time workers*) 1997$, 10³	1992	26.44 (12.06)	30.62 (11.12)	30.64 (13.07)	36.1 (7.46)	30.81 (12.26)	30.81 (12.15)
		1997	28.04 (16.62)	28.59 (11.31)	30.13 (14.17)	31.27 (10.7)	32.18 (13.75)	30.98 (13.84)
		Var. 97/92	**+6.05%**	**-6.63%**	**-1.66%**	**-13.38%**	**4.45%**	**+0.55%**
	Number of months before first job	1992	3.31 (6.16)	2.73 (5.28)	3.68 (6.49)	1.6 (3.46)	3.23 (6.03)	3.16 (5.94)
		1997	6.61 (8.42)	6.83 (8.73)	5.88 (8.12)	6.25 (8.0)	6.39 (8.66)	6.35 (8.5)
		Var. 97/92	**99.70%**	**150.18%**	**59.78%**	**290.63%**	**97.83%**	**100.95%**
	Distribution of graduates	1992 (1)	11.84	8.08	20.74	8.08	51.26	100.00
		1997 (2)	11.53	9.86	19.89	5.83	52.89	100.00
		(2)-(1)	**-0.31**	**1.78**	**-0.85**	**-2.25**	**1.63**	**-**
F E M A L E S	Annual earnings (Full time workers*) 1997$, 10³	1992	24.85 (14.33)	27.34 (15.82)	24.18 (9.59)	34.05 (9.95)	30.28 (37.93)	27.85 (17.16)
		1997	21.72 (7.16)	24.77 (10)	22.99 (8.69)	29.01 (11.53)	26.35 (12.44)	24.62 (10.13)
		Var. 97/92	**-12.60%**	**-9.40%**	**-4.92%**	**-14.80%**	**-12.98%**	**-11.60%**
	Number of months before first job	1992	3.1 (5.86)	3.69 (6.84)	3.39 (5.82)	1.66 (4.2)	3.52 (6.46)	2.92 (5.7)
		1997	6.06 (8.63)	6.45 (8.7)	6.1 (8.57)	5.66 (8.05)	5.63 (8.08)	5.98 (8.43)
		Var. 97/92	**95.48%**	**74.80%**	**79.94%**	**240.96%**	**59.94%**	**104.79%**
	Distribution of graduates	1992 (1)	23.42	10.53	29.9	25.99	10.16	100.00
		1997 (2)	23.09	14.18	28.28	22.79	11.67	100.00
		(2)-(1)	**-0.33**	**3.65**	**-1.62**	**-3.2**	**1.51**	**-**
B O T H G E N D E R S	Annual earnings (Full time workers*) 1997$, 10³	1992	25.26 (13.78)	28.6 (14.27)	26.31 (11.28)	34.48 (9.52)	30.7 (20.43)	29.14 (15.24)
		1997	23.46 (11)	26.26 (10.68)	25.5 (11.45)	29.41 (11.42)	30.95 (13.69)	27.59 (12.42)
		Var. 97/92	**-7.13%**	**-8.18%**	**-3.08%**	**-14.70%**	**+0.81%**	**-5.32%**
	Number of months before first job	1992	3.16 (5.94)	3.36 (6.36)	3.49 (6.05)	1.65 (4.07)	3.3 (6.13)	3.02 (5.8)
		1997	6.21 (8.57)	6.58 (8.71)	6.03 (8.42)	5.75 (8.04)	6.21 (8.53)	6.14 (8.46)
		Var. 97/92	**96.52%**	**95.83%**	**72.78%**	**248.48%**	**88.18%**	**103.31%**
	Distribution of graduates	1992 (1)	18.72%	9.54%	26.18%	18.71%	26.86%	100%
		1997 (2)	18.19%	12.35%	24.72%	15.6%	29.14%	100%
		(2)-(1)	**-0.53**	**+2.81**	**-1.46**	**-3.11**	**+2.28**	**-**

Notes: (*) 30 hours and up weekly. In parentheses are standard-deviations.

Table 3.6: Evolution of Some Jobs' Characteristics

	Education, Fine Arts, Humanities	Social Sciences	Business, Commerce	Health	Sciences	Total
Education level required for the job compared to current level:						
Lower level						
1992	38.02	26.21	30.98	7.99	27.4	26.43
1997	53.95	44.05	47.76	29.25	41.78	43.85
Same level						
1992	38.57	45.15	37.95	76.01	46.36	48.33
1997	22.93	31.95	26.33	49.55	34.13	32.25
Higher level						
1992	23.41	28.64	31.07	16.00	26.24	25.24
1997	23.12	24	25.91	21.2	24.09	23.9
Permanent job:						
1992	58.96	70.72	69.91	80.49	67.23	69.31
1997	56.42	67.12	67.49	69.58	67.26	65.66
Mean number of weekly hours:						
1992	36.46	37.32	38.41	34.21	40.79	37.7
	(10.2)	(9.06)	(8.44)	(8.67)	(8.91)	(9.29)
1997	37.14	35.18	37.87	31.8	41.93	37.61
	(11.98)	(9.69)	(10.22)	(11.98)	(10.68)	(11.43)

Notes: In parentheses are standard-deviations.

Table 3.7: Estimated Unemployment Duration Equations (assuming Weibull distributions)

	Education, Fine Arts. Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std.Err.
Constant	0.0158	0.0349	0.2272[b]	0.1022	0.2046[a]	0.0436	-0.7484[a]	0.0668	-0.4290[a]	0.0275
Age	0.0043[a]	0.0013	0.0038[b]	0.0017	0.0022[b]	0.001	0.0029[b]	0.0011	0.0164[a]	0.0009
Female	-0.0378[a]	0.0137	-0.0258	0.0231	0.0560[a]	0.0112	-0.0419[b]	0.0185	0.0081	0.0192
Visible minority	0.2441[a]	0.0230	0.1192[a]	0.0286	0.1637[a]	0.0147	0.0603[c]	0.0354	0.1188[a]	0.0156
Working prior to college	-0.2142[a]	0.0144	-0.1344[a]	0.0299	-0.0349[b]	0.0162	-0.1754[a]	0.0174	-0.1499[a]	0.0136
Province of residence										
Quebec	-0.0124	0.0268	-0.0867	0.0778	-0.1339[a]	0.0409	-0.0594[c]	0.0337	0.1844[a]	0.0128
Ontario	-0.0390	0.0310	-0.2005[a]	0.0425	-0.1378[a]	0.0273	0.1544[a]	0.0185	0.0066	0.0093
Manitoba, Saskat.	0.0048	0.0587	-0.1381[a]	0.0468	-0.0605[b]	0.0323	0.3569[a]	0.0227	-0.0770[a]	0.0198
Alberta	0.0890[b]	0.0381	0.2662[a]	0.0484	-0.0278	0.0289	0.2368[a]	0.0273	-0.1165[a]	0.0163
B.C.	0.2485[a]	0.0418	-0.0897	0.0560	-0.1083[a]	0.029	0.1944[a]	0.0213	0.0135	0.0199
Spoken languages										
English Only	0.0419	0.0396	-0.2238[a]	0.0621	-0.0278	0.0203	0.3958[a]	0.0477	0.1415[a]	0.0252
Bilingual	0.2134[a]	0.0366	-0.1695[a]	0.0521	-0.0874[a]	0.014	0.4062[a]	0.0371	0.1005[a]	0.0183
Year 1997	0.0585[b]	0.0284	-0.5540[a]	0.1258	-0.0839[a]	0.0172	0.9287[a]	0.0772	0.5900[a]	0.0222
Year 1997 x										
Age	0.0089[a]	0.0015	0.0079[a]	0.0019	0.0126[a]	0.0011	0.0064[a]	0.0015	-0.0054[a]	0.0009
Female	-0.0047	0.0153	-0.0808[a]	0.0309	-0.0008	0.0106	-0.0232	0.0250	-0.1302[a]	0.0237
Visible Minority	-0.0622[b]	0.0250	0.1426[a]	0.0265	0.1904[a]	0.0108	0.0055	0.0434	0.0572[a]	0.0140

(Continued)

Table 3.7 (Continued)

	Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std.Err.
Year 1997 x										
Working before Enrolment	0.2379[a]	0.0154	0.0821[b]	0.0361	-0.0889[a]	0.0201	0.1081[a]	0.0215	0.2120[a]	0.0168
Quebec	0.1277[a]	0.0410	0.4865[a]	0.0913	-0.0176	0.0286	0.1281[a]	0.0394	-0.0898[a]	0.0136
Ontario	0.3853[a]	0.0397	0.4110[a]	0.0491	0.1119[a]	0.0095	-0.0207	0.0212	0.1693[a]	0.0180
Manitoba, Saskat.	0.0097	0.0736	0.2887[a]	0.0755	0.0033	0.0186	-0.3423[a]	0.0219	0.0574[a]	0.0200
Alberta	0.2375[a]	0.0576	-0.0767	0.0581	0.0573[a]	0.0226	-0.3105[a]	0.0324	0.1629[a]	0.0169
B.C.	-0.0414	0.0521	0.4478[a]	0.0751	0.1914[a]	0.0118	-0.1585[a]	0.0218	0.0159	0.0248
English Only	-0.1782[a]	0.0452	0.6377[a]	0.0723	0.0119	0.0208	-0.3810[a]	0.0537	-0.1745[a]	0.0295
Bilingual	-0.5425[a]	0.0423	0.5001[a]	0.0636	-0.0288[c]	0.0148	-0.3907[a]	0.0471	-0.2054[a]	0.0218
Parameter p	0.4244[a]	0.0036	0.3847[a]	0.0039	0.4143[a]	0.0029	0.3862[a]	0.0034	0.4216[a]	0.0028
Mean Log Likelihood	-2.2014		-2.2044		-2.2101		-1.9150		-2.2171	
Number of observations	2,160		1,179		3,138		2,117		5,670	

Notes: - (a), (b) and (c): significant at the level 1, 5 and 10 percent.

Table 3.8: Selection-Corrected Log Annual Earnings Equations Estimates (Procedure suggested by Bourguignon, Fournier & Gurgand, 2001)

	Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Constant	6.4187[a]	0.1998	5.3929[a]	0.2039	5.8780[a]	0.1627	8.0921[a]	0.1631	6.6169[a]	0.2581
Age	0.0419[a]	0.0126	0.0552[a]	0.0094	0.0614[a]	0.0085	-0.0116	0.0074	0.0654[a]	0.0087
Age squared	-0.0005[a]	0.0002	-0.0006[a]	0.0001	-0.0008[a]	0.0001	0.0002[c]	0.0001	-0.0008[a]	0.0001
Log weekly hours	0.8208[a]	0.0421	0.6612[a]	0.0388	0.9231[a]	0.0343	0.7826[a]	0.0254	0.5400[a]	0.0402
Permanent job	0.1390[a]	0.0233	0.1545[a]	0.0245	0.1276[a]	0.0171	-0.0194	0.0176	0.1833[a]	0.0152
Female	-0.0972[c]	0.0573	-0.1332[b]	0.0618	-0.5736[a]	0.0486	-0.3823[a]	0.0452	0.0134	0.0518
Minority group	-0.0071	0.0232	0.0565[b]	0.0275	0.0482[b]	0.0189	0.0319[c]	0.0166	0.0126	0.0202
Spoken Languages										
English only	-0.1735[a]	0.0449	0.1965[a]	0.0552	0.1257[a]	0.0270	0.1081[a]	0.0187	-0.0505[c]	0.0261
Bilingual	-0.0828[b]	0.0399	0.0074	0.0419	0.1119[a]	0.0195	0.1217[a]	0.0131	0.0228	0.0178
Education level required for the job as compared to College level:										
Same level	0.1039[a]	0.0331	0.0833[b]	0.0355	0.1494[a]	0.0190	0.0007	0.0372	0.2856[a]	0.0228
Higher level	0.0889[a]	0.0236	0.0062	0.0350	0.0717[a]	0.0151	-0.0031	0.0329	0.1914[a]	0.0232
Province of Residence										
Quebec	0.0584	0.0494	0.4728[a]	0.0555	0.0757[c]	0.0411	0.0979[a]	0.0266	-0.1336[a]	0.0336
Ontario	0.1828[a]	0.0452	0.3304[a]	0.0415	0.0356	0.0344	0.1740[a]	0.0247	0.0460[c]	0.0266
Manitoba, Saskat.	-0.0525	0.0602	0.0904	0.0607	-0.1184[a]	0.0384	0.0264	0.0249	-0.1697[a]	0.0378
Alberta	-0.0954[b]	0.0438	0.1681[a]	0.0378	0.0020	0.0325	0.1161[a]	0.0263	0.0234	0.0293
B.C.	0.1212[a]	0.0456	0.1895[a]	0.0469	0.0224	0.0375	0.0944[a]	0.0266	0.0450	0.0302
Year 1997	-0.9546[a]	0.2186	0.2307	0.1857	-0.4405[b]	0.1979	-2.6029[a]	0.1991	-0.6945[a]	0.2007
Year 1997 x										
Age	0.0284[b]	0.0111	-0.0688[a]	0.0087	-0.0059	0.0083	0.0800[a]	0.0102	-0.0012	0.0084
Age squared	-0.0003[c]	0.0002	0.0009[a]	0.0001	0.0002	0.0001	-0.0011[a]	0.0002	0.0000	0.0001
Log weekly hours	0.0969[a]	0.0355	0.3775[a]	0.0368	0.1061[a]	0.0355	0.2575[a]	0.0235	0.1909[a]	0.0394

(Continued)

Table 3.8 (Continued)

	Education, Fine Arts & Humanities		Social Sciences		Commerce & Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Year 1997 x										
Permanent job	-0.1052[a]	0.0240	-0.1738[a]	0.0262	-0.0254	0.0217	0.0415[c]	0.0228	-0.1272[a]	0.0195
Female	-0.0853[a]	0.0196	0.0960[a]	0.0178	0.0410[a]	0.0151	-0.0567[a]	0.0194	-0.0713[a]	0.0179
Visible minority	0.0075	0.0273	-0.1158[a]	0.0318	-0.0916[a]	0.0206	0.0964[a]	0.0314	-0.0711[a]	0.0229
English only	0.1606[a]	0.0478	-0.1824[a]	0.0605	-0.0911[a]	0.0305	0.0142	0.0285	0.0260	0.0285
Bilingual	0.0909[b]	0.0403	0.0337	0.0446	0.0208	0.0244	0.0565[a]	0.0189	-0.0317	0.0201
Same level	-0.0004	0.0234	0.0016	0.0326	-0.0314[c]	0.0190	0.3059[a]	0.0348	-0.0618[a]	0.0208
Higher level	-0.0398[c]	0.0227	0.1069[a]	0.0354	-0.0476[a]	0.0172	0.2228[a]	0.0358	-0.0747[a]	0.0248
Quebec	0.1183[c]	0.0661	-0.4863[a]	0.0802	0.0822	0.0517	0.0062	0.0444	0.2379[a]	0.0400
Ontario	0.0507	0.0521	-0.2616[a]	0.0620	0.1903[a]	0.0441	-0.0444	0.0381	0.2206[a]	0.0351
Manitoba, Saskat.	0.0703	0.0751	-0.3758[a]	0.0796	0.1672[a]	0.0496	-0.0493	0.0416	0.2243[a]	0.0471
Alberta	0.1879[a]	0.0477	-0.2630[a]	0.0562	0.1691[a]	0.0396	-0.0813[b]	0.0348	0.1092[a]	0.0330
B.C.	0.1551[a]	0.0469	-0.1749[a]	0.0609	0.1858[a]	0.0442	0.0974[a]	0.0365	0.2327[a]	0.0353
Correction term 1	0.0205	0.0413	-0.2577	0.1747	-0.6294[a]	0.1059	-0.6493[a]	0.0946	-0.6100[a]	0.1069
Correction term 2	0.4977[a]	0.1209	0.1551[a]	0.0375	0.8995[a]	0.1019	0.4195[a]	0.1307	0.5140[a]	0.1165
Correction term 3	0.2491[b]	0.1084	-0.4014[a]	0.1409	-0.0687[b]	0.0303	-0.0550	0.0839	-0.9234[a]	0.0635
Correction term 4	-0.0808	0.1144	-0.6413[a]	0.1483	-0.4020[a]	0.0730	-0.2841[a]	0.0342	-0.7274[a]	0.0670
Correction term 5	0.2714	0.1920	-0.6339[b]	0.2481	0.7909[a]	0.1516	0.3563[a]	0.1305	-0.3982[a]	0.0519
Implied residual standard error	0.4290		0.3695		0.3650		0.3525		0.3803	
Adj. R-squared	0.3843		0.5086		0.4647		0.5617		0.3537	
# observations	1,630		974		2,576		1,895		4,761	

Notes: - Notes: Standard errors are bootstrapped based on 100 replications. (a), (b) and (c): significant at the level 1, 5 and 10 percent.

Table 3.8-bis: Selection-Corrected Log Annual Earnings Equations Estimates (Procedure suggested by Lee, 1983)

	Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Constant	6.0883[a]	0.3879	5.6290[a]	0.5152	5.9111[a]	0.2844	8.1194[a]	0.3249	6.4131[c]	0.3152
Age	0.0645[a]	0.0207	0.0682[a]	0.0237	0.0667[a]	0.0129	-0.0047	0.0166	0.0791[a]	0.0128
Age squared	-0.0009[a]	0.0003	-0.0008[b]	0.0003	-0.0009[a]	0.0002	0.0001	0.0002	-0.0011[a]	0.0002
Log weekly hours	0.7533[a]	0.0538	0.6588[a]	0.0822	0.7625[a]	0.0470	0.7534[a]	0.0521	0.5853[a]	0.0502
Permanent job	0.1371[a]	0.0465	0.1722[a]	0.0562	0.0975[a]	0.0296	-0.0663[c]	0.0351	0.1837[a]	0.0226
Female	-0.0356	0.0526	-0.1852[a]	0.0454	-0.1463[a]	0.0294	-0.1843[a]	0.0414	0.0252	0.0731
Minority group	-0.0237	0.0678	0.0554	0.0694	-0.0244	0.0408	0.0047	0.0452	-0.0270	0.0328
Spoken Languages										
English only	-0.1974[b]	0.0987	0.1736	0.1206	0.1317[b]	0.0596	0.1257[b]	0.0599	-0.0310	0.0455
Bilingual	-0.1001	0.0807	-0.0154	0.0960	0.1151[a]	0.0445	0.1337[a]	0.0435	0.0158	0.0324
Education level required for the job as compared to College level:										
Same level	0.1659[a]	0.0528	0.1688[a]	0.0652	0.1434[a]	0.0342	-0.0988	0.0733	0.2851[a]	0.0267
Higher level	0.0894[c]	0.0529	0.0436	0.0678	0.0011	0.0308	-0.0718	0.0661	0.1804[a]	0.0286
Province of Residence										
Quebec	0.0370	0.1052	0.4761[a]	0.1220	0.1017	0.0951	0.1437[b]	0.0649	0.0144	0.0488
Ontario	0.1589[c]	0.0891	0.2890[a]	0.0804	0.1384[c]	0.0835	0.2969[a]	0.0525	0.1329[a]	0.0408
Manitoba, Saskat.	-0.0230	0.1281	0.0936	0.1509	-0.0300	0.0959	0.0583	0.0600	-0.0226	0.0521
Alberta	-0.1216	0.0984	0.1557	0.0969	0.0652	0.0885	0.1674[a]	0.0583	0.1440[a]	0.0432
B.C.	0.1191	0.0982	0.1623	0.1055	0.1730[c]	0.0902	0.2020[a]	0.0573	0.2054[a]	0.0483
Year 1997	-0.8137[c]	0.4831	0.1829	0.5794	-0.4022	0.3380	-2.2058[a]	0.3669	-0.5000[c]	0.2914
Year 1997 x										
Age	0.0156	0.0254	-0.0697[a]	0.0270	-0.0108	0.0163	0.0537[a]	0.0186	-0.0114	0.0148
Age squared	-0.0001	0.0004	0.0010[b]	0.0004	0.0002	0.0002	-0.0007[a]	0.0003	0.0002	0.0002
Log weekly hours	0.1212[c]	0.0669	0.3945[a]	0.0925	0.1586[a]	0.0540	0.2867[a]	0.0527	0.2080[a]	0.0474

(Continued)

Table 3.8-bis (Continued)

	Education, Fine Arts & Humanities		Social Sciences		Commerce & Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Year 1997 x										
Permanent job	-0.1264[b]	0.0535	-0.1714[b]	0.0672	-0.0608	0.0394	0.0320	0.0454	-0.1122[a]	0.0302
Female	-0.0991[c]	0.0523	0.1016[c]	0.0577	-0.0137	0.0332	-0.0838[c]	0.0435	-0.0913[a]	0.0283
Minority group	0.0214	0.0871	-0.1119	0.0928	-0.0217	0.0539	0.1323[b]	0.0634	-0.0020	0.0427
English only	0.1662	0.1083	-0.1702	0.1354	-0.1098	0.0670	-0.0001	0.0699	-0.0089	0.0513
Bilingual	0.0908	0.0941	0.0465	0.1129	-0.0082	0.0559	0.0422	0.0581	-0.0491	0.0403
Same level	-0.0241	0.0579	-0.0254	0.0745	-0.0413	0.0396	0.3369[a]	0.0684	-0.0625[b]	0.0313
Higher level	-0.0262	0.0616	0.0883	0.0778	0.0278	0.0391	0.2726[a]	0.0727	-0.0536	0.0341
Quebec	0.1049	0.1323	-0.4954[a]	0.1727	-0.0570	0.1096	-0.1099	0.0867	0.0561	0.0619
Ontario	0.0326	0.1087	-0.2752[b]	0.1326	0.0419	0.0970	-0.1785[b]	0.0708	0.0654	0.0504
Manitoba, Saskat.	0.0479	0.1644	-0.3564[c]	0.1915	0.0331	0.1143	-0.1515[c]	0.0861	0.0811	0.0666
Alberta	0.1873	0.1241	-0.2662[c]	0.1432	0.0677	0.1025	-0.1377[c]	0.0822	-0.0024	0.0558
B.C.	0.1647	0.1246	-0.1715	0.1496	0.0947	0.1031	0.0070	0.0804	0.1123[c]	0.0613
Correction term	-0.0151	0.0903	0.2118[c]	0.1084	0.0004	0.0500	-0.3001[a]	0.0559	-0.0932	0.0746
Residual standard error	0.4345		0.4229		0.3708		0.4345		0.3916	
Adj. R-squared	0.3710		0.4919		0.4488		0.5523		0.3410	
# observations	1,630		974		2,576		1,895		4,761	

Notes: The correct asymptotic variance matrices are constructed as in Lee, Maddala and Trost (1980) with slight modifications. (a), (b) and (c): significant at the level 1, 5 and 10 percent.

Table 3.9: Uncorrected Log Annual Earnings Equations Estimates

	Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Constant	6.0809[a]	0.1277	5.8334[a]	0.1565	5.9118[a]	0.0919	7.5525[a]	0.1067	6.1608[a]	0.1080
Age	0.0638[a]	0.0067	0.0750[a]	0.0073	0.0667[a]	0.0043	0.0247[a]	0.0055	0.0817[a]	0.0057
Age squared	-0.0009[a]	0.0001	-0.0009[a]	0.0001	-0.0009[a]	0.0001	-0.0003[a]	0.0001	-0.0011[a]	0.0001
Log weekly hours	0.7515[a]	0.0175	0.6742[a]	0.0254	0.7624[a]	0.0155	0.6113[a]	0.0152	0.6249[a]	0.0174
Female	-0.0301[b]	0.0135	-0.1988[a]	0.0140	-0.1464[a]	0.0085	-0.0331[a]	0.0110	-0.0621[a]	0.0096
Permanent Job	0.1338[a]	0.0140	0.1615[a]	0.0174	0.0975[a]	0.0101	-0.0161	0.0119	0.1801[a]	0.0100
Visible minority	-0.0251	0.0223	0.0225	0.0209	-0.0244[c]	0.0140	-0.0124	0.0159	-0.0243[c]	0.0146
Spoken languages										
English only	-0.1954[a]	0.0325	0.1781[a]	0.0376	0.1317[a]	0.0205	0.0757[a]	0.0207	-0.0323	0.0203
Bilingual	-0.0982[a]	0.0265	-0.0265	0.0299	0.1151[a]	0.0153	0.1057[a]	0.0151	0.0102	0.0143
Education level required for the job										
Same level	0.1616[a]	0.0153	0.1797[a]	0.0202	0.1435[a]	0.0104	0.1389[a]	0.0216	0.2935[a]	0.0115
Higher level	0.0862[a]	0.0163	0.0347[c]	0.0210	0.0011	0.0106	0.0288	0.0234	0.1890[a]	0.0124
Province of residence										
Quebec	0.0372	0.0349	0.5558[a]	0.0357	0.1015[a]	0.0313	0.0200	0.0210	0.0257	0.0214
Ontario	0.1640[a]	0.0277	0.3078[a]	0.0248	0.1382[a]	0.0275	0.1542[a]	0.0155	0.1164[a]	0.0172
Manitoba, Saskat.	-0.0255	0.0422	0.1918[a]	0.0444	-0.0302	0.0318	0.0383[c]	0.0204	-0.0259	0.0232
Alberta	-0.1212[a]	0.0326	0.1888[a]	0.0296	0.0650[b]	0.0287	0.0539[a]	0.0188	0.1393[a]	0.0192
B.C.	0.1217[a]	0.0322	0.2138[a]	0.0318	0.1728[a]	0.0290	0.1103[a]	0.0188	0.1871[a]	0.0205
Year 1997	-0.8169[a]	0.1600	0.2439	0.1794	-0.4026[a]	0.1148	-2.2559[a]	0.1280	-0.5419[a]	0.1292

(Continued)

Table 3.9 (Continued)

	Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Year 1997 x										
Age	0.0155[c]	0.0084	-0.0695[a]	0.0084	-0.0108[c]	0.0056	0.0546[a]	0.0065	-0.0107	0.0066
Age squared	-0.0001	0.0001	0.0010[a]	0.0001	0.0002[a]	0.0001	-0.0008[a]	0.0001	0.0002[b]	0.0001
Log weekly hours	0.1234[a]	0.0217	0.4016[a]	0.0287	0.1587[a]	0.0184	0.2894[a]	0.0180	0.2142[a]	0.0210
Female	-0.0988[a]	0.0173	0.0759[a]	0.0174	-0.0137	0.0112	-0.0695[a]	0.0157	-0.0838[a]	0.0124
Permanent job	-0.1264[a]	0.0177	-0.1585[a]	0.0208	-0.0608[a]	0.0135	-0.0155	0.0157	-0.1020[a]	0.0130
Visible minority	0.0221	0.0289	-0.0716[b]	0.0281	-0.0217	0.0185	0.1377[a]	0.0224	-0.0023	0.0190
English	0.1648[a]	0.0358	-0.2016[a]	0.0418	-0.1097[a]	0.0230	0.0376	0.0244	-0.0137	0.0228
Bilingual	0.0891[a]	0.0310	0.0400	0.0352	-0.0081	0.0191	0.0528[a]	0.0204	-0.0438[b]	0.0179
Same level	-0.0235	0.0192	-0.0280	0.0231	-0.0413[a]	0.0134	0.2393[a]	0.0242	-0.0621[a]	0.0140
Higher	-0.0241	0.0200	0.0916[a]	0.0241	0.0278[b]	0.0135	0.2329[a]	0.0265	-0.0605[a]	0.0150
Quebec	0.1016[b]	0.0433	-0.6455[a]	0.0481	-0.0568	0.0367	0.0003	0.0294	0.0412	0.0271
Ontario	0.0289	0.0353	-0.3862[a]	0.0373	0.0421	0.0325	-0.0918[a]	0.0240	0.0625[a]	0.0224
Manitoba, Saskat.	0.0453	0.0543	-0.4751[a]	0.0566	0.0333	0.0385	-0.0636[b]	0.0290	0.0760[a]	0.0296
Alberta	0.1866[a]	0.0411	-0.3127[a]	0.0440	0.0678[b]	0.0344	-0.0956[a]	0.0288	0.0006	0.0248
B.C.	0.1619[a]	0.0409	-0.2439[a]	0.0451	0.0948[a]	0.0346	0.0908[a]	0.0274	0.1047[a]	0.0272
Adj. R-squared	0.3821		0.5051		0.4549		0.5523		0.3444	
Root MSE	0.4304		0.3715		0.3687		0.3567		0.3833	
# observations	1,630		974		2,576		1,895		4,761	

Notes: - (a), (b) and (c): significant at the level 1, 5 and 10 percent (Two-tail test).
- The hypothesis that the earnings equation did not change between 1992 and 1997 is rejected at 1percent.

Table 3.10: Estimated Conditional Logit (Relative to "Education, Fine Arts and Humanities")

	Social Sciences		Commerce. Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Constant	-1.4209[a]	0.0913	-0.1514[c]	0.0782	-1.7113[a]	0.0820	0.7497[a]	0.0779
Age	0.0340[a]	0.0019	0.0061[a]	0.0017	0.0427[a]	0.0018	0.0320[a]	0.0018
Female	-0.3797[a]	0.0330	-0.2729[a]	0.0236	0.4461[a]	0.0357	-2.2507[a]	0.0262
Visible Minority	0.1560[a]	0.0467	0.2441[a]	0.0385	0.0243	0.0430	0.2081[a]	0.0406
Spoken Languages:								
English Only	0.0150	0.0482	-0.1720[a]	0.0385	-0.2879[a]	0.0424	-0.2168[a]	0.0395
Bilingual	0.1172[a]	0.0457	-0.1715[a]	0.0369	-0.3551[a]	0.0401	-0.1528[a]	0.0376
Father's Education								
Elementary	0.0216	0.0606	0.2055[a]	0.0504	0.5726[a]	0.0542	0.5369[a]	0.0529
Secondary	-0.0475	0.0420	-0.1031[a]	0.0350	0.1904[a]	0.0388	0.2902[a]	0.0366
College	-0.0392	0.0479	0.0682[c]	0.0397	0.1734[a]	0.0444	0.3488[a]	0.0416
Mother's Education								
Elementary	0.2433[a]	0.0656	0.5452[a]	0.0543	-0.1150[c]	0.0589	-0.1549[a]	0.0569
Secondary	0.2756[a]	0.0448	0.5900[a]	0.0370	0.1574[a]	0.0407	0.0059	0.0380
College	0.3546[a]	0.0470	0.1918[a]	0.0397	0.0925[b]	0.0433	-0.1148[a]	0.0409
Province of Residence 12 months before enrolment								
Quebec	0.1446[b]	0.0676	0.7158[a]	0.0596	0.1292[b]	0.0569	0.2094[a]	0.0561
Ontario	0.0528	0.0559	0.2057[a]	0.0513	-0.6272[a]	0.0467	-0.5950[a]	0.0466
Manitoba, Saskat.	0.2629[a]	0.0831	1.0678[a]	0.0696	0.8150[a]	0.0653	0.4218[a]	0.0670
Alberta	-0.3597[a]	0.0676	0.6281[a]	0.0575	-0.5096[a]	0.0561	-0.1776[a]	0.0546
B.C.	-0.0798	0.0682	0.7360[a]	0.0582	-0.1209[b]	0.0552	-0.5905[a]	0.0572
Level of Education before Enrolment								
College	-0.0668[c]	0.0350	-0.2229[a]	0.0298	0.4270[a]	0.0297	0.2187[a]	0.0300
University	-0.4767[a]	0.0399	-0.3244[a]	0.0315	0.2707[a]	0.0317	-0.2125[a]	0.0326

(Continued)

Table 3.10 (Continued)

	Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Was Working before Enrolment	-0.2156[a]	0.0309	-0.2245[a]	0.0229	-0.1229[a]	0.0332	-0.1356[a]	0.0255
Used Student Loans s	0.2790[a]	0.0253	-0.1793[a]	0.0211	0.2954[a]	0.0227	0.0646[a]	0.0221
Labour Market Variables (*):								
Log Annual Earnings	0.9525[a]	0.0799						
Unemployment Duration (in months)	-0.1174[a]	0.0133						
Log Annual Earnings x Working before Enrolment	0.2792[a]	0.0770						
Female	-0.2431[a]	0.0827						
Unemployment Duration x Working before Enrolment	0.0765[a]	0.0128						
Female	0.0851[a]	0.0137						
Mean Log Likelihood	-1.4100							
Pseudo R2	0.10							
Number of observations	13,127							

Notes: "Education, Fine Arts and Humanities" is the reference field of study. (a), (b) and (c): significant at the level 1, 5 and 10 percent.
(*) The coefficients of the labour market variables are the same for all fields of study.

Table 3.11: Estimated Coefficients on Log Annual Earnings and Expected Unemployment Durations in the Conditional Logit

	When including uncorrected log annual earnings estimates (1)		When including selection-corrected log annual earnings estimates			
			Using B-F-G's Procedure (*) (2)		Using Lee's Procedure (**) (3)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
log Annual Earnings	0.6596[a]	0.0874	0.9525[a]	0.0799	0.8894[a]	0.0842
log Annual Earnings x						
Working prior to college	0.5337[a]	0.0813	0.2792[a]	0.0770	0.3213[a]	0.0799
Female	-0.2343[a]	0.0893	-0.2431[a]	0.0827	-0.2188[a]	0.0869
Unemployment Duration	-0.1292[a]	0.0133	-0.1174[a]	0.0133	-0.1209[a]	0.0133
Unemployment Duration x						
Working prior to college	0.0902[a]	0.0129	0.0765[a]	0.0128	0.0819[a]	0.0129
Female	0.0842[a]	0.0137	0.0851[a]	0.0137	0.0884[a]	0.0137

Notes: (*) Bourguignon, Fournier and Gurgand (2001)
        (**) Lee (1983)
        (a), (b) and (c): significant at the level 1, 5 and 10 percent

Table 3.12: Marginal Effects of Selected Variables on the Probability of Choosing Each Field of Study

	Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Age	-0.0037[a]	0.0002	0.0014[a]	0.0001	-0.0037[a]	0.0002	0.0037[a]	0.0002	0.0023[a]	0.0002
Female	0.1067[a]	0.0029	0.0313[a]	0.0024	0.0956[a]	0.0031	0.1669[a]	0.0029	-0.4004[a]	0.0029
Visible minority group	-0.0226[a]	0.0043	0.0019	0.0038	0.0264[a]	0.0054	-0.0180[a]	0.0043	0.0124[b]	0.0048
Spoken languages:										
English Only	0.0253[a]	0.0045	0.0183[a]	0.0038	-0.0051	0.0051	-0.0242[a]	0.0046	-0.0144[a]	0.0048
Bilingual	0.0229[a]	0.0047	0.0298[a]	0.0042	-0.0103[b]	0.0047	-0.0362[a]	0.0037	-0.0063	0.0043
Father's education										
Elementary	-0.0473[a]	0.0051	-0.0295[a]	0.0042	-0.0245[a]	0.0064	0.0505[a]	0.0063	0.0508[a]	0.0065
Secondary	-0.0114[a]	0.0041	-0.0137[a]	0.0034	-0.0429[a]	0.0047	0.0216[a]	0.0043	0.0464[a]	0.0045
College	-0.0209[a]	0.0044	-0.0185[a]	0.0036	-0.0160[a]	0.0053	0.0088[c]	0.0050	0.0465[a]	0.0053
Mother's education										
Elementary	-0.0246[a]	0.0060	0.0125[b]	0.0057	0.1142[a]	0.0085	-0.0411[a]	0.0055	-0.0609[a]	0.0062
Secondary	-0.0391[a]	0.0042	0.0065[c]	0.0037	0.0913[a]	0.0051	-0.0120[a]	0.0044	-0.0466[a]	0.0045
College	-0.0162[a]	0.0044	0.0328[a]	0.0046	0.0263[a]	0.0059	-0.0011	0.0048	-0.0418[a]	0.0048
Province of Residence										
Quebec	-0.0480[a]	0.0058	-0.0163[a]	0.0052	0.1131[a]	0.0094	-0.0272[a]	0.0056	-0.0216[a]	0.0066
Ontario	0.0323[a]	0.0055	0.0287[a]	0.0046	0.1002[a]	0.0075	-0.0747[a]	0.0047	-0.0864[a]	0.0055
Manitoba, Saskat.	-0.0851[a]	0.0052	-0.0350[a]	0.0051	0.1299[a]	0.0109	0.0327[a]	0.0070	-0.0425[a]	0.0070
Alberta	-0.0092	0.0063	-0.0388[a]	0.0043	0.1755[a]	0.0099	-0.0786[a]	0.0044	-0.0488[a]	0.0062
B.C.	-0.0195[a]	0.0062	-0.0183[a]	0.0051	0.1999[a]	0.0102	-0.0374[a]	0.0052	-0.1247[a]	0.0054
Level of education before enrolment										
College	-0.0135[a]	0.0033	-0.0164[a]	0.0026	-0.0685[a]	0.0035	0.0654[a]	0.0035	0.0329[a]	0.0036
University	0.0216[a]	0.0039	-0.0356[a]	0.0027	-0.0463[a]	0.0040	0.0737[a]	0.0040	-0.0134[a]	0.0039
Was working prior to college	0.0246[a]	0.0032	-0.0087[a]	0.0024	-0.0207[a]	0.0032	0.0028	0.0034	0.0020	0.0029
Used student loans	-0.0107[a]	0.0025	0.0251[a]	0.0021	-0.0576[a]	0.0028	0.0402[a]	0.0025	0.0030	0.0026

(Continued)

Table 3.12 (Continued)

		Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
		Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Log annual earnings in:	Education, Fine Arts and Humanities	0.1331[a]	0.0112	-0.0210[a]	0.0018	-0.0445[a]	0.0037	-0.0328[a]	0.0028	-0.0348[a]	0.0029
	Social Sciences	-0.0210[a]	0.0018	0.0946[a]	0.0080	-0.0274[a]	0.0023	-0.0203[a]	0.0017	-0.0260[a]	0.0022
	Business, Commerce	-0.0445[a]	0.0037	-0.0274[a]	0.0023	0.1722[a]	0.0144	-0.0436[a]	0.0037	-0.0567[a]	0.0048
	Health	-0.0328[a]	0.0028	-0.0203[a]	0.0017	-0.0436[a]	0.0037	0.1282[a]	0.0108	-0.0314[a]	0.0026
	Sciences	-0.0348[a]	0.0029	-0.0260[a]	0.0022	-0.0567[a]	0.0048	-0.0314[a]	0.0026	0.1489[a]	0.0125
Unemployment Duration in:	Education, Fine Arts and Humanities	-0.0164[a]	0.0019	0.0026[a]	0.0003	0.0055[a]	0.0006	0.0040[a]	0.0005	0.0043[a]	0.0005
	Social Sciences	0.0026[a]	0.0003	-0.0117[a]	0.0013	0.0034[a]	0.0004	0.0025[a]	0.0003	0.0032[a]	0.0004
	Business, Commerce	0.0055[a]	0.0006	0.0034[a]	0.0004	-0.0212[a]	0.0024	0.0054[a]	0.0006	0.0070[a]	0.0008
	Health	0.0040[a]	0.0005	0.0025[a]	0.0003	0.0054[a]	0.0006	-0.0158[a]	0.0018	0.0039[a]	0.0004
	Sciences	0.0043[a]	0.0005	0.0032[a]	0.0004	0.0070[a]	0.0008	0.0039[a]	0.0004	-0.0184[a]	0.0021
Working prior to college x Log Annual Earnings in:	Education, Fine Arts and Humanities	0.0390[a]	0.0108	-0.0061[a]	0.0017	-0.0130[a]	0.0036	-0.0096[a]	0.0027	-0.0102[a]	0.0028
	Social Sciences	-0.0061[a]	0.0017	0.0277[a]	0.0077	-0.0080[a]	0.0022	-0.0060[a]	0.0016	-0.0076[a]	0.0021
	Business, Commerce	-0.0130[a]	0.0036	-0.0080[a]	0.0022	0.0505[a]	0.0139	-0.0128[a]	0.0035	-0.0166[a]	0.0046
	Health	-0.0096[a]	0.0027	-0.0060[a]	0.0016	-0.0128[a]	0.0035	0.0376[a]	0.0104	-0.0092[a]	0.0025
	Sciences	-0.0102[a]	0.0028	-0.0076[a]	0.0021	-0.0166[a]	0.0046	-0.0092[a]	0.0025	0.0436[a]	0.0120
Female x Log Annual Earnings in:	Education, Fine Arts and Humanities	-0.0340[a]	0.0116	0.0053[a]	0.0018	0.0114[a]	0.0039	0.0084[a]	0.0029	0.0089[a]	0.0030
	Social Sciences	0.0053[a]	0.0018	-0.0242[a]	0.0082	0.0070[a]	0.0024	0.0052[a]	0.0018	0.0066[a]	0.0023
	Business, Commerce	0.0114[a]	0.0039	0.0070[a]	0.0024	-0.0440[a]	0.0150	0.0111[a]	0.0038	0.0145[a]	0.0049
	Health	0.0084[a]	0.0029	0.0052[a]	0.0018	0.0111[a]	0.0038	-0.0327[a]	0.0111	0.0080[a]	0.0027
	Sciences	0.0089[a]	0.0030	0.0066[a]	0.0023	0.0145[a]	0.0049	0.0080[a]	0.0027	-0.0380[a]	0.0129

(Continued)

Table 3.12 (Continued)

		Education, Fine Arts, Humanities		Social Sciences		Commerce, Business		Health		Sciences	
		Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Working prior to college x Unemployment Duration in:	Education, Fine Arts and Humanities	0.0107[a]	0.0018	-0.0017[a]	0.0003	-0.0036[a]	0.0006	-0.0026[a]	0.0004	-0.0028[a]	0.0005
	Social Sciences	-0.0017[a]	0.0003	0.0076[a]	0.0013	-0.0022[a]	0.0004	-0.0016[a]	0.0003	-0.0021[a]	0.0004
	Business, Commerce	-0.0036[a]	0.0006	-0.0022[a]	0.0004	0.0138[a]	0.0023	-0.0035[a]	0.0006	-0.0045[a]	0.0008
	Health	-0.0026[a]	0.0004	-0.0016[a]	0.0003	-0.0035[a]	0.0006	0.0103[a]	0.0017	-0.0025[a]	0.0004
	Sciences	-0.0028[a]	0.0005	-0.0021[a]	0.0004	-0.0045[a]	0.0008	-0.0025[a]	0.0004	0.0120[a]	0.0020
Female x Unemployment Duration in:	Education, Fine Arts and Humanities	0.0119[a]	0.0019	-0.0019[a]	0.0003	-0.0040[a]	0.0006	-0.0029[a]	0.0005	-0.0031[a]	0.0005
	Social Sciences	-0.0019[a]	0.0003	0.0085[a]	0.0014	-0.0024[a]	0.0004	-0.0018[a]	0.0003	-0.0023[a]	0.0004
	Business, Commerce	-0.0040[a]	0.0006	-0.0024[a]	0.0004	0.0154[a]	0.0025	-0.0039[a]	0.0006	-0.0051[a]	0.0008
	Health	-0.0029[a]	0.0005	-0.0018[a]	0.0003	-0.0039[a]	0.0006	0.0115[a]	0.0018	-0.0028[a]	0.0005
	Sciences	-0.0031[a]	0.0005	-0.0023[a]	0.0004	-0.0051[a]	0.0008	-0.0028[a]	0.0005	0.0133[a]	0.0021

Notes: Marginal effects are estimated for each graduate, then weighted sample means are reported. Marginal effects related to dummy variables are evaluated at the difference in the probability between 0 and 1. Standard errors are calculated using Delta method. Selection-corrected log annual earnings are estimated using Bourguignon, Fournier and Gurgand (2001) procedure.

(a), (b) and (c): significant at the level 1, 5 and 10 percent.

Table 3.13: Elasticity of the Probability of Choosing a Field of Study Relative to Annual Earnings and Unemployment Duration

		Men				Women			
		Elasticity (1)	Std. Err.	Elasticity (2)	Std. Err.	Elasticity (1)	Std. Err.	Elasticity (2)	Std. Err.
Not working prior to starting college	Annual Earnings in:								
	Education, Fine Arts, Humanities	0.7832	0.0657	-0.1693	0.0142	0.5833	0.0530	-0.1261	0.0115
	Social Sciences	0.8438	0.0708	-0.1087	0.0092	0.6284	0.0571	-0.0809	0.0074
	Business, Commerce	0.7135	0.0598	-0.2390	0.0201	0.5314	0.0483	-0.1780	0.0162
	Health	0.7792	0.0654	-0.1733	0.0146	0.5803	0.0527	-0.1291	0.0118
	Sciences	0.6903	0.0579	-0.2622	0.0220	0.5141	0.0467	-0.1953	0.0178
	Unemployment Duration in:								
	Education, Fine Arts, Humanities	-0.4186	0.0473	0.0899	0.0102	-0.2547	0.0333	0.0428	0.0070
	Social Sciences	-0.5390	0.0609	0.0689	0.0077	-0.3228	0.0428	0.0368	0.0053
	Business, Commerce	-0.3819	0.0431	0.1283	0.0145	-0.2238	0.0301	0.0656	0.0099
	Health	-0.4434	0.0501	0.0946	0.0107	-0.2791	0.0357	0.0385	0.0074
	Sciences	-0.3533	0.0399	0.1402	0.0158	-0.1731	0.0273	0.1186	0.0135
Working prior to starting College	Annual Earnings in:								
	Education, Fine Arts, Humanities	1.0129	0.0662	-0.2189	0.0144	0.8129	0.0575	-0.1757	0.0125
	Social Sciences	1.0912	0.0713	-0.1405	0.0093	0.8758	0.0619	-0.1128	0.0080
	Business, Commerce	0.9227	0.0603	-0.3091	0.0203	0.7405	0.0524	-0.2481	0.0176
	Health	1.0076	0.0659	-0.2242	0.0147	0.8087	0.0572	-0.1799	0.0128
	Sciences	0.8927	0.0584	-0.3391	0.0222	0.7165	0.0507	-0.2721	0.0193
	Unemployment Duration in:								
	Education, Fine Arts, Humanities	-0.2995	0.0422	0.0637	0.0091	-0.1356	0.0278	0.0166	0.0059
	Social Sciences	-0.3868	0.0544	0.0496	0.0069	-0.1706	0.0357	0.0174	0.0045
	Business, Commerce	-0.2721	0.0385	0.0955	0.0130	-0.1140	0.0251	0.0328	0.0083
	Health	-0.3213	0.0448	0.0652	0.0095	-0.1570	0.0298	0.0091	0.0064
	Sciences	-0.2517	0.0356	0.0989	0.0141	-0.0715	0.0230	0.0773	0.0117

Notes: (1) Percent change in the probability of choosing the same field of study. (2) Percent change in the probability of choosing each of the remaining fields. All estimated elasticities are significant at the level 1 percent. Elasticities are estimated for each individual in the sample, then weighted sample means are reported. Standard errors are calculated using Delta method.

Conclusion Générale

Les modèles de choix de secteur d'emploi développés à la fin des années 1960 et début des années 1970 (Todaro, 1969; Harris et Todaro, 1970; Stiglitz, 1974 et 1976; Eaton et Neher, 1975; et Fields, 1975 à titre d'exemples) ont mis l'accent sur l'effet des écarts de salaire entre secteurs sur le comportement des travailleurs en matière de recherche d'emploi ainsi que le chômage qui en découle. Le taux de chômage d'équilibre est celui qui égalise le salaire espéré dans le secteur à salaire élevé au salaire dans le secteur opposé. Les travailleurs qui se trouvent en chômage le sont volontairement puisqu'ils refusent l'emploi dans le secteur à bas salaire: *"The unemployed have only themselves to blame"* (Eaton et Neher, 1975). La théorie du salaire efficient développée par Shapiro et Stiglitz (1984) blâme plutôt certaines entreprises qui, en cherchant à inciter leurs travailleurs à l'effort, payent des salaires supérieurs à ceux du marché. Cette politique a pour effet de réduire la demande de travail et d'augmenter l'offre, ce qui entraîne un chômage involontaire. Toutefois, certains travailleurs cherchent l'emploi uniquement dans les entreprises qui paient le salaire efficient et déclinent les emplois rémunérés au taux du marché.

Le modèle que nous avons développé dans le premier chapitre s'inscrit dans le même cadre. Les espérances des travailleurs concernant les salaires et les durées de chômage déterminent leur comportement quant au choix de secteur d'emploi. Cependant, à la différence des premiers modèles qui supposent toujours l'existence d'un secteur accessible à tous les travailleurs, nous supposons que les travailleurs sont exposés au risque de chômage dans les deux secteurs d'emploi. L'emploi le mieux rémunéré est associé au plus grand risque de chômage. Un travailleur préfère l'emploi dans le secteur qui maximise son revenu à vie escompté. Le poids du facteur chômage dans cette préférence est représenté par le taux d'escompte personnel. Quand l'écart salarial entre les deux secteurs est substantiel, les travailleurs préfèrent endurer le chômage plutôt que d'accepter un emploi à bas salaire.

L'application empirique dans le cas particulier de choix entre le public et le privé comme secteurs d'emploi au Maroc est dictée par le fait que dans ce pays, le taux de chômage des diplômés est très excessif et qu'en même temps, ces diplômés convoitent fortement l'emploi dans le secteur public. Cette situation semble se produire dans plusieurs autres

pays en voie de développement, notamment en Afrique. Nous avons alors suspecté le comportement des travailleurs comme étant une des causes de leur chômage. Les résultats empiriques montrent que le salaire horaire payé par le secteur public au Maroc est presque le double de celui payé par le secteur privé. Toutefois, les travailleurs semblent moins attirés par cet avantage. Ils privilégient plutôt les facteurs non pécuniaires tels la stabilité de l'emploi et le prestige d'être fonctionnaire dans la société marocaine. En effet, même si l'écart salarial entre les deux secteurs est éliminé, les travailleurs continueront vraisemblablement de préférer l'emploi dans le secteur public malgré le grand risque de chômage qui est associé.

Dans le deuxième chapitre, nous avons présenté une analyse détaillée du chômage des diplômés au Maroc. Dans ce pays, l'éducation est paradoxalement devenue synonyme de chômage. L'aggravation du chômage des diplômés au Maroc s'est produite en parallèle avec la réduction draconienne de l'emploi dans le secteur public depuis 1983 dans le cadre du programme d'ajustement structurel. Les diplômés pensent avoir été sacrifiés par le gouvernement pour des raisons budgétaires et militent pour récupérer ce qu'ils considèrent le droit à l'emploi dans le secteur public. Il arrive souvent qu'ils déclinent des offres d'emploi dans le secteur privé. En effet, la forte segmentation du marché de l'emploi au Maroc ainsi que la politique d'emploi poursuivie par le gouvernement ont pour résultat d'encourager les diplômés à demeurer en chômage en attente d'un emploi dans le secteur public plutôt que d'accepter l'emploi dans le secteur privé éclipsé par les activité informelles.

L'amélioration des chances et des conditions d'emploi dans le secteur privé à travers un niveau de croissance économique soutenue favorable à l'émergence d'entreprises dissociées du secteur informel, paraît être une solution logique et durable au problème de chômage des diplômés au Maroc. La croissance économique sera davantage favorisée si les travailleurs qualifiés s'insèrent dans le secteur privé plutôt que de s'insérer dans des emplois non productifs dans la fonction publique. Enfin, un plus grand investissement de la part du gouvernement dans l'éducation primaire permettra d'améliorer la qualité de la force de travail, stimuler la croissance économique et réduire la part du secteur informel dans l'économie. Les diplômés seront alors davantage incités à chercher de l'emploi dans le secteur privé où ils trouveront des d'emplois décents.

Dans le dernier chapitre, nous avons adapté le modèle développé dans le premier chapitre pour le cas de choix de filière d'études. Ensuite, nous avons utilisé des données canadiennes pour analyser les déterminants du choix de filière d'études par les diplômés du collège. Le modèle économétrique a été estimé sur la base des données d'un échantillon de 15124 travailleurs ayant obtenu un diplôme d'un collège communautaire canadien (CEGEP au Québec) en 1990 et 1995. L'échantillon est tiré de l'enquête nationale canadienne auprès des diplômés. Cet échantillon permet de combiner les variations de rendements marginaux (revenu et durée de chômage) à la fois entre les filières d'études et dans le temps.

Nos résultats appuient les études précédentes quant à l'effet significatif du revenu sur le choix de filière d'études. Ils appuient également note idée selon laquelle la durée de chômage affecte ce choix. Par ailleurs, il ressort des résultats que les femmes mettent moins de poids sur le revenu et la durée de chômage comparativement aux hommes. De plus, les étudiants qui détiennent un emploi avant de commencer leurs études favorisent le revenu au détriment de la durée de chômage dans leur choix de filière d'études. D'autre part, le choix de la filière « Affaires et Commerce » ou « Sciences » est le plus sensible aux changements de revenus et de durées de chômage, alors que le choix de la filière « Sciences Sociales » est le moins sensible. Le choix de filière d'études est également déterminé par plusieurs autres variables (sexe, éducation des parents, groupe ethnique, langues parlées, etc.).

Enfin, nous mentionnons que nos approches, aussi bien dans le choix du secteur d'emploi que dans le choix de filière d'études, sont loin d'être parfaites. En effet, certains biais de sélection sont toujours présents dans les résultats. Dans le cas du choix de secteur d'emploi, nous ignorons le choix d'éducation qui pourrait bien être corrélé avec le choix de secteur. Les étudiants qui poursuivent des études universitaires le font probablement uniquement pour trouver un emploi dans le secteur public. Dans le cas du choix de filière d'études par les étudiants canadiens, les résultats sont conditionnels au choix et à la réussite des études au collège. Nous ignorons les individus qui choisissent d'autres options (par exemple, intégrer le marché de l'emploi ou poursuivre des études à l'université) ainsi que ceux qui ne réussissent pas leur programme au collège (échec ou abandon). Malheureusement, les données utilisées ne permettent pas de remédier à tous ces biais de sélection.

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