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Migration Flows and Capital Movements**

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## ABSTRACT

### Equipping Immigrants: Migration Flows and Capital Movements<sup>\*</sup>

Both policy makers and researchers have devoted considerable attention in recent years to the large current account and capital account imbalances among OECD countries. In particular, the size of the United States current account deficit has attracted intense attention and spawned numerous explanations. There are undoubtedly many reasons for this deficit, including government fiscal policy imbalances, but one explanation that has not previously received much attention is that current account deficits and the matching capital inflows are responses to international flows of labor. Migrants must be equipped with machines, and the resulting demands for capital are likely, all else being equal, to generate cross-border flows of capital. This paper explores the extent to which migration-related capital flows can explain the movements and magnitudes of current and capital account imbalances in OECD countries.

JEL Classification: F21, F22

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## 1. Introduction

In recent years, both politicians and economists have expressed alarm about the magnitude of international current-account and capital-account imbalances. The United States, in particular, is seen as having an excessively large current-account deficit. Numerous explanations have been offered for the patterns of current-account and capital-account flows among rich countries. These are typically seen as reflections of differential growth rates and government macro policies, such as fiscal deficits, that impact international capital markets.

This paper proposes a different explanation for the observed patterns of current- and capital-account flows: specifically, we suggest that these flows are influenced to a degree by international movements of labor, consisting of both legal and illegal migration.

The essence of the argument is very simple. Consider a simple Leontief world in which labor is partly mobile across countries and capital is freely mobile. When a new worker arrives in an economy, she or he must be outfitted with capital—essentially the same amount of capital with which an existing worker of comparable skill is equipped. In-migration generates capital needs. In the absence of capital-market restrictions this will induce offsetting flows in both current and capital accounts.

The same general forces hold in a non-Leontief world with imperfect complementarity between capital and labor.<sup>1</sup> Our paper presents a simple three-period overlapping generation model of an open economy in a world of limited labor mobility and perfect capital mobility. We show that in this model environment, migration of workers—which we take to be exogenous—will be associated with capital flows that help to equip the migrants in their new countries. Countries with net influxes of migrant labor should thus be recipients of capital inflows, *ceteris paribus*.

To some extent, this argument echoes a small literature that associates the same phenomenon with demographic changes occurring through fertility and the age structure of the population. This literature suggests that countries with young populations will both save less and demand

more capital than countries with relatively old populations. For example, Higgins and Williamson (1996) have suggested that countries with high “youth dependency” ratios (large fractions of the population too young to be in the workforce) will require large net capital inflows, while countries with older populations will export capital. Higgins and Williamson use this theory to explain rising savings rates in Asian economies during the late twentieth century, and they suggest that it also plays a significant role in assessing changes in current account balances for Asia’s economies during this period.

Higgins and Williamson note that their paper echoes some very old strands of thought in the development literature, such as Coale and Hoover (1958), later resurrected in Mason (1988) and Collins (1991). Taylor and Williamson (1994) argue that demographic effects contributed to observed capital flow patterns in the late 19<sup>th</sup> century in Canada, Australia, and Argentina. Wilson (2003) uses a dynamic general-equilibrium framework to consider the Canadian case in greater detail, and he concludes that rapid immigration did have a major impact on the current account. Higgins (1998) and Helliwell (2004) find that demographic patterns have had a strong effect on capital flows.

This literature, however, has focused on the impact of changing fertility behavior on current account balances, with a life-cycle model of savings generating the need for capital to flow across countries. For instance, countries with high proportions of working-age populations are typically thought to have excess savings, which should flow to countries that have large populations of young people. However, this literature has struggled with theoretical and empirical disagreements over the presumed life-cycle patterns of savings. Disagreements have arisen over the relationship between national demographic profiles and savings rates, and they appear specifically to have involved some confusion over the relative importance of young and old dependents. Specifically, some authors treated an “aging” population as one in which young dependents were moving into the workforce (thereby increasing savings rates), while others used the term to refer to economies in which workers were entering retirement (thereby decreasing savings rates).

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<sup>1</sup> Of course in the extreme alternative case, in which capital and labor are pure substitutes, the immigration of labor would lead to capital outflows, as the added worker makes machines redundant. We will argue below that while this is a theoretical possibility, it is not the empirically interesting case.

In our paper, we happily avoid both the semantic difficulties and the underlying disagreements over age-savings profiles by relying on a different type of demographic change. We focus on migration. Countries that receive migrants must equip them with capital fairly promptly, since most migrants are of working age and seek to enter the labor force. As a result, in the short run, countries with many immigrants must import capital. This differs from countries with high fertility rates, which acquire “new people” as infants. These high-fertility countries have long time periods during which to accumulate the capital needed to equip new people when they enter the work force.

After demonstrating the link between migration and capital flows in our model economies, we ask whether the data support the theory. We consider two tests of the theory. First, we look at the expansion of the United States current-account deficit over the past several decades. Using a simple calibration of our model, we show that immigration effects alone account for almost half of the changes in the US current-account balance over the period from 1960 to 2005. During this period, the US current-account balance moved from approximately +1.0 percent of GDP in 1960 (a surplus) to -3.5 percent of GDP (a deficit) in 2005. Our calibrated model suggests that, subtracting out the effects of migration, the US current account balance would have fallen only to about -1.0 percent of GDP. In other words, migration has been one of the largest forces affecting the US current-account balance.

Our second test of the theory is to examine the ten largest OECD economies over the period 1970-2004, to see whether net migration rates are correlated with current account balances. In a simple OLS regression of current account balances on net migration rates, the coefficient on migration is strongly and significantly negative.<sup>2</sup> Adding year fixed effects (which pick up events in international financial markets) strengthens the effect and its significance. Adding country fixed effects (which absorb all other time invariant characteristics of countries) tends to reduce the coefficient on migration rates and also to make it statistically insignificant.

We then examine the European experience—and more specifically the Spanish experience during the last decade. The foreign-born population in Spain has increased rapidly since the

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<sup>2</sup>We do not want to overemphasize these findings, due to the well-known difficulties in demonstrating causality and resolving endogeneity problems in simple cross-country regressions. For the time being, we simply note the consistency of the observed correlations of migration and capital flows.

mid-1990s. We believe that this is in part due to the relatively lax rules for immigration from non-EU countries that Spain adopted during a period when many of the other large EU economies tightened their rules of entry.<sup>3</sup> We also note that during the late 1990s the UK experienced a significant increase in in-migration, not quite on the scale of Spain, but nevertheless significant. During this time-period we also observe, as predicted by the model, that the current account position of both countries worsened considerably.

Nevertheless, it also has to be emphasized that not all episodes of rapid change in the current-account balance are necessarily generated or accompanied by equivalent variation in in-migration. This is evident in some of the data we present for the largest European economies. We suggest that the sizeable differences in migration flows within the European Union following the expansion of the EU in recent years will, in the future, provide an opportunity to examine the link between labor and capital flows. This is because various countries in the EU have chosen different policies and time-tables for opening their economies to in-migration from the newest members of the European. In the next 5 to 10 years we should therefore observe significant differences in migration caused, at least in part, by differences in policy. This will allow, as the data becomes available, testing of the theory developed here.

We conclude that although there are clearly many other forces at work to explain international capital-account imbalances, differences in net migration rates may well play a role of some importance.

The remainder of this paper is structured as follows. Section 2 presents a simple three-period overlapping-generations model in which both natural population growth and migration change the demographic structure of an economy. We analyze the model and derive some theoretical results for current-account balances. Section 3 then describes some empirical applications of the model. Section 4 discusses these results and considers the importance and sensitivity of the results to various assumptions. Section 5 offers some concluding remarks.

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<sup>3</sup> One has to be careful in interpreting these changes in immigration rules as exogenous in an econometric sense. This is because the liberal attitude of Spain and the UK toward immigration was certainly at least partially influenced by the impressive performance of their labor markets in this period. Nevertheless, regardless of

## 2. Model

To examine the impact of migration on current-account balances, we need to work with a model in which capital and goods can both move across borders, while migration flows and fertility are treated as exogenous. Since we want the model also to distinguish between the effects of migration and the effects of fertility, we also need the model to include young people and old people, as well as working-age individuals. The sections that follow set out a simple overlapping-generations (OLG) economy that has these characteristics.<sup>4</sup>

### *Population Dynamics*

This is a straightforward OLG environment in which each generation lives 3 periods and is indexed by its birth year. In period  $t$  the cohorts born in  $t$ ,  $t-1$ , and  $t-2$  are alive simultaneously. The only cohort making economically relevant decisions is the middle-aged cohort (i.e. cohort  $t-1$ ). This cohort is endowed with one unit of labor, which it supplies inelastically to the labor market. Old people do not work, but they earn returns from their savings as middle-aged workers. The middle aged allocate their labor income between their own consumption, consumption for their children (to whom they display altruism), and their savings for old age. Each generation provides for its own old age. None of the results that follows is particularly sensitive to this structure; what matters for our purposes is simply that the working-age cohort provides the bulk of domestic savings in the economy.

As a notational convention, we will use the date subscripts to refer to the time period; we will use superscripts to refer to the age of an individual. Variables for a child are superscripted with 0; the middle aged carry a superscript of 1, and the elderly have a superscript of 2. Thus,  $c_t^2$  is the consumption of the elderly at date  $t$ .

In tracking the population dynamics of this economy, we allow for both fertility and migration. Both of these changes are for now taken to be exogenous. As an accounting convention, let the size of the cohort  $t$  in youth be denoted by  $n_t^0$ . Between youth and middle-

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whether these changes in rules are exogenous or endogeneous, the model predicts that we should have observed declining current-account balances in Spain and the UK during the same time period.

<sup>4</sup>Higgins and Williamson (1996) analyze the impact of the age structure on capital flows using a similar model.

age an additional  $m_t > -1$  individuals arrive for each individual of cohort  $t$  already in the country. Thus,  $n_t^1 = n_t^0 (1 + m_t)$ .

Let the fertility rate be  $f > 0$ , such that each individual has  $1 + f$  children. As noted above, migrants enter the country in each period. We assume here that migrants are of working age when they arrive, and that they migrate before reproducing. For simplicity, we also assume that once they arrive in the destination country they adopt the same fertility as the resident population. This is perhaps not an accurate assumption, but it is convenient for simplicity.<sup>5</sup>

The growth rate of the working age population is therefore:

$$\frac{n_{t+1,j}^1}{n_{t,j}^1} = (1 + f_{j,t}) (1 + m_{j,t+1}) \approx 1 + f_{j,t} + m_{j,t+1} > 0.$$

During middle age, individuals of cohort  $t$  provide  $c_{t+1,j}^0$  units of consumption for each of their children, consume  $c_{t,j}^1$  themselves, and save to provide  $c_{t,j}^2$  units of consumption for old age. Individuals inelastically supply 1 unit of labor during middle age. This earns them a wage of  $w_{t,j}$ . Preferences (suppressing subscripts) are given by:

$$U(c^0, c^1, c^2) = \ln c_{j,t}^1 + \rho(f_{j,t}) \ln c_{j,t+1}^0 + \beta \ln c_{j,t}^2$$

The weight function  $\rho(f)$  on childrens' consumption is positive and increasing. In addition,  $\rho(0) = 0$ .

individuals can borrow and save freely such that they face a single budget constraint—however they cannot borrow against their childrens' incomes.

$$(1) \quad (1 + f_{j,t}) c_{j,t+1}^0 + c_{j,t}^1 + \frac{1}{1 + r_t} c_{j,t}^2 = w_{j,t}$$

Capital is mobile and therefore the interest rate faced by consumers in different countries is identical and given by  $r$ .

The first-order conditions of the consumer deliver:

$$(2) \quad \frac{c_{t,j}^2}{c_{t,j}^1} = (1+r_t)\beta$$

and

$$(3) \quad \frac{c_{t+1,j}^0}{c_{t,j}^1} = \frac{\rho(f_{t,j})}{1+f_{t,j}}$$

From the budget constraint and the first order conditions it can be inferred that:

$$\begin{aligned} c_{t+1,j}^0 &= w_{t,j} \frac{\rho(f_{t,j})}{1+f_{t,j}} \frac{1}{1+\beta+\rho(f_{t,j})} \\ c_{t,j}^1 &= w_{t,j} \frac{1}{1+\beta+\rho(f_{t,j})} \\ c_{t,j}^2 &= w_{t,j} \frac{(1+r_t)\beta}{1+\beta+\rho(f_{t,j})} \end{aligned}$$

### **Production**

The production technology is Cobb-Douglas and constant across time.<sup>6</sup>

$$Y_{t,j} = A_{t,j} K_{t,j}^\alpha n_{t,j}^{1-\alpha}$$

We assume that labor markets clear, and thus the entire stock of young workers in a country is employed. Capital depreciates at rate  $\delta$  and the law of motion of capital is therefore:

$$K_{t+1,j} = (1-\delta)K_{t,j} + I_{t,j}$$

Countries differ in five characteristics: the population size  $n$ , the technology parameter  $A$ , its growth rate  $\tilde{a}_j$ , and in the parameters  $m$  and  $f$  which describe population growth due to migration and fertility. Let the distribution of countries with respect to these parameters be

$G(n, A, \tilde{a}_j, m, f)$ . The support of this distribution is  $\mathbb{R}^+ \times (-f, \infty) \times (-1, \infty) \times \mathbb{R}^+ \times \mathbb{R}^+$ .

Small letters denote per-worker quantities. Then,

$$\frac{y_{t,j}}{k_{t,j}} = \frac{r_t}{\alpha}$$

Productivity growth at the rate  $\tilde{a}_j$  implies:

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<sup>5</sup>Considerable empirical evidence suggests that migrants often display fertility behavior that is part of the way between the prevalent patterns in their countries of origin and their countries of destination.

<sup>6</sup> Obviously the growth literature encourages us to think of technology levels as increasing over time. We can incorporate this into the framework easily enough, but for simplicity we ignore growth in the analysis that follows. We do, however, allow for productivity levels to differ across countries.

$$\frac{A_{t+1,j}}{A_{t,j}} = \tilde{a}_{t,j}$$

Define  $a_{t,j} = \tilde{a}_{t,j}^{\frac{1}{1-\alpha}}$ . Then we can solve for the following growth rates:  $\frac{k_{t+1,j}}{k_{t,j}} = a_{t,j} \left( \frac{r_t}{r_{t+1}} \right)^{\frac{1}{1-\alpha}}$

$$\frac{y_{t+1,j}}{y_{t,j}} = a_{t,j} \left( \frac{r_t}{r_{t+1}} \right)^{\frac{\alpha}{1-\alpha}}$$

In equilibrium, workers are paid their marginal product, and thus:

$$\begin{aligned} w_{t,j} &= (1-\alpha) y_{j,t} \\ &= (1-\alpha) A_{j,t}^{\frac{1}{1-\alpha}} \left( \frac{\alpha}{r_t} \right)^{\frac{\alpha}{1-\alpha}} \end{aligned}$$

Because capital markets are open, we assume that the country takes the world interest rate  $r$  as given.

### ***National Accounting***

Total output in a country (which we will refer to as GDP) will either be consumed, invested, or exported:

$$Y = C + I + NX$$

Also, total output plus net factor payments to foreigners will either be consumed or saved:

$$Y = C + S - B$$

Thus,

$$S - I = B + NX$$

The right-hand side is equal to what we call the balance of payments (BoP). These aggregate variables can now be linked to the individual level variables as follows.

Total consumption as a fraction of GDP in a period equals consumption of the young and old in that period, weighted by their respective numbers and divided by GDP:

$$\frac{C_{t,j}}{n_{t,j}^1 y_{t,j}} = \frac{1}{y_{t,j}} \left( (1 + f_{t,j}) c_{t+1,j}^0 + c_{t,j}^1 \right) + \frac{n_{t-1,j}^2}{y_{t,j} n_{t,j}^1} c_{t-1,j}^o$$

Gross investment equals the change in capital stock plus the replacement of depreciated capital. We can express investment as a ratio of GDP.

$$\begin{aligned}
\frac{I_{t,j}}{n_{t,j}^1 y_{t,j}} &= \frac{K_{t+1,j} - (1-\delta)K_{t,j}}{n_{t,j}^1 y_{t,j}} \\
&= \frac{k_{t+1,j}}{y_{t+1,j}} \frac{y_{t+1,j}}{y_{t,j}} \frac{n_{t+1,j}^1}{n_{t,j}^1} - (1-\delta) \frac{k_{t,j}}{y_{t,j}} \\
&= \frac{\alpha}{r_t} \left( a_{t,j} \left( \frac{r_t}{r_{t+1}} \right)^{\frac{1}{1-\alpha}} (1 + f_{t,j} + m_{t+1,j}) - (1-\delta) \right)
\end{aligned}$$

Total savings equals labor income today, net of the consumption of children and the middle aged today. Consumption of the old is financed out of capital income:

$$\begin{aligned}
\frac{S_{t,j}}{n_{t,j}^1 y_{t,j}} &= \frac{w_{t,j} - c_{t,j}^1 - (1 + f_{t,j})c_{t+1,j}^0}{y_{t,j}} \\
&= \frac{w_{t,j} - w_{t,j} \frac{1}{1 + \beta + \rho(f_{t,j})} - (1 + f_{t,j})w_{t,j} \frac{\rho(f_{t,j})}{1 + f_{t,j}} \frac{1}{1 + \beta + \rho(f_{t,j})}}{y_{t,j}} \\
&= (1-\alpha) \frac{\beta}{1 + \beta + \rho(f_{t,j})}
\end{aligned}$$

Combining and simplifying delivers the following expression for excess savings (the capital account) as a ratio of GDP:

$$(4) \quad \frac{S_{t,j} - I_{t,j}}{n_{t,j}^1 y_{t,j}} = \frac{(1-\alpha)\beta}{1 + \beta + \rho(f_{t,j})} - \frac{\alpha}{r_t} \left( a_{t,j} \left( \frac{r_t}{r_{t+1}} \right)^{\frac{1}{1-\alpha}} (1 + f_{t,j} + m_{t+1,j}) - (1-\delta) \right)$$

We already imposed the condition that consumers' budget constraints must hold and that all of output is paid out to the factors of production. Together these ensure that goods markets within the country clear. We also require, however, that the world market for investment goods clears. Aggregating excess savings across countries results in the market-clearing condition for investment goods:

$$\int n_{t,j}^1 y_{t,j} \left( \frac{(1-\alpha)\beta}{1 + \beta + \rho(f_{t,j})} - \frac{\alpha}{r_t} \left( a_{t,j} \left( \frac{r_t}{r_{t+1}} \right)^{\frac{1}{1-\alpha}} (1 + f_{t,j} + m_{t+1,j}) - (1-\delta) \right) \right) dG = 0$$

The expressions for excess savings and the aggregate investment good market-clearing condition can be simplified further if we impose a stationary world with  $r_t = r$ :

$$\frac{S_{t,j} - I_{t,j}}{n_{t,j}^1 y_{t,j}} = \frac{\alpha}{r} \left( \frac{(1-\alpha)\beta}{\alpha(1+\beta+\rho(f_{t,j}))} - (a_{t,j}(1+f_{t,j}+m_{t+1,j})-(1-\delta)) \right)$$

$$\int n_{t,j}^1 y_{t,j} \left( \frac{(1-\alpha)\beta}{1+\beta+\rho(f_{t,j})} - \frac{\alpha}{r} (a_{t,j}(1+f_{t,j}+m_{t+1,j})-(1-\delta)) \right) dG = 0$$

delivering an intuitive formulation for the capital account as a ratio of GDP in each location:

$$(5) \quad \frac{S_{t,j} - I_{t,j}}{n_{t,j}^1 y_{t,j}} = \frac{\alpha}{r} \left\{ \frac{1}{1+\beta+\rho(f_{t,j})} \frac{\int n_{t,x}^1 y_{t,x} * (a_{t,x}(1+f_{t,x}+m_{t+1,x})-(1-\delta)) G(dx)}{\int \frac{n_{t,x}^1 y_{t,x}}{1+\beta+\rho(f_{t,x})} G(dx)} - (a_{t,j}(1+f_{t,j}+m_{t+1,j})-(1-\delta)) \right\}$$

### **Characterizing Equilibrium**

Suppose that all countries are in equilibrium. In a cross-section  $(r_t, r_{t+1})$  are the same for all countries and we can predict differences in current account balances simply from differences in their GDP growth rates, labor-force growth rates (which combine fertility rates and age structure), and migration rates. Note that neither levels nor growth rates of productivity of any individual country enter into Equation (4), so that growth rates of GDP are sufficient for predicting current account balances. In a stationary world, with a stationary distribution of  $G(n, A, \tilde{a}_j, m, f)$ , we have  $r_t = r_{t+1}, \forall t$ , in which case Equation (4) simplifies further and becomes (5). For additional simplification, in what follows we will assume that productivity growth is constant over time within the countries of interest. We will also assume that  $f$  is constant, which is contrary to the data, but perhaps not an important oversimplification for the time period under consideration. Thus, we will explore only the impact of population changes due to migration.

Equation (5) expresses the ratio of the current account balance to GDP as the product of the capital share divided by the interest rate with the difference of the GDP-weighted average labor force growth across countries from the country-specific labor-force growth. What matters for determining the sign and size of the trade balance is a comparison of local population growth—and thus capital needs—with world capital needs, where these world

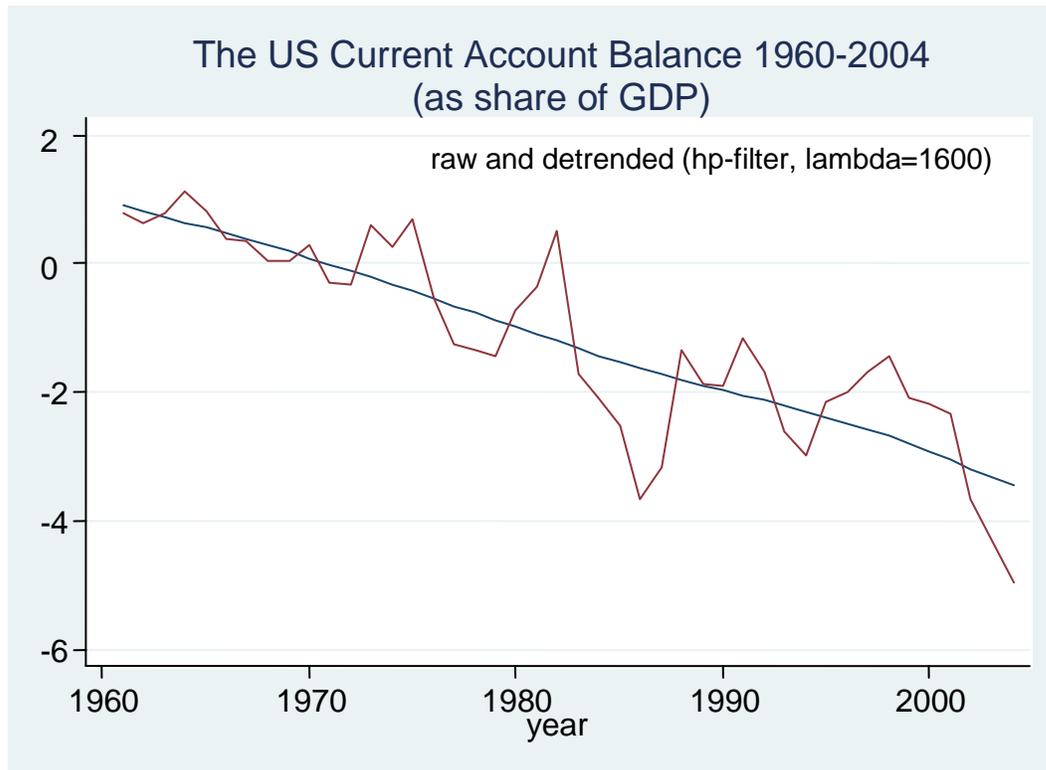
capital needs are heavily weighted toward countries with large populations and large total-factor productivity.

Note how fertility enters in a manner different from migration. Countries with high fertility have relatively low savings rates—they spend a lot on their children. Thus, a country with a high-fertility rate (compared to other countries) will, *ceteris paribus*, have a high CA deficit. Note further that differences in fertility rates across countries prevent us from differencing out the depreciation rate; nevertheless, the conclusions are still valid.

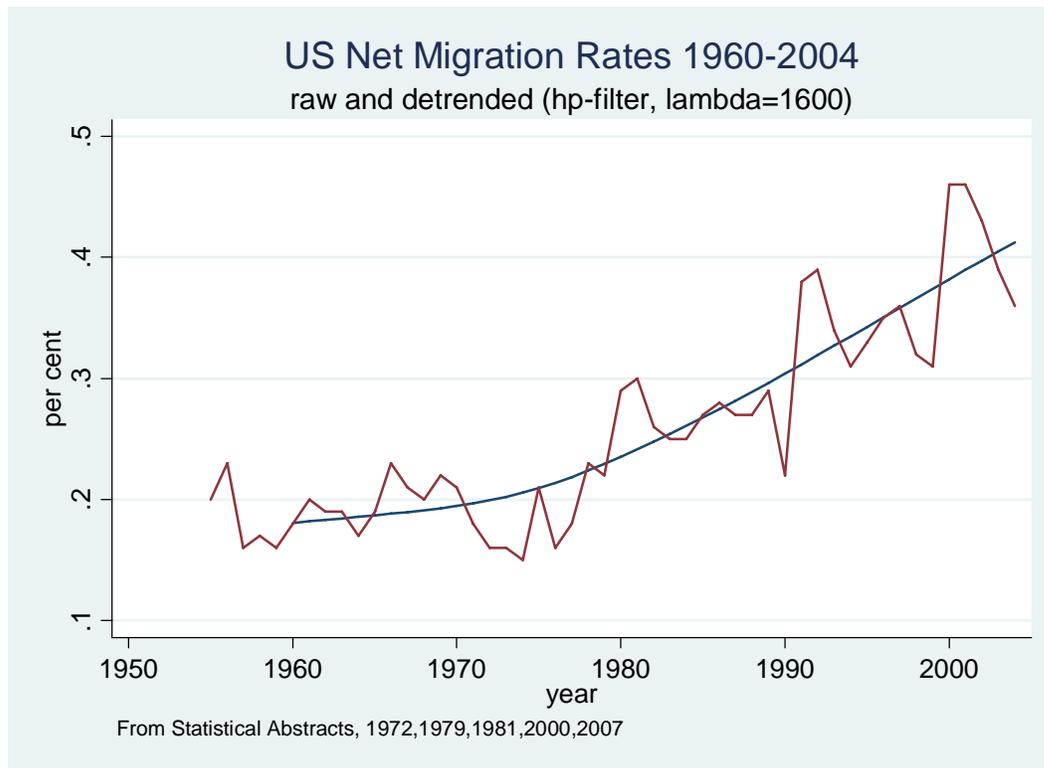
Finally, note that the right-hand expression offers a prediction not only for the sign but also for the magnitude of the relation between population growth and the current-account balance. With a generation lasting 30 years and an annual real interest rate of 3%, we would get  $r = 1.42$ . With  $\alpha = 0.4$ , we get a coefficient of 0.28. This might not sound like much, but  $g$  is also accumulated over 30 years. Thus, an increase in  $g$  from 0 to 2 percent annually would give rise to about 80 percent additional population growth over the thirty-year period, which in turn corresponds to an accumulated extra current-account balance of about 22 percent of GDP. These are substantial effects—not far from one percent of GDP annually.

### 3. Empirical Applications

Our first question is how much of the recent changes in the US current-account balance can be explained by migration. To begin, we examine the data on the CA balance from 1960 to 2004. Figure 1 shows the CAB of the US (taken from the Penn World Tables v.6.2) over this time-period. Because our theory does not offer serious explanations of high frequency movements in the CAB, we also consider the de-trended time series. Figure 1 displays the trend component from a Hodrick-Prescott filtering exercise using a smoothness parameter of 1600.

**Figure 1**

To consider the impact of migration on the current-account balance, we consider data on net migration rates. Figure 2 shows the time trend in net migration rates, taken from various statistical abstracts of the US. The net migration rate is total immigrants minus total emigrants divided by the population.

**Figure 2**

From the two graphs, it is clear that between 1970 and 2004, the United States imported both a lot of capital and a lot of labor. Our first empirical exercise is to ask how much capital would have been imported had there been no increase in net migration over this period; i.e., we set  $m = 0.18\%$  and hold it constant over time. To compute this counterfactual time series of the current-account balance, we need to make a number of additional simplifying assumptions, as discussed above:

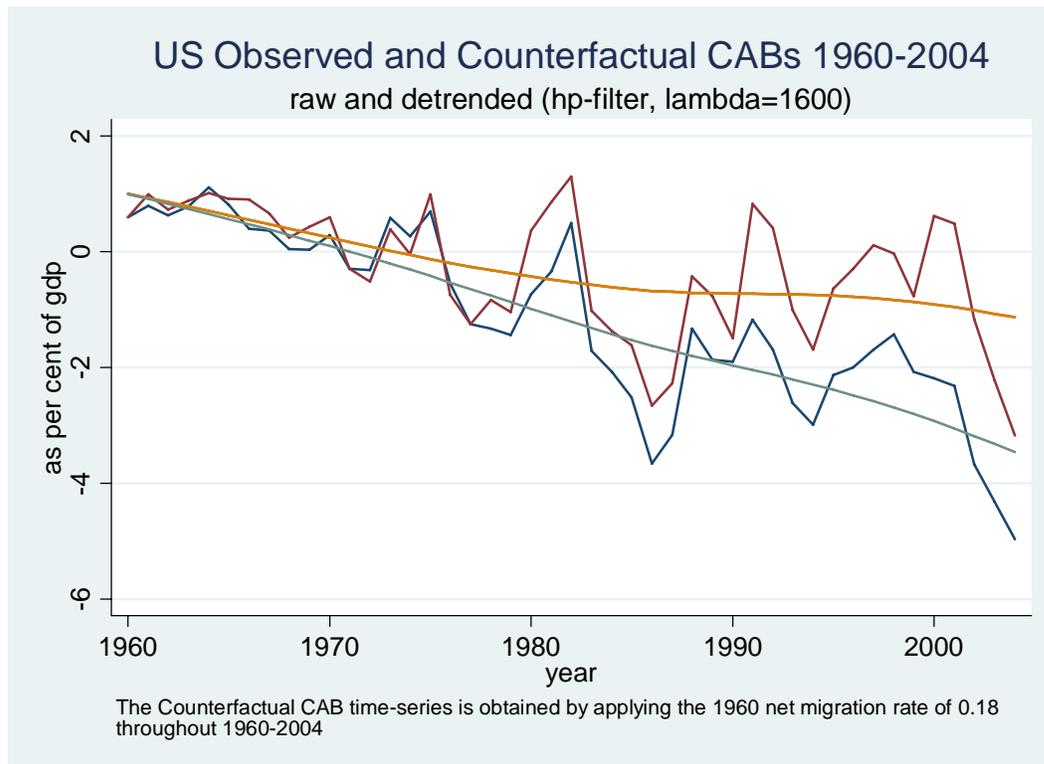
1. The world is stationary such that  $r_t = r$ .
2. The natural growth rate of the population between 1960 and 2006 in the US is constant at  $f$ .
3. Productivity growth is constant such that  $a_{t,j} = a$ .

This allows us to focus on net migration rates as driving variables for variation in the CAB over this period. We need further to pin down the values of other key parameters. In keeping

with common assumptions in the literature, we take the capital share  $\alpha = 0.3$  and the real world interest rate to be 3%.

This allows us to immediately apply Equation (5) by feeding in counterfactual net migration rates. The resulting time-series—both the raw counterfactual and the smoothed version—are shown in Figure 3:

**Figure 3**



The result is striking. Without increases in migration, the current-account balance would have declined at a far more moderate rate. The actual series moved by roughly 5 percent of GDP, from a 1 percent surplus to a 4 percent deficit. Holding migration rates constant, our exercise shows that the CA balance would have moved by approximately half as much—to a deficit of around 1 to 2 percent.

The exercise suggests that immigration to the United States created an enormous demand for capital inflows. It also suggests that forces other than fiscal policy contributed significantly to the CA imbalances. It is striking that capital and labor inflows are related phenomena and

might be reinforcing each other. Although we make no attempt here to model the endogenous migration of labor, our analysis is certainly consistent with a story in which high productivity levels in the United States, relative to the rest of the world, were inducing both labor flows and accompanying flows of capital.

### Cross-Section and Panel Regressions

To see whether the same pattern holds for countries other than the United States, we next turn to a second empirical exercise. For this exercise, we analyze migration and capital flows of the OECD countries. We exclude the former communist countries due to the short panels that are available for these economies. We also exclude Korea and Mexico, since there is no data on migration for these. This leaves us with 24 economies. Again the CAB data come from the Penn World Table and the net migration rates are from the OECD. Not all of the countries have data for all years, and thus we have an unbalanced panel. The following table summarizes the data by country.

**Table 1: Descriptive statistics on current account balances and net migration rates in the OECD.**

Country	Year Range	CAB Mean (std)	Net Migr. Rate Mean (std)	Share in OECD GDP
Australia	1970-2003	-3.70 (1.72)	0.55 (0.20)	0.02
Austria	1970-2004	-0.74 (1.60)	0.22 (0.31)	0.01
Belgium	1970-2000	2.49 (2.83)	0.09 (0.10)	0.01
Canada	1970-2004	-0.96 (2.04)	0.51 (0.31)	0.03
Denmark	1970-2004	0.17 (3.27)	0.13 (0.13)	0.01
Finland	1970-2004	-0.00 (4.34)	0.03 (0.18)	0.01
France	1970-2004	0.62 (1.76)	0.12 (0.07)	0.06
Germany	1970-2003	-0.73 (1.70)	0.38 (0.44)	0.09
Greece	1970-2003	-4.59 (2.40)	0.35 (0.39)	0.01
Iceland	1970-2004	-3.14 (3.38)	-0.04 (0.32)	0.00

Ireland	1970-2003	-3.71 (5.21)	0.09 (0.56)	0.00
Italy	1970-2003	-0.01 (1.80)	0.13 (0.22)	0.06
Japan	1970-2000	1.85 (1.39)	-0.01 (0.02)	0.13
Luxembourg	1970-2004	6.71 (9.15)	0.68 (0.43)	0.00
Netherlands	1970-2004	4.18 (1.98)	0.25 (0.14)	0.02
New Zealand	1970-2004	-4.69 (2.72)	0.01 (0.58)	0.00
Norway	1970-2004	2.73 (7.00)	0.17 (0.10)	0.01
Portugal	1970-2004	-10.21 (3.98)	0.13 (0.90)	0.01
Spain	1970-2003	-1.69 (1.81)	0.20 (0.41)	0.03
Sweden	1970-2004	1.65 (2.95)	0.21 (0.17)	0.01
Switzerland	1970-2004	7.67 (3.21)	0.22 (0.40)	0.01
Turkey	1973-2004	-2.47 (2.10)	0.15 (0.15)	0.01
UK	1970-2002	-0.91 (1.71)	0.06 (0.11)	0.06
USA	1970-2003	-1.54 (1.26)	0.32 (0.12)	0.36

We regress the current-account balance (as a percent of GDP) on the net migration rate over the time period from 1970 to 2004.

From Equation (5), the predicted sign on net migration is negative and the magnitude should

be about  $-\frac{\alpha}{r} \approx -\frac{0.3}{0.03} = -10$ .

Tables 2, 3 and 4 show the results of a regression of current-account balances on the net migration rate and a constant. Table 2 uses a GDP weighting for observations, while Table 3 is unweighted. Table 4 shows the results omitting both the smallest economies (those with a share of OECD GDP less than 0.01) and the US. Table 4 is meant to remove both the small economies that are subject to large year-to-year variation and at the same time not let the

results be dominated by the US experience (as is the case when the data is GDP-weighted). Results are shown both for the raw data on net migration and for the HP-filtered version of this data, which removes the short-run fluctuations that we do not attempt to model. For both the raw data and the filtered data, we report the results with and without country fixed effects and year fixed effects.

**Table 2.***Correlations between Net Migration and Current-Account Balance in GDP-weighted OECD-Panel, 1970–2004*

	Raw Data				HP-Filtered			
	Net Migration Rates	-2.22 [0.51]***	-0.38 [0.33]	-2.33 [0.55]***	-0.39 [0.39]			
HP-filtered Net Migration Rate					-4.94 [2.19]**	-1.29 [3.09]	-5.57 [2.05]**	-2.01 [1.83]
Fixed Effects	None	Country	Year	Country, Year	None	Country	Year	Country, Year
Observations	821	821	821	821	821	821	821	821
R-squared	0.05	0.54	0.1	0.58	0.14	0.74	0.16	0.75

Standard errors in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

HP-Filtered Net Migration Rate and Current-Account Balance are Hodrick–Prescott filtered Time series with lambda = 1,600. Regressions on filtered data have heteroskedasticity-robust standard error allowing for autocorrelation at the country level.

**Table 3***Net Migration and Current-Account Balance in Unweighted OECD-Panel 1970–2004*

	Raw Data				HP-Filtered			
	Net Migration Rate	0.92 [0.68]	-0.02 [0.38]	0.26 [0.63]	-1.03 [0.43]**			
HP-filtered Net Migration Rate					4.27 [3.01]	3.86 [2.17]	2.66 [3.31]	-2.47 [2.85]
Fixed Effects	None	Country	Year	Country, Year	None	Country	Year	Country, Year
Observations	821	821	821	821	821	821	821	819
R-squared	0.00	0.54	0.08	0.62	0.05	0.71	0.08	0.78

Standard errors in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

HP-Filtered Net Migration Rate and Current-Account Balance are Hodrick–Prescott filtered Time series with lambda = 1,600. Regressions on filtered data have heteroskedasticity-robust standard error allowing for autocorrelation at the country level.

**Table 4.***Net Migration and Current-Account Balance on Unweighted restricted OECD-Panel 1970–2004*

	Raw Data				HP-Filtered			
	Net Migration Rate	-2.60***	-0.29	-3.03***	-0.65			
	[0.53]	[0.35]	[0.59]	[0.45]				
HP-filtered Net Migration Rate					-4.93**	-1.29	-5.57**	-2.01
					[2.19]	[3.09]	[2.05]	[1.83]
Fixed Effects	None	Country	Year	Country, Year	None	Country	Year	Country, Year
Observations	400	400	400	400	400	400	400	400
R-squared	0.07	0.60	0.16	0.69	0.14	0.74	0.16	0.75

Standard errors in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The restricted OECD panel includes only country observations for economies that account for more than 1% of the OECD. It also omits the US. The restricted OECD panel therefore refers to medium-sized economies.

HP-Filtered Net Migration Rate and Current Account Balance are Hodrick–Prescott filtered Time series with  $\lambda = 1,600$ .

Regressions on filtered data have heteroskedasticity-robust standard error allowing for autocorrelation at the country level.

Consider first the results from Table 2, in which observations are weighted by GDP. These results suggest that the correlations between migration and current-account balances have the correct sign and even reasonable magnitudes. While the expected magnitude of -10 does not appear in the regression results, the HP-filtered data in particular give rise to coefficients that are generally smaller, but not wildly different from this value. The weighted but unfiltered data also give consistently correct signs, although the magnitudes tend to be somewhat too small. The weighted regressions have the effect of decreasing the importance for the regression results of some of the smaller countries in the OECD. As Table 3 shows, including the smaller countries with equal weightings tends to give rise to different and less significant results. The contrast with Table 4 however indicates that this is largely driven by the very small economies. We believe that the experience of these economies is often dominated by the very specific events that are not plausibly modeled by our framework. An example is the emergence of Norway as a major oil producer over the last 30 years. If we focus on the economies with a share of OECD GDP of more than 1% and exclude the US, then the observed relation between migration and current account balances is as predicted by our theory.

The evidence from Tables 2–4 is therefore supportive of our theory. We find, especially in the between-country variation, that the net migration and capital flows are positively correlated. The within-country correlations are also roughly supportive, however not statistically significant.

#### **European Experiences since 1994**

Since 1995 there has been a marked increase in net migration into the European Union. This increase however has not been equal across the European economies. Some have significantly tightened immigration rules (for instance Germany) and have restricted access to their labor markets for immigrants from outside the EU. Spain and the United Kingdom by contrast have during this time-period largely maintained or expanded access to their labor markets to non-EU entrants.

The experience of Spain since the middle of the last decade is especially interesting. In 1996 Spain passed an amendment to their immigration law of 1985.<sup>7</sup> This amendment codified a number of immigrant rights, such as access to education, equality and access to legal counsel. It also created a permanent resident category and allowed for family reunification as one reason for permitting entry into the country. In 2000 the “Law on the Rights and Freedoms of Foreigners in Spain and their Social Integration” took force. As its name suggests, this law further strengthened immigrant rights and furthered their integration. After 2000 the new conservative government initiated a number of additional measures intended to manage but not necessarily impede immigration.

The relatively liberal rules on migration in Spain since the mid 1990s, the parallel tightening of immigration rules in some of its European partners, and the impressive performance of their labor markets during this time period combined to generate significant increases in net migration. We document this with immigration data from various sources for the five largest European economies in Table 5.<sup>8</sup> The same table also shows the current-account balance of these 5 economies as made available by the European Statistical Office.

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<sup>7</sup> This law of 1985 restricted access to Spain for non-EU immigrants. This legislation was itself the result of substantial pressure prior to Spain’s accession to the EU in 1986. Its European partners feared Spain would act as a gateway to their own labor markets and thus pressed for a tightening of controls on immigration.

<sup>8</sup> We have chosen these data with the aim of including the most recent data available. Therefore some of the data in Table 5 are not yet available for the whole OECD set of countries.

**Table 5: Migration and the Current Account in the 5 largest EU Economies: 1994–2004**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
<b>France</b>											
Net In-migration (Flow, as % of population)	-0.01	-0.03	-0.03	-0.02	-0.01	0.16	0.17	0.20	0.22	0.22	0.17
Current Account (% of GDP)	0.8	1.1	1.5	2.9	2.6	2.1	0.9	1.1	1.7	1.0	0.2
<b>Germany</b>											
Net In-migration (Flow, as % of population)	0.39	0.49	0.34	0.11	0.06	0.25	0.20	0.33	0.27	0.17	0.10
Current Account (% of GDP)	0.5	0.5	0.9	1.2	1.4	0.9	0.4	2.0	4.6	4.0	5.0
<b>Italy</b>											
Net In-migration (Flow, as % of total population)	0.05	0.06	0.11	0.10	0.11	0.08	0.10	0.08	1.13	1.05	0.95
Current Account (% of GDP)	2.9	3.8	4.7	3.9	3.1	1.9	0.9	1.4	1.0	0.6	0.7
<b>Spain</b>											
Net In-migration (Flow, as % of total population)	0.16	0.18	0.21	0.24	0.40	0.60	0.96	1.08	1.56	1.48	1.42
Current Account (% of GDP)	0.1	0.0	0.5	0.9	-0.2	-1.9	-3.1	-2.5	-2.1	-2.4	-4.0
<b>United Kingdom</b>											
Net In-migration (Flow, as % of total population)	0.06	0.11	0.08	0.10	0.17	0.23	0.24	0.26	0.27	0.30	0.34
Current Account (% of GDP)	-1.4	-0.4	-0.3	0.2	-0.8	-1.7	-2.0	-2.7	-2.9	-2.7	-3.0

Data stems from the European Statistical Office Yearbook 2006–2007.

The most striking finding in this table is the substantial increase in net migration into Spain since about 1996, which is accompanied with a similar worsening of the current-account balance. The increase in net migration flows in Spain dwarfs any other change in migration rates observed in this table. Given the legislative background, this increase maybe is not surprising and it is certainly encouraging for our theory that this period was likewise a period during which Spain's current-account balance worsened considerably.

### Discussion

A virtue of the simple analysis that we do for the United States is that it makes no assumptions about the direction of causation; we simply offer a decomposition of the current-account balance into the portion attributable to migration and the portion attributable to all other factors. An obvious limitation of this analysis, however, is that we take migration to be

exogenous. We would normally expect, instead, that international migration flows are systematically linked to some of the same underlying forces that affect current-account balances.

Specifically, migration should be related to wage differentials. By incorporating relative wages in the decomposition, we could model migration as dependent on the standard of living in a country. We might reasonably also include exogenously imposed rules that regulated migration.

In some sense, endogenizing migration in this fashion is trivial; it amounts to specifying  $m$  as a function of wages and a rule parameter:  $m(w, \psi)$ . The derivations of Equations (2.7) to (2.10) will not be affected by this more complex approach. However, the exercise would be pertinent, because it gives rise to a correlation between migration and TFP growth. Economies with higher levels of TFP growth will experience more in-migration. Furthermore, this approach would allow us to discuss the consequences of relaxing the regulations on migration (as seems to have happened in the US in the last three decades years and in parts of Europe in the last several years).

Another potential extension of this model would be to address the current-account impact of fertility differences. This is a question that, as noted above, has been addressed more extensively than the impact of migration. In our model, the current-account variation induced by fertility differences will be even larger (for a given amount of population growth) than for an equivalent difference in migration rates. This reflects the endogenous savings differences that accompany the life-cycle impacts of fertility differences.

#### **4. Conclusion**

Our analysis of the US data shows that migration appears to have played a quantitatively important role in determining the level of the current-account deficit, and the regression results suggest similar results for other large OECD countries. Furthermore, the Spanish experience since the 1990s with its substantial increase in net migration and in its current account strengthens the argument that capital and labor inputs flows are indeed correlated across the developed economies.

The European experience since 2004 promises a rare opportunity to study the link between labor flows and capital flows. The migration policies of existing EU member states toward the 8 new members (the A8 countries) that entered the EU in 2004 (most notably Poland) and likewise toward Rumania and Bulgaria (EU entry: 2007) differ greatly. For instance, the UK, Ireland, and Sweden allowed migration from the A8 countries as of May 2004; Spain and some other countries relaxed their migration rules toward the A8 in 2006; whereas the majority still maintain strict migration regulations. As the data on migration flows and capital-account balances will become available in the next few years this episode will provide a rare opportunity to study the connection between labor and capital flows across borders.

We would not suggest that migration is the only important factor in determining current-account flows, nor that it outweighs fiscal policy or exchange-rate misalignments, to give two examples of standard explanations for current-account imbalances. But it would equally be foolish to focus on macro policy to the exclusion of demographics and migration flows.

In our model, these current-account imbalances are not, in themselves, “bad” or inefficient. They represent an efficient response of the international capital market to the changing capital needs of different countries at different moments in time. In this sense, efforts to reduce or eliminate the current account imbalances may cause efficiency losses that should be balanced against other policy objectives. It should also be noted that migration flows cannot be viewed as harmful simply because they contribute to current-account deficits. In fact in our model, wages in countries receiving migrants are not affected by these migration flows. Migration from less to more productive economies has—in our model—an unambiguously positive effect. This follows, assuming constant returns to scale and unrestricted capital markets. Of course, a more complete model might or might not have important distributional effects and detrimental impacts on those workers that compete with migrants.

Finally, note that this is probably not the right model for thinking about all current account imbalances. It would be difficult to argue, for example, that China’s large current-account surpluses at present are driven by significant out-migration of workers. Clearly there are many other forces at work in shaping global patterns of trade and capital flows.

**References**

- Coale, Ansley and Edgar Hoover. 1958. *Population Growth and Economic Development in Low-Income Countries*. (Princeton, NJ: Princeton University Press).
- Collins, Susan. 1991. Saving behavior in ten developing countries. In Douglas Bernheim and John Shoven, eds., *National Saving and Economic Performance* (Chicago: University of Chicago Press).
- Helliwell, John F. 2004. [Demographic changes and international factor mobility](#). NBER Working Papers No. 10945. Cambridge, MA: National Bureau of Economic Research.
- Higgins, Matthew. 1998. [Demography, national savings, and international capital flows](#). *International Economic Review* 39(2): 343–69.
- Higgins, Matthew and Jeffrey G. Williamson. 1996. Asian demography and foreign capital dependence. NBER Working Paper 5560 (Cambridge, MA: National Bureau of Economic Research).
- Mason, Andrew. 1988. Saving, economic growth, and demographic change. *Population and Development Review* 14(1): 113–44.
- Taylor, Alan and Jeffrey G. Williamson. 1994. Capital flows to the New World as an intergenerational transfer. *Journal of Political Economy* 102(2): 348–69.
- Wilson, Stuart J. 2003. A dynamic general equilibrium analysis of migration and capital formation: the case of Canada. *Review of Economic Dynamics* 6(2): 455–81.