Canadian Economic Development and Factor Movements before the Great Depression

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1. Introduction

The Wheat Boom Era in Canadian economic history is one characterized by the accumulation of massive amounts of both mobile factors of production, capital and labour, and rising per capita incomes. The rate of investment in Canada rose from 12% of gross national product in 1896 to a high of 34% in 1912. The domestic savings rate surpassed the ten percent barrier consistently after 1896. Foreign investors also participated in the investment boom, with foreign capital inflows rising to a high of 18% of GNP in 1912. Per capita incomes grew at an average rate of 2.6% per year from 1896 to 1929, much higher than the one percent annual growth rate experienced over 1870-1896. Did capital accumulation precede growth in incomes? Did domestic and foreign investors respond differently to changing economic conditions in Canada?

The Canadian labour market also experienced dramatic change. The number of immigrant arrivals rose from 17,000 in 1896, to almost 400,000 in 1912. During this period, emigration also rose from 37,000 in 1896 to 300,000 in 1912. It is often thought that immigrants were entering Canada as a stopover on their way to the United States. If so, the gross immigration figures would exaggerate the extent of immigration into Canada, and in a similar fashion, the gross emigration rates would exaggerate the extent

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of emigration out of Canada. To what extent were the flows of immigration and emigration linked? Did improvements in incomes draw immigrants to Canada and restrain the flow of emigrants?

This paper examines the relationship between domestic and foreign sources of capital, as well as the relationship between immigration and emigration. In addition, the relationship between rising incomes and factor movements is explored. Results obtained using time series techniques and causality testing suggest that productivity improvements led to surges in investment, funded first by domestic sources. Foreign capital flowed into Canada to join the investment booms, following the lead of domestic investors. Immigration also increased after improvements in per capita incomes in Canada. The flow of emigrants increased along with surges in immigration, but overall, rising per capita incomes led to increases in net immigration.

2. Canadian Economic Development

Statistics relating to gross national product for the Canadian economy are available back to 1870. The data show that Canadian GNP grew quite favourably in relation to that of its neighbour, the United States, in the years before the Great Depression, as shown in Table 1. The decades of noticeable growth differences were during 1870s when Canadian growth fell behind that of the US, during the 1900s when Canadian growth was stronger than that of its neighbour, and in the 1910s, when the Canadian economy faltered during the decade marked by the Great War. Even though Canadian economic performance was comparable to that of the US during the 1880-1900 period, the Canadian economy was perceived at the time to be stagnating, particularly since many Canadians were moving to the United States. Population, employment and investment data for the Canadian economy are presented in Table 2, which shows that Canada was a country of net emigration during the three decades spanning the 1871-1901 period, and then shifted into a country of net immigration at the beginning of the twentieth century. Rates of labour force growth and capital accumulation were lower before the turn of the century than afterwards.

Capital Accumulation

Canada experienced two small bursts of investment activity, in the early 1870s coinciding with the construction of the Intercolonial Railway that linked the Atlantic provinces to Central Canada, and in the 1880s with the completion of the Canadian Pacific Railway. The major surge in investment, however occurred after 1896, as shown in Figure 1. The rate of gross investment rose from an average of 15% before 1897, to a high of 34% in 1912. During the period of study, Canada's investment requirements were predominantly funded from domestic sources. Foreign capital did play an important supporting role, especially in the years just before WWI.

Green and Urquhart (1976) stated that capital accumulation was the result of increased investment demand to satisfy social overhead needs, and to equip new workers for production in the economy, as a response to massive immigration in Canada. In addition, investment was required to exploit resource discovery and technological improvements. Massive amounts of capital moved from the Old World to the New World. Taylor and Williamson (1994: 349) presented the view that capital chased European migrants to the New World economies, including Canada. Advances in technology also required massive amounts of capital (Abramovitz, 1993: 217).

The world capital market has been viewed as well-integrated in the years before WWI, especially in light of massive amounts of British capital flowing around the world in search of profitable opportunities. Zevin (1992) proposed that world markets for capital were as integrated in the late nineteenth century as they were in the late twentieth century. If capital markets were well-integrated, then capital was highly mobile and able to move to where profitable opportunities exist, to exploit new resources and meet the investment demands of new technology. However, Paterson (1976: 35) recognized the slow reaction of British investors to Canadian investment opportunities, and Carlos and Lewis (1995) raised the topic of informational asymmetries between foreign and domestic investors. These asymmetries would give rise to domestic sources of supply meeting the investment requirements of economic booms early, with foreign investors joining the investment booms later once the market had proven itself. Taylor and Williamson (1994: 367) also alluded to the crowding-out effect of world capital markets on domestic savings. This was addressed by McLean (1994), where it was found that

foreign capital inflows crowded-out domestic savings in Australia, and had a slight (but statistically insignificant) crowding-out effect on domestic savings in Canada.

In summary, the main hypotheses of capital accumulation and flows can by categorized as follows:

1. Capital accumulated in response to population and labour force growth;
2. Capital flowed in response to resource discovery and technological improvements;
3. Foreign capital chased after migrants;
4. Foreign capital followed domestic capital accumulation due to informational asymmetries; and,
5. Foreign and domestic capital were substitutes and crowded-out each other.

Migration Patterns

The gross immigration and gross emigration estimates for Canada indicate that Canada was a country with massive population movements in the years before the Great Depression. Migration rates are presented in Figure 1. Historians have tried to characterize these migration patterns experienced by Canada. The major barrier facing a satisfactory characterization of these patterns is the lack of adequate data. The official immigration series is problematic, since there are concerns about the inclusion of migrants to Canada, who came to Canadian ports, only to move on to the United States. For instance, immigrants landed in Canada in high numbers during a period of relative population stagnation in the 1880s, but many continued their migration south (Caves and Holton, 1959: 35; McInnis, 2000: 416). Many migrants arrived first in Canada to take advantage of preferential transport rates and subsidies, or to avoid US inspections, and then crossed the border to settle in the US (McDougall, 1961: 168; Ramirez, 2001: 41). Transport companies also brought migrants to Canadian ports to get Canadian government bonuses, especially during the Sifton era (Widdis, 2000: 291). There were attempts to eliminate transients from the official figures, but it was difficult to account for those who falsely declared their intent to stay in Canada before slipping across the border (McDougall 1961: 165-169). Ramirez (2001: 42) stated that about forty percent of all

passengers to the major ports of Canada moved inland before crossing the border into the US.

Regardless of transient flow, there were substantial flows of Canadians moving to the United States. Before the Wheat Boom Era, Maritimers and French Canadians were moving into New England. Upper Canadians were leaving Canada for the US due to the lack of agricultural land. The US frontier was much closer in relation to the uncertain and distant Canadian Prairies (McInnis, 1998; Ramirez, 2001: Ch. 1). In 1901, Canadian per capita income was about two-thirds of the US figure (McInnis, 1994: 153). Incentives existed for Canadians to move south.

Gross emigration rates are estimated by first estimating population growth by natural increase, and then by using population, natural increase and immigration estimates to calculate the residual of gross emigration. Gross emigration can vary widely based on birth rate and death rate assumptions. Since there is concern over the gross immigration estimates, and the estimates for the natural increase of the Canadian population, gross emigration estimates have a high degree of uncertainty.

The first major attempt at making emigration estimates was conducted by Keyfitz (1950), using English life tables, Canadian census data, gross immigration statistics, and US census and immigration data regarding the Canadian-born. He presented two sets of decadal estimates for emigration, one using the annual immigration data, and estimates of natural increase, and another using decadal changes in the Canadian and foreign-born in Canada. These estimates are shown in Tables 3 and 4. Firestone (1958) constructed annual estimates of natural increase, using records of births and deaths, supplemented by some estimates used by Keyfitz. He then used these estimates to present an annual gross emigration series using the official annual gross immigration statistics and population data. Firestone's estimates are included in Table 3.

McDougall (1961) made some adjustments to Keyfitz' decadal estimates using US life tables instead of the English life tables, and McInnis (2000) has renewed the attempt to construct a less uncertain picture of migration patterns over the census decades. The McInnis estimates are included in Table 4. The estimates that use census data have the advantage of eliminating transients from the figures, however, they have the disadvantage of excluding those migrants who arrived in Canada with the intention of

settlement, stayed for a brief period and contributed to the Canadian economy, and then left for other countries within the census decade. What is clear, regardless of the difficulties with the estimates, is that Canada was a country with substantial inflows and outflows of migrants.

What then are some of the characterizations, explanations and views of these patterns in the literature? Lower (1930: 568) stated that immigration was unnecessary, and that "except when we had large areas of vacant land to be filled up quickly, our immigrant population simply displaced the native born." Lower's thesis was that Canada was experiencing an exchange of native-born for foreign-born, and that immigration did not increase the population. Immigrants were willing to accept lower wages than natives, and thus drove out Canadians, forcing them to move south. Coats (1936: 280) wrote that Canadians were being displaced by foreigners in white-collar jobs, and noted "that a big exodus of Canadian-born comes after, rather than before a big immigration movement." Caves and Houlton (1959: Ch. 4) estimated a statistical model of the Canadian economy using data representing five-year periods with 11 observations, and suggested that the estimation results supported the Lower displacement theory, as they found that past gross immigration had predictive power over gross emigration.

Lower did not highlight that higher wages in the US caused the emigration of Canadians. Per capita incomes in Canada have been consistently lower than those in the US. Ramirez (2001: 51) stated that there was anti-immigration backlash in the United States when it was thought that French Canadians were displacing the US-born, because French Canadians were willing to accept lower wage rates than US residents. If the displacement thesis applied to Canada, perhaps it also applied to Canadian migrants in the US. Like immigrants to Canada, Canadians were searching for better employment prospects. English-Canadians were represented at the top levels of the US labour market, in business, professions, and skilled trades (Ramirez, 2001: 32, 185).

If Canadians were moving to the US in search of better opportunities, they may have left behind opportunities for immigrants to Canada. Dales (1966: 43-45) presented the replacement theory of immigrants, whereby foreigners migrated to Canada to take jobs that were available after a Canadian-born exodus. This may also occur when

Canadians are not willing to fill the available employment vacancies in Canada, especially unskilled jobs in remote locations (Ramirez, 2001: 65).

The hypotheses of migration flows and the relationship between immigration and emigration in Canada can be categorized as follows:

1. Immigrants displaced Canadian residents leading to the emigration of Canadians;
2. Immigrants replaced Canadian emigrants; and,
3. Immigrants flowed through Canada in a stage migration process staying for very short, or long periods of time, with Canadian residents as bystanders to the migration patterns.

The main objective of this study is to try to uncover the relationship between per capita income growth, migration patterns, and capital accumulation from domestic and foreign sources. Do the factors of production accumulate before improvements in per capita incomes, or after? Is there a difference between the patterns of domestic investment and foreign investment in Canada? Does foreign investment crowd-out domestic investment? How does income growth affect the patterns of immigration and emigration? Does domestic income growth cause increases in immigration, and decreases in emigration? Do increases in immigration lead to increases in emigration or vice-versa? The next section describes the methodology and presents econometric results to help answer these questions.

3. Methodology

Consider a simple, constant returns to scale production function, that relates output to the factor inputs, capital and labour:

$$Y_t = F(K_t, L_t) = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

It is important to note that other factors may influence production, including resource discoveries, technological improvements, and economies of scale. These items are accounted for in the Solow residual, as multifactor productivity. The effect of these items is subsumed into the variable A_t.

Labour input may be defined as the product of the population times the average level of human capital in production:

$$L_t = H_t N_t . \tag{2}$$

Given this description of production, output is increased by multifactor productivity gains, capital investment, or increases in labour. The two main factors of production will be encouraged to accumulate based on their returns, r_t for capital owners, and w_t for labourers, expressed as a rate per unit:

$$r_t = F_1(K_t, L_t) - \delta_t = \alpha A_t K_t^{\alpha-1} L_t^{1-\alpha} - \delta_t \tag{3}$$

$$w_t = F_2(K_t, L_t) = (1-\alpha) A_t K_t^{\alpha} L_t^{-\alpha} \tag{4}$$

Factors will face improved conditions to accumulate and earn higher returns when multifactor productivity improves, or when the other factor of production increases.

The production function may be described in per capita terms:

$$\frac{Y_t}{N_t} = A_t \left(\frac{K_t}{N_t}\right)^{\alpha} \left(\frac{L_t}{N_t}\right)^{1-\alpha} = A_t \left(\frac{K_t}{N_t}\right)^{\alpha} H_t^{1-\alpha} \tag{5}$$

Output per person can rise due to improvements in multi-factor productivity, per capita physical capital, and per capita productive human capital. How then are economic growth, investment, and migration related? Migration will be influenced by changes in the returns to labour, and thus by changes in multifactor productivity and investment. Investment will be influenced by changes in the returns to capital, and thus by changes in multifactor productivity and labour. In the case where migration affects the average per capita productive human capital in the economy, output per capita will be affected, as will the incentives for investment.

Data

Canadian gross national product, gross investment, foreign capital inflow, population, and immigration data are available on an annual basis dating back to 1870. Labour force or employment data are only available in census years during the period of interest to this study. Data relating to capacity utilization, technological improvements, and natural resources are not available. Migration is the demographic variable that best reflects conditions in the labour market. In Table 2, it appears that population growth and

employment growth by decade move in a similar manner, however, employment growth more closely resembles changes in net migration. Tables 3 and 4 show that after 1911, both employment growth and net migration dropped off, whereas the other component of population growth, natural increase, rose after 1911. Migration is generally concentrated among working-age adults. When labour market conditions are poor, labour can and will move to a location thought to have better job opportunities. When labour market conditions are favourable, domestic workers have less incentive to move, and foreign workers may choose to move in.

The investment series is split into two components, long-term foreign capital inflows and domestic investment. Traditionally, gross domestic capital formation is decomposed into foreign capital inflows, which are equivalent to the current account deficit, and domestic savings, which are measured as the residual of gross domestic capital formation less foreign capital inflows. In the national accounts, gross domestic capital formation covers purchases of durable physical productive assets, including buildings, machinery and equipment, as well as residential buildings, but does not include items like farm land-clearing, livestock, and consumer durables. The items included in capital formation are mostly long-lived assets, requiring long-term investment commitments. Accordingly in the analysis that follows, the foreign component of investment is defined as long-term foreign capital inflows in order to abstract from any short-term items in the capital account. The domestic investment figures are the residual of gross investment less long-term foreign capital inflows, and refers to the portion of investment financed domestically.

This study aims to uncover the effects of economic development and investment on migration and vice-versa. The relationships between output, Y, investment, V (and by extension, investment related to domestic and foreign supply) and migration, M (and its forms, immigration and emigration) on a per capita basis are described by the following functional forms:

$$\frac{Y}{N} = f(\frac{V}{N}, \frac{M}{N}, X); \tag{5}$$

$$\frac{V}{N} = f(\frac{M}{N}, X); \tag{6}$$

$$\frac{M}{N} = f(\frac{V}{N}, X). \quad (7)$$

Here, X represents factors other than investment and migration, including natural resource discovery and use, technological improvements, and domestic changes in labour that do not cause, or are not caused by, a shift in immigration or emigration (e.g. any change in employment rates). These X-factors have a strong influence over output and are assumed to be closely correlated with output, but are not measured.

There is often feedback between output and investment in empirical studies. It appears that output can serve as a proxy for these factors that affect multi-factor productivity. As a result, it becomes apparent that it is not possible to determine *a priori* which of the variables in the system of equations (5)-(7) is exogenous. Some of these variables may also experience periods of delayed response to changes in other variables. For instance, there may be a delay for investment to influence output, especially for large-scale capital projects. Under the displacement theory, immigrants displace natives and cause emigration with a period of delay. Similarly, under the replacement theory, emigration causes future immigration. Migration also often exhibits chain effects. In the case of capital accumulation, foreign investors may react slowly to booming economic conditions if domestic investors have an informational advantage over foreign investors. Thus, the VAR methodology will be used to examine the dynamic relationships between these variables.

Econometric Analysis

The variables of interest for this study are: the natural logarithm of real output per capita, denoted by y; the natural logarithms of real gross investment, real long-term foreign capital investment, and real domestic investment, all in per capita terms, denoted by v, f, and s respectively; and the rates of net migration, immigration, and emigration, denoted by m, i, and e. Please see the appendix for a description of the data and their sources.

Several of these series exhibit patterns of growth over time, specifically the output and the three investment series. In order to avoid the possibility of a spurious regression, Augmented Dickey-Fuller and Phillips-Perron tests were conducted to determine whether or not the series were trend-stationary or difference stationary. Each series was regressed

on a constant and a time trend, and the residuals were tested under the null hypothesis of non-stationarity. These test results are presented in Table 5. The test results suggest that all time series are trend-stationary.

Vector autoregressive modeling was used in light of the questionable exogeneity of any of the variables. The model was estimated as follows:

$$Z_t = \sum_{i=1}^{q} \Gamma_i Z_{t-i} + \lambda D_t + \varepsilon_t, \qquad \varepsilon_t \sim \text{Niid}(0,\Omega), \tag{8}$$

where Z_t is a $p\times1$ matrix of the p variables of interest in the system of equations, and D_t is a 3×1 matrix of deterministic series, including a constant term, a time trend, and a dummy variable set to 1 during the First World War (1914-1918), and 0 otherwise. Granger-causality tests were then conducted to suggest which variables had a leading influence on others.

The first system of equations to be examined was (y, v, m), to explore the relationships between output, investment, and net migration. The Akaike and Schwartz test statistics were computed to identify the optimal lag length for the system, to avoid over-parameterization. The Akaike criterion is minimized with a lag length of two, while the Schwartz criterion is minimized with a lag length of only one. Econometric results suggest a significant lag structure at the second lag, and since the Schwartz criterion is more biased than the Akaike criterion against long lag structures, an optimal lag length of two was chosen (q=2). The Akaike and Schwartz test statistic for all systems of equations examined in this study are presented in Table 6. The regression and Granger-causality test results are presented in Table 7. The causality test results at the bottom of the table show that past values of output per capita have predictive power for the net migration rate, and for investment per capita. These results suggest that changes in per capita incomes led changes in both investment and net migration, and that there is no causal relationship between investment and net migration.

In order to examine relationships between the components of investment and migration, along with income, the system of equations was expanded to include five variables (*y, s, f, i, e*). Expanding the system proved problematic since the Akaike test statistic continually decreased with increasing lag length. The difficulty with a large lag length is that the degrees of freedom fall dramatically, especially in this study where

there are only 58 observations. For example, the maximum lag length tested was 6, at which the Akaike test statistic was minimized, and when q=6 the degrees of freedom were 19. On the other hand, the Schwartz test statistic was minimized at a lag length of one. Granger-causality testing then proceeded with q=1. However these results must be treated with caution because of the Akaike test results, which are suggestive of a longer lag structure. The Granger-causality test results are presented in Table 8 (the regression results are not presented). The results suggest that output Granger-caused domestic investment and gross immigration, and that domestic investment Granger-caused foreign investment. Further testing revealed that there appears to be no causal relationship between the investment measures and the migration measures. Domestic and foreign investment had no effect on either immigration or emigration, and immigration and emigration had no effect on either domestic or foreign investment measures.

Next, the system was split to examine the relationships between output and the components of investment (*y, s, f*), and to examine the relationships between output and the components of migration (*y, i, e*). Table 9 presents the results for the system that includes per capita real income, and per capita real domestic and foreign investment. The residual cross-correlations show that income innovations were positively correlated with domestic and foreign investment innovations, although the correlation is much stronger between income and domestic investment. The causality test results suggest that productivity developments preceded changes in domestic investment, and that domestic investment led foreign investment.

The negative correlation between domestic and foreign investment innovations is suggestive of a contemporaneous crowding-out effect or compensatory effect. One may infer that when domestic savings accumulated to finance investment projects in Canada, foreign capital was crowded-out in the short-term. Similarly, when foreign capital flows diminished, domestic investment partially compensated for this decline to meet Canadian investment requirements. This appears to be the case immediately after 1896 as shown in Figure 1. These results also suggest that when foreign capital flowed in, domestic investment was crowded out in the short-term, and when domestic savings slacked, foreign investors were able to meet investment demand. Figure 1 shows this pattern from the middle of the first decade of the twentieth century till 1913. However, domestic

investment had a delayed positive impact on foreign investment on the whole. Increases in domestically-financed investment led to increases in foreign investment.

The relationships between per capita incomes and migration measures are reported in Table 10. The Granger-causality test results suggest that there is bi-directional feedback between the gross immigration rate and per capita incomes, and that gross immigration leads gross emigration. The results for the income regression indicate that gross immigration has a statistically significant effect on income. The overall impact of immigration on per capita incomes is positive. Although statistically insignificant, the overall impact of emigration on per capita incomes is negative. There are also implications concerning the different signs of the coefficients over time. The first lagged effect of immigration on income is negative, suggesting that the inflow of migrants reduces per capita incomes, but the second and third period effects of immigration on income are positive. In a similar fashion, the first lag of emigration has a positive effect on per capita incomes, but second and third period effects are negative. This suggests that immigration first reduces per capita incomes, perhaps because immigrants do not effectively integrate in the Canadian economy right away, but later become strong contributors to increase per capita incomes. At the same time, emigration first results in an increase in per capita incomes, as the labour market tightens with less underemployed labour, but emigration later results in lower per capita incomes, as their productivity is lost to foreign countries. These inferences may also be derived from the regression results for the system of income, net migration, and investment – net migration had a negative first-period effect on per capita incomes, then a positive second-period effect, and overall, the impact of net migration on per capita income was positive, although statistically insignificant.

There is no evidence from these results that per capita income changes had a significant effect on gross emigration – the results do not suggest that rising per capita incomes curtail gross emigration in the aggregate. There is a positive cross-correlation between income and gross emigration, but the relationship between immigration and emigration is overwhelmingly dominant. It must be noted, however, that the relationship between income and net migration is a positive one, as shown in Table 7. Those results indicate that improvements in per capita incomes led to increased net migration. The

point estimates in Table 7 indicate that one-percent rise in per capita incomes resulted in an increase in the net immigration rate of 0.06 percentage points. The point estimates in Table 10 indicate that a one-percent rise in per capita incomes caused an increase in the gross immigration rate of 0.10 percentage points, and an increase in the gross emigration rate of 0.03 percentage points. So the effect on the net immigration rate was 0.07 percentage points, when net migration was separated into its components.

The cross-correlation statistics show that there is a strong contemporaneous correlation between innovations to gross immigration and gross emigration. As shown in Figure 2, when the gross immigration rate is large, so too is the gross emigration rate. This may be the result of flow-through migration, where Canada is not really the intended destination of immigrants, but that migrants are passing through Canada to settle in the United States. The effect of immigration lagged one period on emigration is negative, while the effect of the third lag of immigration is positive. One might interpret this as slight evidence that when immigration rises, many of these immigrants may flow through Canada to the United States immediately, but immigration has the lagged first period effect of reducing emigration. This may be a sign that improved labour conditions caused an initial immigration surge, and that Canadians and recent immigrants were more likely to stay the following year, also due to improved conditions. The positive third period impact of immigration on emigration may be a delayed effect on emigration, perhaps due to delayed re-migration because conditions in Canada were not as favourable as expected. This may have also been the result of return migration. This result might be interpreted as supporting the Lower displacement thesis, but these competing theories can not be evaluated in this type of study given the available data. Overall, the impact of a rise in immigration was increased emigration.

Even though statistically insignificant, the total effect of gross emigration on gross immigration was found to be positive, and the cross-correlation between immigration and emigration was also found to be positive. There is minimal (and statistically insignificant) evidence to support the displacement hypothesis that higher rates of emigration led to higher rates of immigration.

Discussion

The examination of the relationships between income, investment, and migration measures uncovered several interesting features of Canadian development in the years leading up to the Great Depression. The results consistently showed that per capita income changes had a strong impact on investment, specifically from domestic sources of supply, and on net and gross immigration patterns. Capital and labour appeared to be equally mobile and responsive to productivity developments. Capital and labour moved to where the opportunities seemed best, and not simply in response to movements in the other factor of production.

Domestic and foreign investment crowded-out each other in the very short-term (within one year). However, for periods longer than a year, domestic investment had a positive effect in attracting foreign investment to Canada. Surges in investment in Canada were first met by domestic sources of supply, which were later joined by surges in foreign investment. Similarly, when domestic investment funds declined, foreign capital partially compensated to meet investment requirements, but soon after reacted by declining as well. This lends support to the hypothesis that foreign investors were at a disadvantage compared to their domestic peers in evaluating capital investment opportunities in Canada. Perhaps as a result of such asymmetries, much foreign capital went to meet safe portfolio investment into social overhead in Canada. More than eighty percent of British money calls over 1865-1914 consisted of social overhead capital and safe government and government-backed debt, including railway finance (Simon, 1970: 242). In contrast, US investors had better information than British investors due to their geographical proximity (Field, 1914: 23-24). US investment was mostly direct investment, and in industrial and resource sectors of the economy (Lewis, 1938: 577-606; Viner, 1924: 303). The evidence on capital flows also indicates that foreign capital was not simply chasing migrants, but rather the prospect of profitable opportunities.

Gross immigration and net immigration surges corresponded with rising per capita incomes. Improvements in productivity in Canada provided the incentives for labour to move to Canada. Immigration and emigration patterns were tightly correlated. While the statistical evidence indicated that immigration Granger-caused emigration, the supporting statistical evidence cannot distinguish between the two competing hypotheses

that immigrants displaced Canadians, or that immigrants to Canada engaged in step or flow-through migration on their way to the US. Evidence that would be supportive of the replacement hypothesis is statistically insignificant. Overall, immigration and emigration were tied together very closely in the very short-term (within one year), and immigration rates had a leading effect on emigration rates for up to three subsequent years. The migration estimates that use the official gross immigration series presented in Table 3, and the migration estimates that use the census populations of Canadian and foreign-born in Table 4 indicate that Canada was a country with large movements into, out of, and through its borders. Canada was part of a large North American labour market where people were, for the most part, free to choose where to move.

4. Conclusion

Canada experienced a period of tremendous growth in per capita incomes, investment, employment, and net migration in the years leading up to the Great Depression. Both capital and labour accumulated and migrated in massive amounts to Canada during this period. It is has been uncertain whether one factor of production led the charge in and to Canada. It is commonly believed that foreign capital followed migrants to the New World including Canada, implying that foreign labourers had better information than foreign investors regarding Canadian economic development. There are also competing hypotheses that describe the patterns of migration to, from, and through Canada during this period.

The purpose of this paper was to uncover the relationships between the macroeconomic and demographic series of per capita income, investment (also decomposed into domestic and foreign sources of supply), and migration (along with gross immigration and emigration components). Vector autoregressive modeling techniques and Granger-causality tests were used to this end. The results presented in this paper shed light on some of the hypotheses of Canadian economic development. The factors of production both moved quickly to exploit opportunities in Canada. The movement of these factors was not closely tied to each others' movements, but rather to productivity developments in Canada.

Investors sought out profitable opportunities in Canada, but domestic investors took the lead in Canadian investment cycles. Foreign capital did not simply chase migrants to Canada, but were more closely tied to movements in the domestic supply of investment funds. Foreign investors joined the investment booms rather than start them. It appears that foreign investors either waited for proof of sustained growth in the Canadian economy, or suffered from an informational disadvantage in relation to their Canadian counterparts.

When Canada experienced strong economic growth, more migrants came and stayed in Canada, than residents who left. Canada experienced net immigration during periods of strong growth, and net emigration during periods of slow growth. Emigration patterns were closely tied with immigration patterns, and immigration had delayed positive effects of emigration. However, given the available data, it is not possible to say that the econometric evidence supports the displacement or flow-through hypotheses of the relationship between immigration and emigration, to the exclusion of the other. Canada was a country with significant flows both in to, out of, and through its borders.

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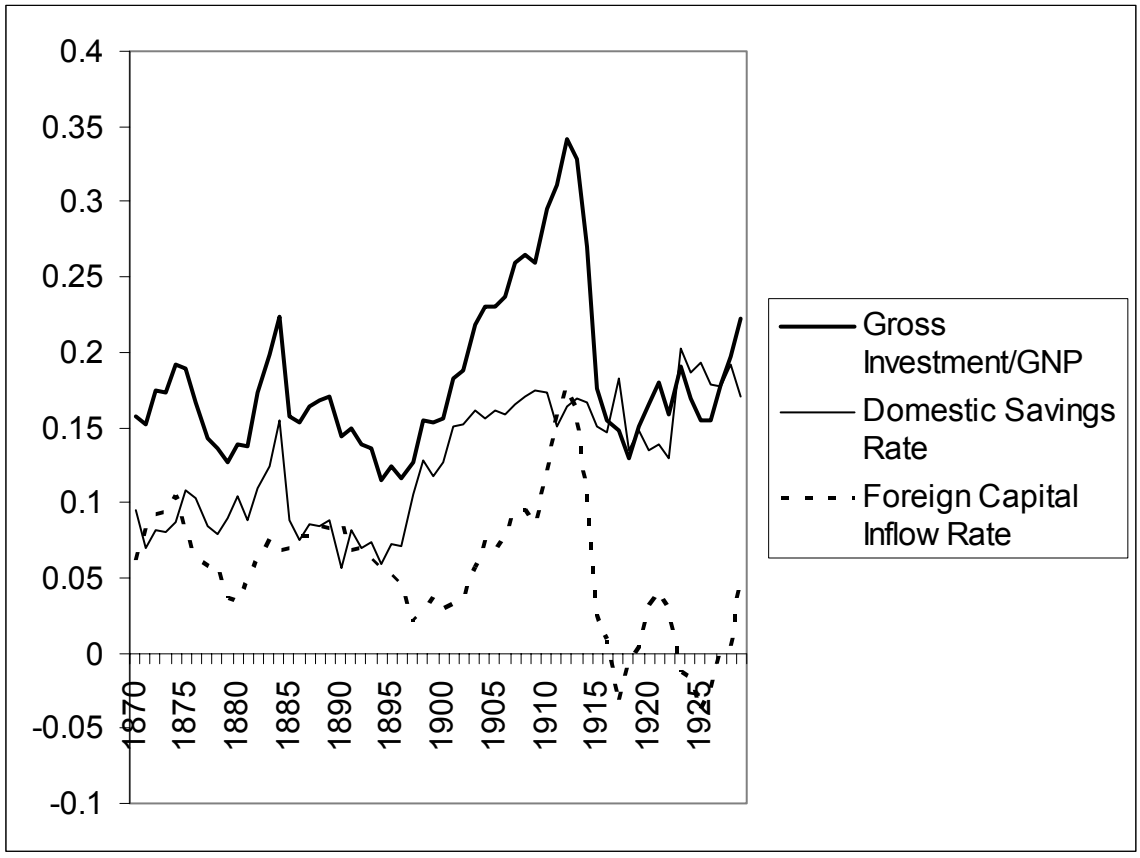

Figure 1: Gross Investment, Domestic Savings, and Foreign Capital Inflow Rates, Canada, 1870-1929.
Sources: Urquhart and Buckley (1983), Urquhart (1993).

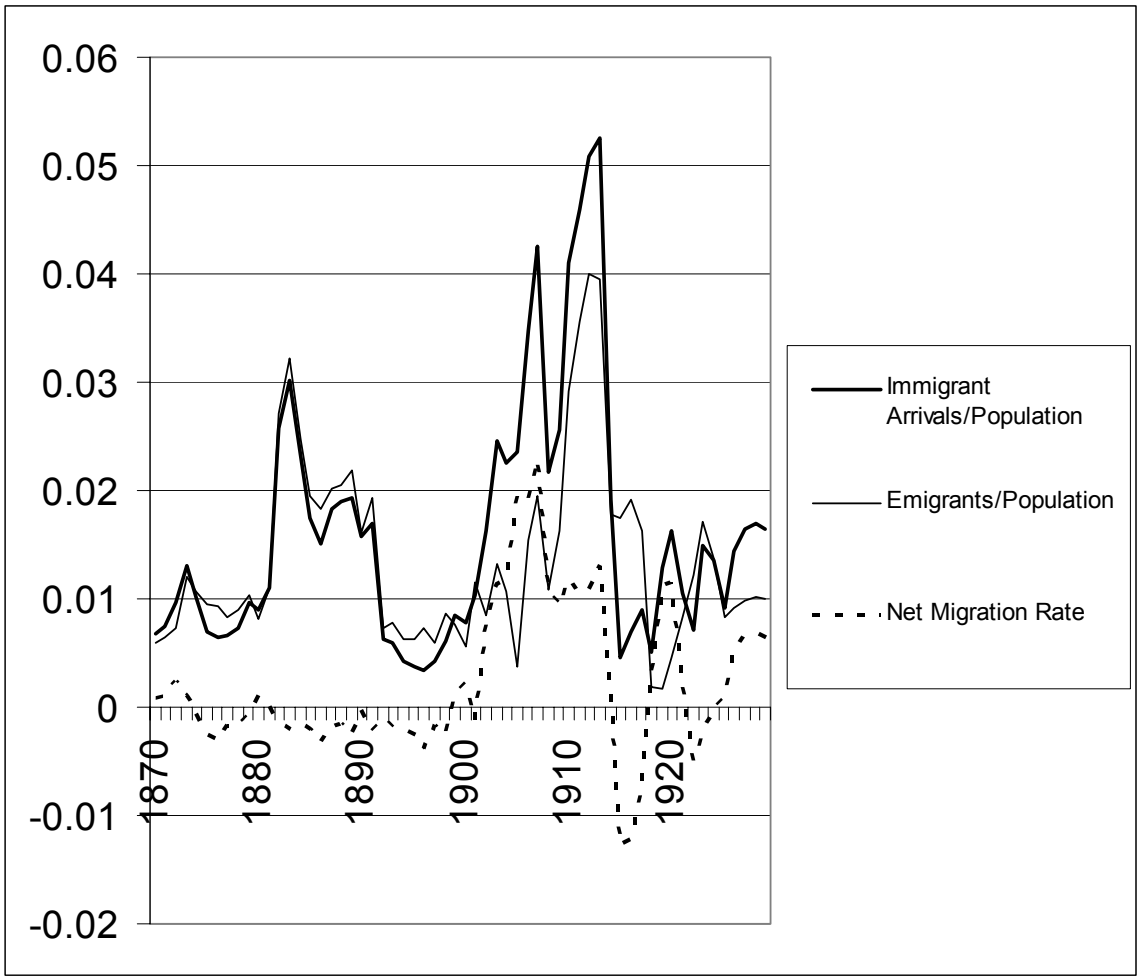

Figure 2: Migration Rates, Canada, 1870-1929.
Sources: Urquhart and Buckley (1983), and Firestone (1958).

Table 1: Canadian and US Annual Growth Rates of Real GNP (in percentages)

	Canada	US
1871-80	2.5	5.7
1880-90	3.3	3.5
1890-1900	3.4	3.6
1900-10	6.1	3.8
1910-20	1.6	2.5
1920-25	4.6	4.7

Source: Urquhart (1993: Table 1.7)

Table 2: Population Growth, Employment Growth, and Gross Investment

	Population Growth (in thousands, by decade)	Employment Growth (in thousands, by decade)	Average Annual Gross Domestic Capital Accumulation Rate (in percentages)
1871-81	636	233	15.9
1881-91	508	231	16.9
1891-1901	538	214	13.7
1901-11	1,836	902	23.6
1911-21	1,581	416	21.7
1921-31	1,589	549	18.1

Sources: Population data is from Urquhart and Buckley (1983), employment data is from Urquhart (1987: Table 3), and gross domestic capital formation rates are derived from Urquhart (1993) and Urquhart and Buckley (1983). See the appendix for more information.

Table 3: Estimates of Migration Flows using Annual Figures (in thousands)

Decade	Keyfitz (1950)			Firestone (1958)		
	IM	EM	NI	IM	EM	NI
1871-81	353	438	-85	391	411	-20
1881-91	903	1,108	-205	968	1,055	-87
1891-1901	326	507	-181	395	474	-79
1901-11	1,782	1,066	715	1,975	1,128	847
1911-21	1,592	360	233	1,804	1,561	243
1921-31	1,198	1,095	103	1,258	1,002	256

Notes: IM, EM, and NI refer to the estimates for Immigrants, Emigrants, and Net Migration respectively. Keyfitz figures refer to the population aged 10 years and over.

Table 4: Estimates of Migration using Census Data (in thousands)

	Keyfitz (1950)			McInnis (2000)		
	IM	EM	NI	IM	EM	NI
1871-81	45	129	-85	137	410	-273
1881-91	98	303	-205	273	529	-256
1891-1901	112	293	-181	271	554	-283
1901-11	893	177	715	1,214	610	604
1911-21	471	238	233	855	572	283
1921-31	463	360	103	748	550	198

Notes: IM refers to net migration of the foreign-born, EM to net migration of the Canadian-born, and NI to net migration, for the Keyfitz figures, and for the McInnis figures for 1871-1901. The McInnis data for 1901-1931 makes no such distinction between the Canadian-born and Foreign-born.

Table 5: Unit Root Tests (1870-1929)

Variable	Augmented Dickey-Fuller Test Statistic (Number of lags)	Phillips-Perron Test Statistic
y	-2.675 (0)**	-2.764**
v	-2.482 (1)**	-2.039**
f (1870-1927)	-1.873 (1)*	-3.566**
s	-2.884 (1)**	-4.174**
m	-3.028 (7)**	-2.896**
i	-2.846 (6)**	-2.816**
e	-2.784 (0)**	-2.961**

Notes: The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were performed on the residuals of the regressions, $X_t = \alpha + \beta t + u_t$, where $X = y, v, f, s, m, i,$ or *e*. The test statistics correspond to test regressions without mean or drift. The symbols * and ** denote statistical significance at the 0.10 and 0.05 levels respectively. The critical values for significance levels of 0.10 and 0.05 are –1.62 and -1.95. The number of lags used in each of the ADF tests was determined by using the Akaike and Schwartz criteria, and is indicated in parentheses. An insignificant test statistic indicates that the null hypothesis of non-stationarity cannot be rejected at the given significance level. All series were found to be trend-stationary.

Table 6: Akaike and Schwartz Test Results (1874-1929)

System	VAR (q=1)	VAR (q=2)	VAR (q=3)	VAR (q=4)
(*y, v, m*)	AK: -21.930 **SC: -21.605**	**AK: -21.964** SC: -21.313	AK: -21.889 SC: -20.913	AK: -21.712 SC: -20.410
(*y, f, s, i, e*)*	AK: -32.663 **SC: -31.742**	AK: -32.706 SC: -30.864	AK: -32.780 SC: 30.017	AK: **-32.897** SC: -29.214
(*y, f, s*)*	**AK: -10.442** **SC: -10.111**	AK: -10.242 SC: -9.579	AK: -9.990 AK: -8.996	AK: -9.834 SC: -8.508
(*y, i ,e*)	AK: -27.670 **SC: -27.344**	AK: -27.813 SC: -27.162	**AK: -27.827** SC: -26.850	AK: -27.670 SC: -26.368

Notes: * indicates that the sample was reduced to (1875-1927). Statistics in boldface indicate where the criteria was minimized. The Akaike information criterion (AK) and Schwartz criterion (SC) are calculated as:

$\text{AK}(q) = \ln\left|\Omega_q\right| + \frac{2m^2 q}{n}$, and $\text{SC}(q) = \ln\left|\Omega_q\right| + \frac{m^2 q \ln(n)}{n}$, where *q* is the lag length of the VAR, Ω is the estimated residual covariance matrix from the VAR(*q*), *m* is the number of equations in the system, and *n* is the common sample size. The optimal lag length is chosen as that in which the criteria are minimized.

Table 7: Regression and Granger-causality Test Results for (*y, v, m*), 1872-1929

Regressor or Statistic	**Results for y_t (Standard error) [p-value]**	**Results for v_t (Standard error) [p-value]**	**Results for m_t (Standard error) [p-value]**
y_{t-1}	**0.869**	**1.429**	**0.029**
	(0.198)	**(0.386)**	**(0.011)**
y_{t-2}	-0.215	**-0.709**	0.002
	(0.173)	**(0.339)**	(0.010)
Sum of coeffs.	*0.654*	*0.720*	*0.032*
v_{t-1}	0.034	**0.660**	-0.004
	(0.087)	**(0.169)**	(0.005)
v_{t-2}	0.005	0.002	0.002
	(0.078)	(0.153)	(0.004)
Sum of coeffs.	*0.039*	*0.662*	*-0.002*
m_{t-1}	-3.627	-3.335	**0.715**
	(2.603)	(5.089)	**(0.146)**
m_{t-2}	4.070	9.252	-0.254
	(2.500)	(4.887)	(0.140)
Sum of coeffs.	*0.443*	*5.918*	*0.461*
Constant	2.264	-3.342	**-0.215**
	(1.167)	(2.281)	**(0.065)**
Time trend	**0.006**	-0.005	**-0.0005**
	(0.003)	(0.006)	**(0.0002)**
WWI dummy	0.0003	**-0.257**	**-0.011**
	(0.048)	**(0.093)**	**(0.003)**
Adjusted R^2	0.970	0.949	0.774
Box-Pierce-Ljung test for first order autocorrelation - χ^2 (1)	0.147 [0.701]	0.061 [0.805]	0.0002 [0.989]
Box-Pierce-Ljung test for autocorrelation - χ^2 (18)	14.076 [0.724]	10.298 [0.922]	13.808 [0.742]
H_o: *W* does not Granger Cause *X*	***X* = *y*** ***F*-statistic [p-value]**	***X* = *v*** ***F*-statistic [p-value]**	***X* = *m*** ***F*-statistic [p-value]**
W* = *y	---	**6.928** **[0.002]**	**4.856** **[0.012]**
W* = *v	0.203 [0.817]	---	0.322 [0.726]
W* = *m	1.411 [0.254]	2.123 [0.131]	---
***W* = [*v m*] ^{T}**	1.591 [0.192]	---	---
	(*y*,*v*)	**(*y*,*m*)**	**(*v*,*m*)**
Cross-Correlation of residuals	0.714	0.473	0.264

Table 8: Granger-causality Test Results for (*y, s, f, i, e*), 1871-1927

H_o: *W* does not Granger Cause *X*	***X = y*** ***F*-statistic [p-value]**	***X = s*** ***F*-statistic [p-value]**	***X = f*** ***F*-statistic [p-value]**	***X = i*** ***F*-statistic [p-value]**	***X = e*** ***F*-statistic [p-value]**
W = y	---	**9.220 [0.004]**	1.854 [0.180]	**10.522 [0.002]**	0.777 [0.382]
W = s	2.537 [0.117]	---	**9.706 [0.003]**	0.038 [0.846]	0.006 [0.941]
W = f	0.861 [0.358]	2.579 [0.115]	---	1.179 [0.283]	2.371 [0.130]
W = i	0.658 [0.421]	0.308 [0.582]	0.770 [0.384]	---	0.993 [0.324]
W = e	0.085 [0.772]	0.011 [0.916]	0.002 [0.962]	3.243 [0.078]	---
***W*=[*s f i e*]^T**	0.643 [0.635]	---	-=--	---	---
***W*=[*s f*]^T**	1.268 [0.290]	---	---	0.732 [0.486]	1.692 [0.195]
***W*=[*i e*]^T**	0.443 [0.644]	0.465 [0.631]	0.955 [0.392]	---	---
Cross-correlation		*s*	*f*	*i*	*e*
y		0.489	0.192	0.620	0.452
s		---	-0.469	0.476	0.486
f				0.074	0.006
i					0.813

Table 9: Regression and Granger-causality Test Results for (*y, s, f*), 1871-1927

Regressor or Statistic	**Results for y_t (Standard error) [p-value]**	**Results for s_t (Standard error) [p-value]**	**Results for f_t (Standard error) [p-value]**
y_{t-1}	**0.626**	**1.900**	-2.075
	(0.155)	**(0.577)**	(1.332)
s_{t-1}	0.052	0.101	**1.747**
	(0.040)	(0.148)	**(0.342)**
f_{t-1}	0.005	0.067	**0.541**
	(0.013)	(0.049)	**(0.114)**
Constant	**2.394**	**-9.357**	8.080
	(0.939)	**(3.494)**	(8.074)
Time trend	**0.006**	-0.013	-0.002
	(0.002)	(0.008)	(0.019)
WWI dummy	0.021	**-0.368**	-0.150
	(0.035)	**(0.132)**	(0.305)
Adjusted R^2	0.967	0.815	0.565
Box-Pierce-Ljung test for first order autocorrelation - χ^2 (1)	0.543 [0.461]	0.275 [0.600]	0.129 [0.719]
Q test for autocorrelation - χ^2 (18)	13.512 [0.760]	8.688 [0.967]	9.421 [0.949]
H_o: *W* does not Granger Cause *X*	***X* = *y*** ***F*-statistic [p-value]**	***X* = *s*** ***F*-statistic [p-value]**	***X* = *f*** ***F*-statistic [p-value]**
W* = *y	----	**10.858** **[0.002]**	2.426 [0.126]
W* = *s	1.718 [0.196]	---	**26.078** **[0.000]**
W* = *f	0.161 [0.690]	1.817 [0.184]	---
***W* = [*s f*] ^{T}**	0.861 [0.429]	---	---
	(*y*,*s*)	**(*y*,*f*)**	**(*s*,*f*)**
Cross-Correlation of residuals	0.497	0.162	-0.483

Table 10: Regression and Granger-causality Test Results for (*y, i, e*), 1873-1929

Regressor or Statistic	**Results for y_t (Standard error) [p-value]**	**Results for i_t (Standard error) [p-value]**	**Results for e_t (Standard error) [p-value]**
y_{t-1}	**0.850**	**0.046**	0.021
	(0.172)	**(0.016)**	(0.014)
y_{t-2}	0.055	-0.011	-0.014
	(0.209)	(0.019)	(0.017)
y_{t-3}	-0.233	0.010	0.005
	(0.161)	(0.015)	(0.013)
Sum of coefficents	*0.673*	*0.045*	*0.012*
i_{t-1}	-2.100	0.480	-0.217
	(2.882)	(0.261)	(0.232)
i_{t-2}	1.050	-0.271	-0.003
	(3.569)	(0.324)	(0.287)
i_{t-3}	4.062	0.359	0.395
	(2.568)	(0.233)	(0.206)
Sum of coefficents	*3.013*	*0.569*	*0.175*
e_{t-1}	1.397	0.297	**0.962**
	(3.170)	(0.287)	**(0.255)**
e_{t-2}	-2.538	-0.096	-0.177
	(3.914)	(0.355)	(0.314)
e_{t-3}	-1.945	-0.075	-0.186
	(2.827)	(0.256)	(0.227)
Sum of coefficents	*-3.086*	*0.125*	*0.600*
Constant	**2.336**	**-0.313**	-0.084
	(1.091)	**(0.099)**	(0.088)
Time trend	**0.006**	**-0.0007**	-0.0002
	(0.003)	**(0.0003)**	(0.0002)
WWI dummy	-0.006	**-0.021**	**-0.011**
	(0.048)	**(0.004)**	**(0.004)**
Adjusted R^2	0.969	0.777	0.678
Box-Pierce-Ljung test for first order autocorrelation - χ^2 (1)	0.015 [0.903]	0.513 [0.474]	0.015 [0.901]
Q test for autocorrelation - χ^2 (18)	9.927 [0.934]	11.909 [0.852]	6.448 [0.994]
H_o: *W* does not Granger Cause *X*	***X* = *y*** ***F*-statistic [p-value]**	***X* = *i*** ***F*-statistic [p-value]**	***X* = *e*** ***F*-statistic [p-value]**
W* = *y	---	**4.327**	0.821
		[0.009]	[0.489]
W* = *i	**2.967**	---	**3.188**
	[0.042]		**[0.033]**
W* = *e	1.269	0.511	---
	[0.296]	[0.677]	
	(*y*,*i*)	**(*y*,*e*)**	**(*i*,*e*)**
Cross-Correlation of residuals	0.576	0.304	0.796

Appendix: Data Sources

The data was taken from Urquhart (1993), Urquhart and Buckley (1983), and Dick and Floyd (1992). The number of immigrant arrivals and the population figures are from Urquhart and Buckley (1983). The number of emigrants is from Firestone (1958: Table 83). The income series was constructed using the GNP series from Urquhart (1993) from 1870 to 1926, and from Urquhart and Buckley (1983) from 1926 to 1929. In 1926, the series was spliced, taking averages of the overlapping series. The investment series corresponds to the gross domestic capital formation series in Urquhart (1993) from 1870 to 1926, and in Urquhart and Buckley (1983) from 1926 to 1929. In 1926, the series was spliced, using the average of the two overlapping series. Long-term foreign capital inflows were taken from Dick and Floyd (1992: 190-1) for 1871-1913, from Urquhart (1993: 19-23), for 1870, and 1914-1926, and from Urquhart and Buckley (1983), series G98, for 1927-1929.The domestic investment series was calculated as a residual of gross investment less long-term foreign capital inflows. Series were converted into real values using the GDP deflator provided in Urquhart (1988), with 1981 as the base year.