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UNIVERSITÉ DE MONTRÉAL

**QUANTIFYING HISTORICAL CAPITAL MOBILITY IN CANADA :
AN ERROR CORRECTION APPROACH**

par

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Abstract: Using an error correction model to measure the short run correlation between saving and investment, capital mobility is estimated in Canada since 1870. Capital mobility appears to be relatively high during both world wars, the twenties and the fifties, whereas its is remarkably low during the Great Depression. Ambiguous results are obtained for the late 19th century and from 1960 onwards.

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I INTRODUCTION

The object of this study is to provide a quantitative measure of the evolution of international capital mobility in Canada. More specifically, the correlation between Canadian investment and saving rates from 1870 to 1995 will be analysed using an error-correction model in order to get an indication of how capital mobility has developed since Confederation. Inspired by the work of Jansen and Schulze (1996), the error correction approach will enable us to quantify short term capital mobility during each of the different structural phases that the Canadian economy has experienced over the past 125 years. Intuitively, we would expect an open economy such as Canada's to follow the general trends of capital mobility in the global economy, and thus, look for relatively well integrated capital markets under the Gold Standard period, high barriers to international trade and investment during the inter-war years, and gradually increasing capital mobility since the Second World War.

Our investigation, specifically designed for Canada, provides indicators of capital mobility which do not always confirm this general historical trend. In many instances, however; Canada's situation does conform with the developments in global finance. As expected, we find capital mobility to be relatively high during both world wars, with WWII marking an historical zenith. Capital appears to be very mobile during the 1920's and 1950's, whereas it approaches immobility during the Great Depression. Ambiguous results are obtained for the late nineteenth century and from

1960 onwards, however. Historical analysis reveals that capital mobility should have been rather high in these two time periods, but the investment-saving correlations from our analysis are nearly unitary, indicating low capital mobility. These results, as well as their possible explanations, will be examined in depth.

The paper is structured as follows: Section II provides an overview of the importance of capital mobility in economic theory, as well an exposition of the Feldstein-Horioka puzzle. Section III evaluates previous work on the issue of capital mobility. Section IV presents the error correction model (ECM), while Section V deals with the particularities of the data used. Section VI explains the methodology employed to quantify capital mobility using the ECM. The econometric results of our tests are revealed in Section VII. An historical interpretation of all of the results is made in Section VIII. Section IX examines the theory that deliberate government policy explains the high investment-saving correlations observed Canada, followed by some concluding remarks in Section X.

II THE IMPORTANCE OF CAPITAL MOBILITY AND THE FELDSTEIN-HORIOKA PUZZLE

The importance of capital mobility in international macroeconomics cannot be underestimated. According to neoclassical theory, the marginal productivity of capital is inversely related to the scarcity of this factor of production, making the

most profitable areas for investment those regions where capital is relatively rare. Under the condition of perfect capital mobility, capital is allocated to the various regions of the world in such a manner as to have an equalisation of returns on investment. It is indeed factor mobility which permits this global equivalency of returns. The hypothesis of perfect capital mobility forms the basis of most theoretical work and modelling, in particular the standard neo-classic intertemporal current account model. International consumption smoothing adequately explains temporary changes in a country's current account only if perfect capital mobility is assumed. The degree of international capital mobility also plays an essential role in standard Keynesian theory (for example, in the open-economy Mundell-Fleming model), as well as in neo-Keynesian developments (in overshooting models, for instance). Applied economists and policy makers rely on this concept to an equal extent, since the effectiveness of different policy instruments is greatly influenced by the degree of capital mobility.

Interest in the quantification of capital mobility began with the seminal article by Feldstein and Horioka (1980), which was the first analysis of the correlation between the gross national saving rate and the domestic investment rate. The authors proposed that perfect mobility implied a zero correlation between investment and saving rates. Such a correlation would indicate that domestic investment no longer had to depend on national saving, firms having access to the international pool of capital. Likewise, a zero correlation meant that national saving was no longer limited

by domestic investment opportunities and could be placed in international markets. Their study, based on a cross section analysis of 16 OECD countries, showed that there was a high degree of correlation between these saving and investment rates. In fact, the correlation coefficient wasn't significantly different from one. These results led the authors to conclude that capital mobility wasn't as high as popularly believed. Pushing the argument, Feldstein and Horioka suggested that a country's investment rate depended on its saving rate, and that governments could stimulate domestic investment by encouraging greater national savings, much like in a closed economy. According to Feldstein-Horioka, a high saving rate that causes a high investment rate (and not vice versa), thus explaining why they regress the investment rate on the saving rate as follows:

$$I_t/Y_t = \alpha + \beta (S_t/Y_t) + \varepsilon_t$$

where I_t/Y_t is the investment rate, S_t/Y_t the saving rate and ε_t a well behaved disturbance. The authors called β the "saving retention coefficient", reflecting the idea that this coefficient approximately represents the percentage of national saving that is transformed into domestic investment as opposed to being invested abroad. In this paper we shall refer to β as the investment-saving correlation.

The empirical results of their study did not concord with the dominant idea that international financial integration was rapidly accelerating and that most industrialised countries experienced a high degree of capital mobility. The article

generated a multitude of other empirical studies that only confirmed the high degree of correlation (see section III). For the past two decades economists have wrestled with the Feldstein-Horioka puzzle, trying to reconcile this stylised empirical fact with the dominant hypothesis of high, if not perfect, international capital mobility. It must be kept in mind, however, that the notion of perfect capital mobility is itself an ideal, because there are several factors that cause at least a portion of national savings to be invested domestically. Such factors include asymmetry of information and differences in the institutional structures of countries, especially with regards to investment risk and tax rules.

The error correction model used in this paper measures short term capital mobility. Our emphasis on measuring the short term investment-saving correlation is a deviation from the standard approach in this field of research. The vast majority of tests in this area measure long term capital mobility over a restricted time period. The majority of studies have employed cross-section techniques and have involved data dating from the 1960's to the present day. Near unitary investment-saving correlations have been obtained in most investigations involving industrial countries. Standard international macroeconomic theory provides a possible explanation for this high correlation: the intertemporal current account (as a percentage of GDP) must be constant in the long run steady state, automatically implying that investment rate equal saving rate. An error-correction model measures the correlation between the changes in investment and saving from one period to the next, all while taking into

consideration the fact that these two macroeconomic variables are bound by a long term equilibrium relation. The ECM method could be a more precise way of quantifying capital mobility than the cross section approach. It could also provide a better idea of how capital mobility has evolved historically, which is exactly what we shall attempt to do in the case of Canada.

It is important to note that throughout this investigation, investment, saving and the current account will always be expressed as percentages of GDP. This analysis in terms of rates enables us to consider these macroeconomic variables to be constant (in the) in the steady state. Thus, economic growth is incorporated into our analysis and we avoid the ludicrous situation of having to assume that long run absolute values of I, S, GDP, and CA are constant in the long run. Our model is therefore compatible with a standard principle of macroeconomic growth theory: an economy has reached a steady state when its capital stock, output, consumption, gross investment and gross savings grow at a constant rate. This approach highlights the fact that it is the constant *relationship* between I and S (rather than their absolute levels) that is essential for the sake of proceeding with an error-correction analysis.

III PREVIOUS RESEARCH

The Feldstein-Horioka puzzle has spawned a huge mass of theoretical and empirical literature. Most macroeconomic explanations of the high correlation

between investment and saving rates involve the presence of third factors that render the correlation spurious (these include the procyclicality of savings and investment (Obstfeld, 1986), productivity shocks (Obstfeld, 1986, Cardia, 1991), demographic changes (Summers, 1988), taxes (Summers, 1988), non-traded goods (Murphy, 1986), governmental savings (Bayoumi, 1990), among others). Many papers have been devoted to correcting specific aspects of the regressions in order to take into consideration one or more of the above mentioned third factors. Both Feldstein and Frankel, for instance, have used instrumental variables to compensate for the endogeneity of investment and savings. Feldstein ran the cross-section regression on five year averages in order to wash out the business cycle effects and correct for the procyclicality of investment and saving. It must be noted that despite the various improvements in estimation techniques, unitary correlations persist for OECD countries and the Feldstein-Horioka puzzle essentially remains unresolved.

Other arguments have been more financial in nature, centred around the violation of real interest parity (Frankel, 1991, and Dooley, 1987), due to the imperfect integration of goods markets and currency premia. Frankel suggests that while financial capital mobility may exist, physical capital may in fact be rather immobile. If physical capital plays a dominant role in the capital stock of developed nations, then this could explain the high correlations found in most OECD countries.

Several authors (Buitier 1981, Baxter and Crucini 1990) point out that a unitary correlation does not compromise the hypothesis of capital mobility. In the steady state, the standard intertemporal current account model indicates that the current account must be constant (as a percentage of GDP). This implies an investment-saving correlation of 1 in the long run, considering the fact that the current account corresponds to the difference between the investment and saving levels of a nation. In the short run, however, deviations between saving and investment are possible if there is capital mobility. Agents can use the international capital markets to smooth their consumption during temporary negative shocks or lend their savings abroad in the case of a surplus. This is the crux of the argument behind the application of an error correction model to the Feldstein-Horioka puzzle.

One basic criticism of the entire correlation approach is that it doesn't always reflect capital mobility. Indeed, it is quite possible that a totally isolated country with the same degree of capital scarcity as the rest of the world will demonstrate no change in capital inflows upon opening its borders to the outside. Moreover, a country with large barriers to capital mobility may still experience sizeable capital inflows or outflows if the domestic return on capital is substantially different from that of the rest of the world (Taylor, 1996). Furthermore, the correlation values mean nothing in themselves and become significant only when compared to those of other time periods or of other nations, and only then when all the intervening third factors mentioned above have been taken into consideration. As noted by Jansen and

Schulze, a high correlation between investment and saving rates is only a necessary condition of relative low capital mobility. Economic literature (see above) abounds with examples of high positive correlation that can be generated in the presence of high capital mobility. Many complex factors could contribute to high correlations, only one of which is low capital mobility. On the other hand, persistent low (or negative) correlations can only be attained in the presence of a certain degree of capital mobility (i.e. no immobility). Thus in the true Popperian tradition, the Feldstein-Horioka correlation criteria can only refute capital immobility.

Empirically, several authors have performed Feldstein-Horioka type tests on historical data. The most comprehensive by far is by Taylor (1996) on 12 countries dating back from 1850. Zevin (1992) and Eichengreen (1990) have run extensive studies on the gold-standard era. Recent examples of cross-sectional studies include Tesar (1991) and Sinn (1992), whereas Frankel (1986), Feldstein and Bachetta (1991), and Bayoumi (1990) have adopted a time series approach.

By some accounts, the justification for using time-series data rather than cross-sectional data has been found weak. Indeed, it can be argued that the capital mobility measured in cross-sectional studies has a certain "systemic property" in the sense that a certain degree of capital mobility in one country automatically implies a minimum level of capital mobility in at least one other nation; hence the notion of estimating mobility country by country is somewhat anomalous. While we agree that

a degree of capital mobility in one country implies a degree of mobility in at least one other country, we dispute the claim that the time series approach is misguided. Indeed, cross-section and time-series approaches embody a very similar interpretation of capital mobility. Precisely, investment-saving correlations answer two types of questions: (1) whether a single nation is financially integrated over time in the world capital market (time-series approach) and (2) whether a group of countries is financially open to the world at some point in time (cross-section approach). The superiority of the cross-section approach over the time series method based on a "systemic property" is dismissed if one recalls that the capital mobility coefficient in the Feldstein-Horioka regression does not reflect the extent of the capital flow among the countries in the sample but rather the extent to which individual countries in the sample retain their national saving within the saving country.

It must be noted that the aforementioned empirical tests do not concord completely with modern macroeconomic theory. As remarked by Jansen and Schulze (1996), theory tells us that a constant relationship must exist between saving and investment on the long term, but that non-unitary correlations are possible in the short period. A dynamic element should be included in the econometric specification. All purely cross-sectional results aren't completely satisfactory due to their static

character. Even some time series specifications, like that of Frankel (1986, 1991):

$$I_t/Y_t = \alpha + \beta S_t/Y_t + \varepsilon_t \quad (1)$$

where I_t/Y_t is the investment rate, S_t/Y_t the saving rate and ε_t a well behaved disturbance, are by nature static and thus fail to take into consideration the dynamic adjustment process. Other models, like that of Bayoumi (1990):

$$\Delta (I_t/Y_t) = \alpha + \beta \Delta (S_t/Y_t) + \varepsilon_t \quad (2)$$

examine only short term correlation, without taking into consideration the steady state equilibrium. Other time series specifications have been proposed, but none incorporate the stable long term equilibrium (between S/Y and I/Y) and the dynamic short term adjustment component in the same specification. This makes Jansen and Schulze's error correction model all the more innovative.

IV THE MODEL

The theoretical framework of our model is quite conventional: the setting is an open economy where immortal representative agents maximise their intertemporal utilities subject to a budgetary constraint. Capital is perfectly mobile and the current account is stable on the long run. Short term current account deficits and surpluses

are allowed to smooth consumption in response to shocks, but permanent deficits aren't. The short run investment-saving correlation may deviate from the steady state value of one. The sign and dimension of the non-zero endogenous correlation values will depend on the nature of the shock and the structure of the economy.

As indicated by Jansen and Schulze, this standard model has important econometric implications regarding specification. Since the exogenous variables upon which investment and saving depend could be non-stationary, saving and investment could be non-stationary as well. Furthermore, a long term equilibrium relationship forces investment and saving rates to have a one-to-one relationship in the long run. It is thus possible that saving and investment are cointegrated. Granger and Engle (1987) prove that all cointegrated variables can be represented in an error-correction form. They use a two step procedure to derive the error-correction model. The first step involves the residual Z_t of the simple time series regression in levels:

$$I_t/Y_t = \theta + \pi (S_t/Y_t) + Z_t \quad (3)$$

Z_t becomes the error correction term (lagged once) in the error correction model developed by Granger and Engle:

$$\Delta(I_t/Y_t) = \Psi + \beta \Delta(S_t/Y_t) + \phi [\pi (S_{t-1}/Y_{t-1}) + \theta - (I_{t-1}/Y_{t-1})] + \varepsilon_t \quad (4)$$

After redefining the parameters ($\alpha = \Psi + \phi\theta$ and $\pi = 1 + \delta/\gamma$, which is the cointegrating

vector), we have the error correction model as specified by Jansen and Schulze (1996):

$$\Delta(I_t/Y_t) = \alpha + \beta \Delta(S_t/Y_t) + \gamma [(S_{t-1}/Y_{t-1}) - (I_{t-1}/Y_{t-1})] + \delta(S_{t-1}/Y_{t-1}) + \varepsilon_t \quad (5)$$

β expresses the short term correlation between I/Y (investment rate) and S/Y (saving rate), which is measured by the portion of the change in investment rate that is explained by the change in saving rate over a single period. We can identify β as representing a quantitative measure of short run, year-to-year international capital mobility. δ and α are coefficients used to test the hypothesis of a long run unitary correlation. The steady state equilibrium is attained once $t = t+1$. By replacing $\Delta I_t = \Delta S_t = 0$ into equation (5) we obtain

$$\alpha + \gamma (S_t/Y_t - I_t/Y_t) + \delta (S_t/Y_t) = 0 \quad (6)$$

In the long run, if $S_t/Y_t = I_t/Y_t$, then the current account is constant if δ is equal to 0 and is balanced if α (the constant) is also equal to zero. This model will therefore allow us to simultaneously test for the degree of short term capital mobility and the maintenance of a steady state equilibrium.

V THE DATA

Four data sets are used in this investigation. In the data covering the period prior to 1926, gross national saving is derived from historical data on gross domestic capital formation and the current account using the following macroeconomic identity:

$$\begin{aligned} \text{CA} &= \text{X} - \text{M} + r\text{B} \\ &= (\text{Y} - \text{C} - \text{G}) - \text{I} \\ &= \text{S} - \text{I} \end{aligned}$$

where **B** represents net foreign assets and **r** is the real interest rate. This identity is used because Canadian national saving was not calculated in a systematic manner before 1926. All data is transformed into rates by dividing both gross investment and gross savings by the GDP. The first data set comes from Taylor's work and is homogenous and without lapses from 1870 to 1992 (I took the liberty of updating the last three years). This will be termed **data set 1**. It is most probable that Taylor's data does not come from a single source, although this is not mentioned. It was therefore necessary to acquire more data from different sources. Unfortunately, none of these alternate sources provided data covering the entire period of investigation. Data from 1870 to 1945 was available from the National Bureau of Economic Research web site on historical macroeconomics database (**data set 2**) and is compiled in the same manner as **data set 1**. Data from 1926 to 1989 (**data set 3**) uses national saving rates

which are calculated by Statistics Canada (Cansim web site), and data from 1960 to 1995 was obtained from the World Development Indicators 1998 CD Rom (**data set 4**). These three data sources, although not homogeneous, can nonetheless confirm and contribute to the general results of this econometric inquiry.

VI THE METHODOLOGY

The first step in the data analysis was confirming the non-stationarity of both variables in all the data sets. The existence of unit roots was checked using the Augmented Dickey Fuller test and by cross referencing with MacKinnon critical values. In all of the various data sets sufficient lags of either I or S were added in order to secure an approximate white noise error term in the ADF regressions, which was verified using a LM tests and visual inspections of Box-Jenkins correlelograms. A constant (intercept term) as well as a trend element were included in all of the tests. All of the series proved to be non-stationary. **Table 1** indicates the ADF test results for all of the data sets. The cointegration of investment and savings rates was confirmed for all four data sets using the Johansen cointegration test. The results of all four series are found in **Table 2**.

As pointed out by Lewis (1954), structural breaks typically characterise settler-economy saving and investment rates, and rapid changes in these rates are a

central factor in the process of development and industrialisation. The detection and the proper identification of the various structural breaks in the Canadian investment-saving relation is thus crucial to our analysis. A visual inspection of the graph of Taylor's series (**Graph 1**) leads us to think that the correlation between investment and saving rates was relatively constant prior to the First World War, radically disrupted in the inter-war period, and rather ambivalent in the post war period.

Table 1 Augmented Dickey Fuller Test Results

Data set 1 (1870-1995)	Investment rate (I)	Saving rate (S)
ADF test statistic	-2.2887	-2.4831
1% critical value*	-3.4835	-3.4835
5% critical vlaue*	-2.5789	-2.5789
Data set 2 (1870-1945)		
ADF test statistic	-1.5359	--2.1412
1% critical value*	-3.5188	-3.5188
5% critical vlaue*	-2.9001	-2.9001
Data set 3 (1935-1968)		
ADF test statistic	-1.2758	-2.5464
1% critical value*	-3.6422	-3.6422
5% critical vlaue*	-2.6148	-2.6148
Data set 4 (1960-1995)		
ADF test statistic	-1.5646	-1.4817
1% critical value*	-3.6289	-3.6289
5% critical vlaue*	-2.9472	-2.9472

* MacKinnon critical values for rejection of hypothesis of unit root.

Table 2 Johansen Cointegration Test Results

Data set	Eigen values	Likelihood Ratio	5% critical value	1% critical value	No of Cointegrated equations
Data set 1	0.115249	20.30242	15.41	20.04	None**
	0.040439	5.118671	3.76	6.665	At most 1
Data set 2	0.111192	16.16652	15.41	20.04	None*
	0.032485	2.443810	3.76	6.65	At most 1
Data set 3	0.458605	22.59919	15.41	20.04	None**
	0.088460	2.963818	3.76	6.65	At the most 1
Data set 4	0.359633	15.55754	15.41	20.04	None*
	0.039652	1.294717	3.76	6.65	At the most 1

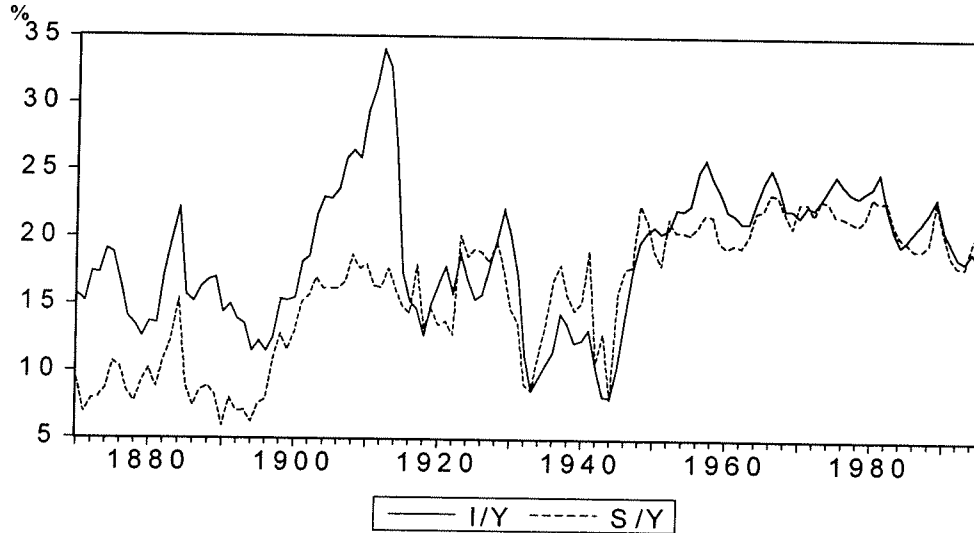
(**) denotes rejection of the hypothesis at 5% (1%) significance level
L.R. test indicates 2 cointegrating equations at the 5% significance level

The most difficult part of the analysis involved the detection of structural breaks. This was an essential part of the empirical work, since only it could allow for the proper comparison of capital mobility in different periods. The CUSUM and CUSUM squared methods were employed to determine the general area of the breaks, and Chow breakpoint tests were used to confirm the CUSUM results and help in pinpointing the exact year of the rupture. More precisely, Chow tests were run exclusively on the years indicated by the CUSUM results as marking potential rupture points. Only those years passing the Chow tests were qualified as structural breakpoints.

To better explain the procedure that was used, we will examine how the CUSUM diagnostic test was used to detect structural breaks in **data set 1**. The CUSUM diagram is presented in **Graph 2**. Judging from the severe changes in the

sum of the accumulated residuals that appear during the First World War and the end of the Second World War in the diagram, we suspected breakpoints to be present during these periods. Subsequent Chow test on the key years indicated by the CUSUM diagram in both of these periods indicate that 1914, 1918 and 1945 were the most likely structural breakpoints. It must also be noted that the accumulated residuals in the CUSUM diagram crosses the 5% significance threshold around 1939. Intuitively, the beginning of WWII springs to mind, but Chow tests indicate that the structural break actually occurs in 1935. A CUSUM squared diagnostic test on the same data set indicates that 1929 and 1981 could also qualify as breakpoints.

Graph 1 Saving/GDP and Investment/GDP (data set 1)



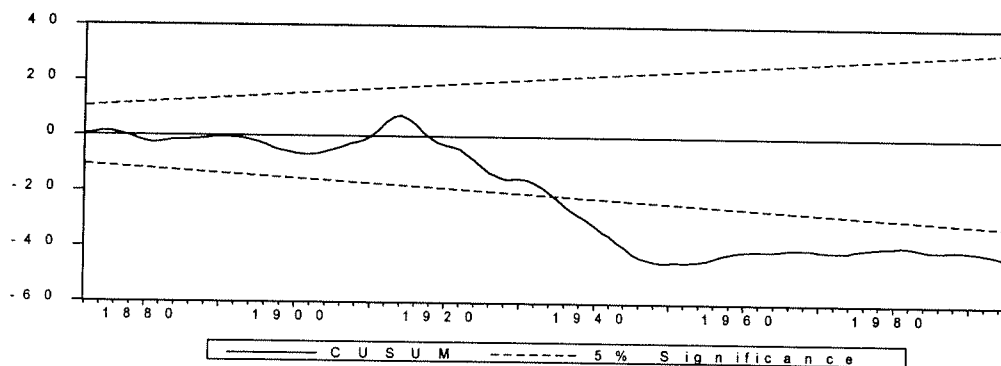
This technique of detecting structural breaks (visual inspections of CUSUM results that are confirmed with Chow breakpoint tests) was applied to all of the data sets in order to establish the different structural breaks that have occurred throughout the various time periods. Each data set has a different set of structural breaks that may be compared during overlapping periods. The four series of results must be considered as complementary, reinforcing each other so as to provide a more complete picture of the evolution of capital mobility in Canada.

Graph 2 clearly shows that the sum of the residuals exits and remains below the 5% significance level boundaries after the 1930s. This fact is repeated in all of the data sets, suggesting that third factors come into play at this point in Canadian history. This radical change in the investment-saving paradigm is probably the reflection of the jump Canada made from a natural resource-based economy to an industrial nation as a result of the Second World War. We have taken this rupture into consideration by attributing separate dummy variables to the pre and post-war periods.

Certain methodological issues need to be addressed before continuing. The presence of structural breaks in the various I/Y and S/Y series could pose a problem with the cointegration tests. Unfortunately, econometric theory has not yet definitely indicated in which manner the test results are modified (and whether they are modified at all!) as a result of structural breaks in the variables. The non-stationnarity

and the cointegration of Canadian investment and saving rates have been confirmed in numerous studies, so it is prudent to assume that our test results are correct. In any case, the error-correction approach is also valid for stationary variables. There is also some debate as to the robustness of CUSUM results when applied to non-stationary variables, but this concern may be safely set aside because the CUSUM approach remains valid if all the variables in the estimated regression are cointegrated (and this is certainly the case with I/Y and S/Y).

Graph 2 CUSUM structural stability diagram (data set 1)



The ordinary least squares regression technique was used to estimate equation (5), which is slightly transformed in order to take into consideration the different structural break periods. Dummy variables are used in order to isolate the effect of each period in the overall regression, and the structural equation thus assumes the

following general form:

$$\Delta(\mathbf{I}_t/\mathbf{Y}_t) = \alpha + (\beta_1 \mathbf{D}_1 + \beta_2 \mathbf{D}_2 + \dots + \beta_n \mathbf{D}_n) \Delta(\mathbf{S}_t/\mathbf{Y}_t) + \gamma [(\mathbf{S}_{t-1}/\mathbf{Y}_{t-1}) - (\mathbf{I}_{t-1}/\mathbf{Y}_{t-1})] + \delta (\mathbf{S}_{t-1}/\mathbf{Y}_t) + \varepsilon_t$$

(7)

where \mathbf{D}_i ($i = 1, 2, 3, \dots, n$) takes a value of 1 during the subperiod i and is equal to 0 in all others. The periods are those delimited by the structural break tests. The results of all the regressions are summarised in **Table 3** and are discussed in the next section. Note that there will be a different β (measure of short term capital mobility) for each different structural period, but the cointegrating vector, represented by γ and δ in the error correction component, will remain constant and take on a single value for the entire regression.

VII THE RESULTS

Let us first review the data in a non-historical manner in order to capture the salient points of this quantitative analysis. Several key results emerge when looking at all four regressions transversally in **Table 3**. First of all, every β coefficient is significantly different from zero at the 5% level, except for the 1981-1995 coefficient, which is significant only at the 10% level. Acceptance at the 10% level may be tolerable for the purpose of this study, however, given that the short run correlation is only an approximation of capital mobility. A second noticeable feature

is that the period prior to 1914 is characterised by the same high short term investment saving correlation (0.79) in both of the relevant data sets. This may be attributed to the fact that, given the limited quantitative information available prior to WWI, the data in both of the time series covering this period (**data sets 1 and 2**) comes from the same source: the NBER historical macroeconomic database (see references).

The overlapping time periods appear to have roughly the same coefficients when they cover the same approximate time span (such as 1935-45 in data sets 1 and 3 with coefficients of 0.28 and 0.25 respectively, and the period of the last fifteen years in data sets 1 and 4 with coefficients of 0.55 and 0.61 respectively). The correlation does not appear to have a steady downward trend, as one would expect if capital mobility is gradually increasing. Instead, there seem to be substantial variations in the correlation throughout the entire 125 year span. The capital mobility coefficient varies to a greater extent when the structural break periods are greater in number.

As indicated in section IV, δ and α are coefficients used to test the hypothesis of a long run unitary correlation. In this steady state equation

$$\alpha + \gamma (S - I) + \delta S = 0 \quad (6)$$

the current account is constant if δ equal to 0 and is balanced in the long run if α (the constant) is also equal to zero. The test results in all of the regressions cannot reject the hypothesis that both these coefficients are significantly different from zero. Thus the hypothesis that saving is equal to investment in the long run cannot be rejected, implying that the intertemporal current account must be balanced.

To be better evaluate the short run error-correction approach, it is useful to compare the ECM results with those generated by a traditional time-series Feldstein-Horioka type regression having the following specification:

$$I_t/Y_t = \chi + (\upsilon_1 D_1 + \upsilon_2 D_2 + \dots + \upsilon_n D_n) S_t/Y_t + \varepsilon_t$$

where the dummy variables correspond to the same periods as those in the error correction model, and υ is the capital mobility coefficient of Feldstein-Horioka type analyses and χ is the constant of the regression. **Data set 1** is used. In interpreting these results, however, we must take into consideration all of the multiple shortcomings associated with this specification (see section III). The results are presented in **Table 4**.

Table 3

$$\Delta(I_t/Y_t) = \alpha + (\beta_1 D_1 + \beta_2 D_2 + \dots + \beta_n D_n) \Delta(S_t/Y_t) + \gamma[(S_{t-1}/Y_{t-1}) - (I_{t-1}/Y_{t-1})] + \delta(S_{t-1}/Y_t) + \varepsilon_t$$

Table 3		1870	1910	1920	1930	1940	1950	1960	1970	1980	1990	1995
Data Set 1												
α	0.31	(0.52)										
γ	0.10	(2.50)										
δ	0.00	(-0.08)										
R^2	0.39											
S.E.	1.66											
		1870-1913	1914-19	1920-28	1929-34	1935-45	1946-1980	1981-1995				
		$\beta_1 = 0.79$ (5.39)	$\beta_2 = 0.77$ (2.96)	$\beta_3 = 0.44$ (2.12)	$\beta_4 = 0.78$ (3.10)	$\beta_5 = 0.28$ (2.40)	$\beta_6 = 0.40$ (2.01)	$\beta_7 = 0.55$ (1.82)				
Data Set 2												
α	0.14	(0.14)										
γ	0.03	(0.64)										
δ	-0.11	(-0.19)										
R^2	0.38											
S.E.	2.09											
		1870-1913	1914-1928	1929-33	1934-38	1939-45						
		$\beta_1 = 0.79$ (4.17)	$\beta_2 = 0.52$ (2.14)	$\beta_3 = 0.82$ (3.16)	$\beta_4 = 0.74$ (2.06)	$\beta_5 = 0.3$ 1 (1.21)						
Data Set 3												
α	0.14	(0.14)										
γ	-0.60	(-1.18)										
δ	0.7	(1.27)										
R^2	0.27											
S.E.	2.53											
		1926-38	1939-45	1946-89								
		$\beta_1 = 0.55$ (3.53)	$\beta_2 = 0.31$ (1.33)	$\beta_3 = 0.51$ (2.79)								
Data Set 4												
α	0.09	(0.62)										
γ	-0.10	(-0.74)										
δ	1.48	(0.74)										
R^2	0.57											
S.E.	1.07											
		1960-1977	1978-85	1986-1995								
		$\beta_1 = 0.89$ (3.84)	$\beta_2 = 1.28$ (4.35)	$\beta_3 = 0.61$ (2.48)								

Estimated β_n appears in the second line, where n indicates the specific structural break represented by a dummy variable
t-statistics in brackets

Table 4 Regression Results

$I_t/Y_t = \chi + (\upsilon_1 D_1 + \upsilon_2 D_2 + \dots + \upsilon_n D_n) S_t/Y_t + \varepsilon_t$			
Period		Coefficient	t-stat
α		4.19	3.99
D_1	$\upsilon_{1870-1913}$	1.24	14.12
D_2	$\upsilon_{1914-1919}$	0.84	8.71
D_3	$\upsilon_{1920-1928}$	0.74	9.69
D_4	$\upsilon_{1929-1934}$	0.89	7.88
D_5	$\upsilon_{1935-1945}$	0.49	5.69
D_6	$\upsilon_{1946-1980}$	0.86	15.99
D_7	$\upsilon_{1981-1995}$	0.82	13.66
R^2	0.76	Stand. error	2.58
R^2 adjusted	0.75	SSR	786.58

All the savings retention coefficients (υ) in this Feldstein-Horioka specification (**Table 4**) are significant and unilaterally higher than the coefficients generated by the error-correction model (β) (these results must be compared to those in the regression on **data set 1** in Table 3). It appears that the Feldstein-Horioka method of measuring long term capital mobility gives indications of lower capital mobility than does the short term ECM approach. These results aren't in contradiction with the intertemporal current account theory upon which the ECM method is based. In the long run, the current account must be constant as a percentage of GDP, implying that national savings rate be in a one-to-one relationship with the domestic investment rate. It must be further noted that, except for the 1935-1945 period, all of the coefficients aren't significantly different from one. Thus the puzzling Feldstein-Horioka results are reproduced in the case of Canada. One must not make the error,

however; of thinking that the Feldstein-Horioka and the ECM coefficients are measuring the same aspect of capital mobility. The Feldstein-Horioka coefficient is a reflection of long term capital mobility, whereas the ECM clearly indicates the variation in investment rates due to a variation in saving rates over a single period, making the coefficient an indicator of short run capital mobility. In any case, it is apparent that the error correction approach provides a measure of capital mobility that is significantly different from previous quantification techniques based on static models.

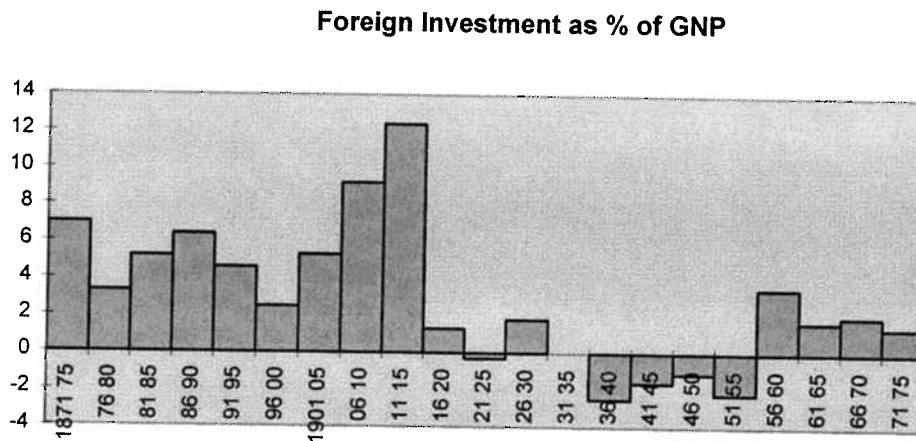
VIII HISTORICAL ANALYSIS

The period dating from Confederation to the Great War (1867-1913) was critical to the birth and development of the Canadian nation. To a large extent, the international flow of financial capital into British North America from Great Britain and the United States was the prime motivation behind the union of the provinces. It is generally agreed upon amongst historians that Confederation was an elaborate exercise designed to reassure British and American investors who were desperately needed to revitalise the development of the colony's economy (Naylor, 1980). The new state structure, with its federal tax collection, its debt consolidation, and its ability to centralise economic policy, proved to be an effective manner of raising the colony's international credit rating.

The development of the young nation depended principally on foreign investment, more so than in any other period since. In many ways, Canada was born an open economy and experienced the influence of foreign investment more acutely than most other modern nations. As shown in **Table 5**, net foreign investment (foreign investment in Canada minus Canadian investment abroad), both direct and portfolio, accounted for a greater share of gross domestic capital formation and of GDP than in any period since. The wheat boom (1911 to 1915) embodied the pinnacle of capital inflow (see **Graph1**).

It seems an apparent paradox then, that this period has a relatively high short term investment-savings correlation (0.79 with **data sets 1 and 2**). Upon thorough examination of the problem, however, several explanations become plausible. The British and American investment in Canada were largely long term affairs involving infrastructure development and did not necessitate frequent capital transfers. American investments in particular were almost completely direct in nature, and thus rather immobile over the short period. Capital markets were highly inefficient, and were not able to give foreign investors enough information on the relative risks involved in short term investment, so foreign capital rarely was invested in areas not benefiting from guarantees from the Canadian government. Since the government

Table 5 Net foreign investment as % of GNP (foreign investment in Canada - Canadian investment abroad)



Source: Marr, W, and D. Paterson, *Canada, An Economic History* (1980)

mainly guaranteed long term projects, short term capital mobility was not required (Marr, 1980). This was further accentuated by the fact that international financial instruments were in their infancy and the technology employed was primitive by today's standards.

The high short term correlation also finds an explanation in the general dependence of Canada on outside sources for economic development. The dominance of foreign investment as an expenditure component in the aggregate demand in this staple-based economy was such that the shocks affecting foreign

investment also affected the domestic business cycle proportionally, causing domestic savings to rise and fall with incoming capital flows. This example demonstrates the endogeneity of both investment and saving.

The first World War changed the pattern of capital mobility in Canada. The war drained Great Britain of its investment capacity, and obligations to the crown obliged Canada to become a net exporter of goods to war-torn Europe. Domestic investment fell to the level of national saving but there were increased fluctuations between the two amounts. During the actual war period the correlation doesn't fall significantly (from 0.79 to 0.77 in **data set 1**), but the war is a catalyst for the period to come.

The roaring twenties brought about an accentuation of American-Canadian commerce and our southern neighbour became ever more present in Canadian capital ventures. The United States surpassed Great Britain as the major foreign investor during this period, and direct investment became the dominant form of foreign ownership in the Canadian economy. American investment was much less involved in the long-term mega-projects as were the British ones. Short term investment in Canada increased thanks to the development of more efficient capital markets throughout North America. Furthermore, by this time the Canadian economy had attained the critical mass required to actually begin investing abroad (Marr, 1980). All these factors may have succeeded in significantly increasing short term capital

mobility in Canada and thus could explain the relatively low level of correlation between short term investment and savings from the First World War to 1928 (0.52 with NBER data (**data set 2**)-although WWI isn't marked as a structural break, and 0.44 with Taylor's data (**data set 1**)). The situation rapidly deteriorated, however, with the advent of global depression.

The Great Depression (1929-1933) engendered a decrease in capital mobility on a global scale, and Canada certainly did not escape the trend. Both investment and savings plunged, as the Canadian economy closed its borders and turned inwards. Short term capital mobility appears to have plunged (0.82 for **data set 2** and 0.78 for **data set 1**), and did not significantly re-establish itself until the Second World War ($\beta = 0.74$ for the period of 1934 to 1938 with the NBER data). These high values for the investment-savings correlation apparently do not contradict our intuitions regarding this tumultuous period in global financial history.

World War Two marks the emancipation of Canada as an economically developed nation. The war forced Canada to massively augment the productivity of its resources and rationalise its productive capacity. The size of the federal government increased exponentially in order to manage the massive outpouring of war production. Investment dropped dramatically as government expenditure absorbed dominant portions of output, but saving rates remained relatively stable in the early years of the Axis tide. The war and reconstruction material exported to

Europe were financed by huge loans during this critical period, and the creation of this debt could explain why short term capital mobility became quite high ($\beta = 0.31$ from 1939 to 1945 with the NBER data). Canada maintained its position of structural capital exporter right through to the early 50s when the oil boom in Alberta and the Korean War's demand for raw materials dramatically increased both foreign and domestic investment in the country.

The investment-saving short run correlation entered a period of remarkable stability in the beginning of the 1960s that would last up until the second oil shock. This was the period of great economic prosperity in which savings and investment reached record levels. The Bretton Woods monetary system was in place since the late 40s and had contributed to the formation of robust world trade. Taylor's data shows a relatively low correlation of 0.4 lasting from the Second World War to 1980. Statistic Canada's data presents similar results.

The World Bank data tells a different story, however. This data set indicates that the correlation was quite high from the 1960's right up until the second oil shock in 1978 (0.89 correlation from 1960 to 1977 with the World Bank data (**data set 4**)). It is curious that this apparent structural break was masked in the Taylor data set. In any case, it is difficult to explain this high correlation by a lack of capital mobility. Certainly one would not expect this period to have experienced the lowest short term capital mobility since Confederation! Indeed the weakness of the Feldstein-Horioka

measure of capital mobility becomes apparent. Many outside factors could account for the high correlation, such as the widespread use of Keynesian anti-cyclical policies (which could have taken the form of government intervention with regards to the balance of payments - this possibility is considered in section XI), the Vietnam War, and the first oil shock. It is possible that during this period of prolonged prosperity Canada reached its long term equilibrium and that the relationship between savings and investment had become stable. In essence, Canada became sufficiently well-endowed in capital to be near its steady state in terms of net foreign asset levels (Obstfeld and Rogoff, 1996). Still, some major shocks to the world economy, such as the first oil shock and the collapse of Bretton Woods, could be expected to have generated structural changes Canadian short term capital mobility, yet they do not appear to do so econometrically.

The period of 1978 to 1985 is one of great turbulence in terms of the investment savings correlation. The world economy experienced a major supply shock when the Iraq-Iran war in 1979 caused the near doubling of oil prices. This was followed in the early 80s by the speculative bubble involving the US dollar that caused a gigantic flow of foreign capital to enter the US (and thus leave the rest of the world). Investment rates plunged in Canada and only resumed their previous levels once a concerted effort by the G-7 brought the American dollar to a "soft-landing". Throughout this period the short term saving-investment coefficient was 1.28, indicating that investment and savings moved in the same downward direction,

but with domestic investment taking a steeper plunge than national saving. Here again the lack of capital mobility doesn't seem to be a factor influencing the high short run correlation (on the contrary, the high correlation was probably caused by too much mobility!). The Taylor data detects a much smaller coefficient (0.55) from 1981 to 1995 but nonetheless confirms that the correlation rose compared to earlier values. The seemingly anomalous result of 1.28 underscores the fact that β isn't a true measure of correlation (since a correlation is, by definition, bounded by -1 and 1). Rather, it is a regression coefficient that approximates a correlation.

Our regression results indicate a recent change in capital mobility in the mid-eighties. The coefficient for this last period is 0.61 using the World Bank data, a marked reduction from the earlier periods, but nonetheless not indicative of perfect capital mobility. It can be inferred that capital mobility has gone up, but the extent of this transformation is unclear, considering the doubtful measures of capital mobility derived in the previous period.

It is interesting to note that the measures of capital mobility produced by the error correction approach are significantly lower than the results obtained by Feldstein-Horioka cross-section type tests. The ECM results seem to be comforted by the common view that international capital mobility is increasing, which suggests that the error-correction approach to measuring capital mobility could be a viable alternative to traditional cross-section tests.

XI GOVERNMENT CURRENT ACCOUNT INTERVENTION VIA PUBLIC SAVING AND INVESTMENT

It has been argued by several authors that the high correlation between saving and investment may arise from deliberate government action, via the public sector fiscal expenditures, on the balance of payments in order to limit the accumulation of current account deficits or surpluses (Fielke, 1982, Tobin 1983, Bayoumi, 1990). For example, if the government reacts to a trade deficit (the result of an increase in private investment, for instance) by temporarily increasing public saving via a cut in government expenditures, then national saving and investment will be correlated for reasons having nothing do with capital mobility.

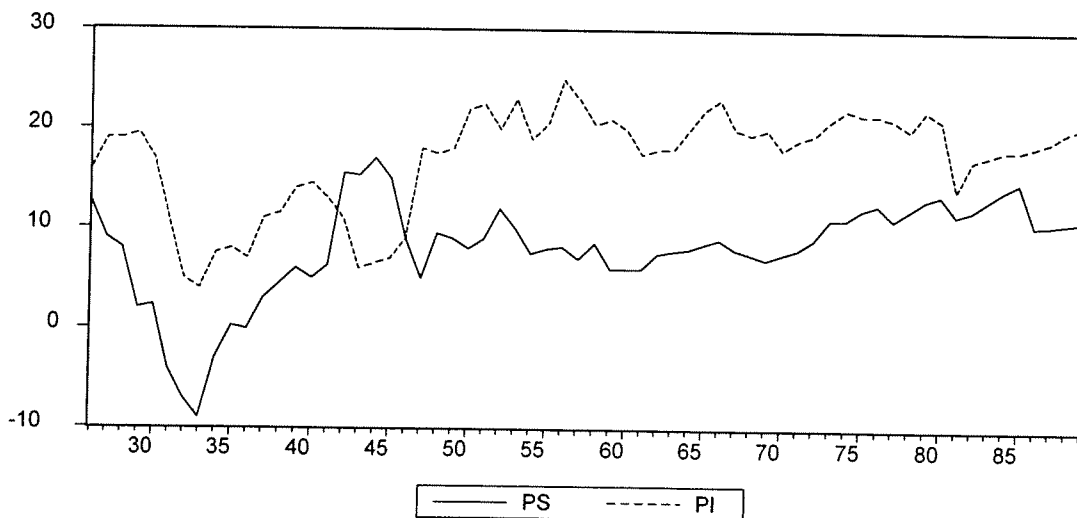
Bayoumi finds evidence of government intervention by analysing the correlation between private savings and private investment. The importance of endogenous private sector behaviour is assessed by comparing the coefficients generated from the regression of private sector saving on investment with those obtained economy-wide data. A significant endogenous private sector would be exemplified by a correlation of private saving and investment that is at least as high as that established for the entire economy. The correlation of private savings and private investment could be the result of any number of reasons, including population growth, productivity shocks, or any of the other factors that have been mentioned in section II. Similarly, a lower correlation in private saving and investment than in

economy-wide saving and investment could be indicative of either government controls and interventions with regard to the balance of payments, or low capital mobility. We will apply Bayoumi's methodology to analyze historical Canadian capital mobility.

In the data from Statistics Canada (**data set 3**), total investment and savings has been broken down into its public and private components (see **Graph 3**). Government investment (GI), private investment (PI), government saving (GS), private saving (PS), and the current account (CA) are all expressed as nominal shares of GDP.

The error correction model is applied to this analysis of private investment and saving because there is an equilibrium relationship which binds these two

Graph 3 Private Saving (PS) and Investment (PI) rates



macroeconomic variables together. In the long run, private savings rate must be in a constant relationship with the private investment rate because, in the steady state, the private sector cannot have an ever-changing surplus or deficit with regards to either the rest of the world (if net private savings (deficit/surplus) are transferred to or from other nations) or the public sector (if net private savings (deficit/surplus) are transferred to or from the government). This argument is identical to the one used in section II. The short run deviation from the long run relationship can be represented in an error correction specification, exactly as in the analysis involving total investment and savings.

The next step is to apply the methodology explained in section IV to the data. Augmented Dickey-Fuller stationarity tests indicate that the hypothesis of a unit root hypothesis is not rejected for both private investment and private savings time series (**Table 6**). The Johansen cointegration test confirms that both variables are, in fact, cointegrated (**Table 7**). No structural breaks were detected. Please refer to section IV for further details on this methodology.

Table 6 Augmented Dickey Fuller Test Results on Private Investment and Savings

Period: 1926-1989	Private Investment rate (PI)	Private Saving rate (PS)
ADF test statistic	-3.0360	-3.3872
1% critical value*	-4.1135	-4.1135
5% critical vlaue*	-3.4836	-3.4836

- MacKinnon critical values for rejection of hypothesis of unit root.

Table 7 Johansen Cointegration Test Results (Private Investment and Savings)

Eigen values	Likelihood Ratio	5% critical value	1% critical value	No. of Cointegrated equations
0.16210	15.937	15.41	20.04	None**
0.0404	5.3255	3.76	6.66	At most 1*

*(**) denotes rejection of the hypothesis at 5% (1%) significance level
L.R. test indicates 2 cointegrating equations at the 5% significance level

Having verified that PI/Y and PS/Y are non-stationary and cointegrated, we now proceed with our analysis by running a regression using the familiar error correction model framework:

$$\Delta(I_t/Y_t) = \alpha + (\beta_1 D_1 + \beta_2 D_2 + \dots + \beta_n D_n) \Delta(S_t/Y_t) + \gamma [(S_{t-1}/Y_{t-1}) - (I_{t-1}/Y_{t-1})] + \delta(S_{t-1}/Y_t) + \varepsilon_t$$

The periods used are the same as those used in **data set 3**, namely 1926-1938, 1939-1945, and 1945-1989. The results are resumed in **Tables 7 and 8**. **Table 6** restates the regression results from **data set 3** that have previously been reported in **Table 3** for ease of comparison.

Table 8 Total Investment on Total Saving Regression Results

$$\Delta(I_t/Y_t) = \alpha + (\beta_1 D_1 + \beta_2 D_2 + \dots + \beta_n D_n) \Delta(S_t/Y_t) + \gamma [(S_{t-1}/Y_{t-1}) - (I_{t-1}/Y_{t-1})] + \delta(S_{t-1}/Y_t)$$

Period	Coefficient	t-stat
α	0.09	0.62
$D_1 \beta_{1926-1938}$	0.55	3.53
$D_2 \beta_{1939-1945}$	0.31	1.33
$D_3 \beta_{1946-1989}$	0.51	2.79
γ	-0.6	-1.18
δ	0.70	1.27
R^2	0.27	Stand. Error 2.54
R^2 adjusted	0.22	SSR 374.04

Table 9 Private Investment on Private Saving Regression Results

$$\Delta(\text{PI}_t/\text{Y}_t) = \alpha + (\beta_1\text{D}_1 + \beta_2\text{D}_2 + \dots + \beta_n\text{D}_n) \Delta(\text{PS}_t/\text{Y}_t) + \gamma [(\text{PS}_{t-1}/\text{Y}_{t-1}) - (\text{PI}_{t-1}/\text{Y}_{t-1})] + \delta(\text{PS}_t/\text{Y}_t)$$

Period		Coefficient	t-stat
α		1.56	1.39
$\text{D}_1 \beta_{1926-1938}$		0.46	2.31
$\text{D}_2 \beta_{1939-1945}$		-0.21	-0.83
$\text{D}_3 \beta_{1946-1989}$		-0.09	-0.41
γ		0.13	1.84
δ		-0.03	-0.42
R^2	0.18	Stand. error	2.47
R^2 adjusted	0.10	SSR	348.43

Comparing **Tables 8** and **9**, it can be seen that the β values of private saving and investment are clearly inferior to those of total saving and investment in all three sub-periods. Apparently, the relatively high investment-saving correlations are not caused by an endogenous reaction of private savings. Except for the 1926-1938 period, the values of β aren't significantly different from zero, leading one to conclude that either foreign capital must indeed have a role to play in the financing of Canadian investments, or that public saving has filled the gap. The issue of which of these last two factors has played the dominant role is precisely the issue we are concerned with.

Bayoumi's conclusion that the high correlation coefficient is the result of government intervention relies on the reasoning that if the high correlation doesn't result from the private sector, then it must come from the public sector. This

argument does not take into consideration third factors that could influence the savings and investment behaviour of *both* sectors simultaneously. We require a more direct test of government current account intervention. The model that will be employed for this purpose is adapted from the intertemporal current account model. It reflects the idea that the difference between government investment and saving is a function of the temporary deviation of the current account from its "permanent" long run level. Thus government excess saving will increase to compensate for the lack of private saving in the face of a temporary current account deficit, and will decrease when there is an excess of private savings over investment, which could lead to a current account surplus.

$$GS_t/Y_t - GI_t/Y_t = -\xi_1 (CA_t/Y_t - CA^*/Y) - \xi_2 (CA_{t-1}/Y_t - CA^*/Y) \quad (8)$$

In equation (8), GS/Y and GI/Y are public saving and investment rates respectively and $GS_t/Y_t - GI_t/Y_t$ is excess government saving. CA/Y is the current account as a percentage of GDP, and CA^*/Y is its permanent value, which also corresponds to the level desired by the government. $CA_t/Y_t - CA^*/Y$ therefore measures any temporary deviation of the current account from its permanent value. If CA^* is zero (i.e. the current account is balanced in the long run) then $CA_t/Y_t - CA^*/Y$ represents a current account deficit or surplus. The equation is lagged because it is assumed that any government intervention takes a certain amount of time to come into effect. The exact number of lags must be determined empirically. The ξ

coefficients represent the degree to which the government's excess saving responds to current account disequilibrium. This coefficient is negative because, if there is, in fact, government intervention to restore a balance of payments equilibrium, then it is only reasonable that excess government saving react in the opposite direction of the disequilibrium (in order to cancel it out).

Before continuing, however, it is necessary to clarify several points. This part of the report deals with a particular, isolated problem: the possibility of governmental current account intervention through public saving and investment. This isn't the only way that the government can influence total savings and investment - tax, monetary and tariff policy also deserve to be studied, among others. Many have raised the objection that GS/Y and GI/Y could affect private S/Y and I/Y , though raised taxes on capital, for instance. Well, in that particular case, it is the *tax* that influences PI and PS , rather than the actual level of GI and GS . We are examining exclusively the effect of the levels of GI/Y and GS/Y on the CA/Y , not the impact of the tools that were used to make government investment and saving vary in the first place. Admittedly, this is quite a restricted and incomplete view that doesn't take into consideration crowding out effects. But the whole purpose of this section is to verify Bayoumi's claim, and nothing more.

Econometrically, equation 8 is tested using the following specification:

$$GS_t/Y_t - GI_t/Y_t = a_0 + a_1 CA_t/Y_t + a_2 CA_{t-1}/Y_{t-1} \quad (9)$$

where the permanent current account level is incorporated in the constant term a_0 . a_1 and a_2 represents ξ_1 and ξ_2 respectively. If there is government balance of payment intervention, then the a coefficients should be negative, reflecting the sign of ξ . Thus we have $H_0: a < 0$, where H_0 indicates government intervention. An OLS regression was run on equation 9, using data from 1926 to 1989. The results are presented in **Table 10**.

Table 10 Regression Results

$CA_t/Y_t - CA^*/Y = a_0 + a_1 CA_t + a_2 CA_{t-1} + \varepsilon_t$			
Coefficient		Value	t-stat
a_0		-4.29	-7.21
a_1		-0.003	-1.07
a_2		0.003	0.20
R^2	0.03	Stand. error	4.64
R^2 adjusted	-0.01	SSR	1290.25

The results speak for themselves. Neither a_1 nor a_2 are significantly different from zero, so we must reject the hypothesis of active balance of payment intervention by the Canadian government. We can deduce that, in the case of Canada, government investment and savings policy does not seem to be a possible explanation for the relatively high investment-savings correlation.

X CONCLUSION

The results of this analysis suggest that the correlation approach to quantifying capital mobility, although seemingly pertinent during the periods prior to the 1960s, becomes an increasingly misleading indicator of capital mobility in recent decades. Periods of supposed high capital mobility appear to have savings-investment correlations indicating the contrary. As mentioned previously, high correlations do not in themselves indicate low short term capital mobility - a third factor could be affecting both the investment and savings rates identically. Unfortunately, many periods of high correlations exist over the last thirty years, making this measure of capital mobility quite unsatisfactory. We have, however, been able to draw the conclusion that government current account policy does not appear to play a role in explaining the relatively high investment-savings coefficients in Canada.

Several lessons can be learnt from this historical study of Canadian international capital mobility. First of all, both world wars, the roaring twenties and the post-war period until 1960, can be considered times of relative high capital mobility, whereas the results indicate that the Great Depression and the period leading up to WWII were times of low capital mobility. The conclusions are less clear concerning the period of 1870 to 1913 as well as from 1960 onwards. Both of these eras are marked by relatively high investment saving correlations, although history would lead us to believe that these were times of quite high capital mobility.

For these periods at least, the Feldstein Horioka puzzle persists. In order to obtain more conclusive results, the error-correction approach should be applied to monthly data over the past thirty years.

Although unable to resolve the puzzle of high investment-savings correlations in recent periods using annual data, the error correction approach has nonetheless demonstrated its capacity to provide a theoretically sound measurement of capital mobility. It produces correlation results that are considerably lower than those obtained from previous cross-section approaches, suggesting that capital mobility has been underestimated in earlier studies. Until a better method of quantifying capital mobility is developed, research using the error correction technique must be continued in order to obtain a better understanding of the evolution of international capital mobility in Canada and in the rest of the world.

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