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HIGH SKILLED IMMIGRANT RECRUITMENT AND THE GLOBAL ECONOMIC CRISIS: THE EFFECTS OF IMMIGRATION POLICIES

by

Natasha T. Duncan and Brigitte S. Waldorf

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Purdue University

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HIGH SKILLED IMMIGRANT RECRUITMENT AND THE GLOBAL ECONOMIC CRISIS: THE EFFECTS OF IMMIGRATION POLICIES

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Abstract

Since the turn of the twenty-first century, developed countries have engaged in a race for the best and the brightest. States have been lowering barriers to entry and actively recruiting talent from abroad as the premium on human capital has increased in today's knowledge economies and as demographic problems due to aging and low fertility are becoming a reality. What is interesting is that formerly immigration-adverse, non-traditional immigration states are now opening their doors to this pool of highly skilled migrants. From permanent residency to temporary visas not requiring employer sponsorship, states attempt to sweeten their offers to global talent so the latter would come to their shores. Even more interestingly, notwithstanding the current global economic turmoil, states continue to invite and retain well-educated migrants, while low-skilled migrant labor is turned away. This paper analyses immigration policies since the beginning of the global financial crisis in 2008. Based on this background, the paper presents a non-linear dynamic model where the attraction of global talent is influenced by both countries' immigration policies and the stock of highly-educated migrants. The model is used to simulate the effects of loosened immigration restrictions on the accumulation of global talent.

Keywords: Immigration Policy, Economic Crisis, High Skilled Migrants, Non-linear Dynamic Model

JEL Codes: J24, J11, J61

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Introduction

Over the past decades, the issue of immigration has been quite salient on states' political agendas. Governments are increasingly concerned about *who* enters their country, for the sake of national security (particularly post-9/11) but also for the sake of enhancing their economic competitiveness. This is reinforced by the language surrounding international labor migration which is framed in terms of national advantage and competitiveness, suggesting that increasingly governments see migrants as essential to their economic vitality. Although this consideration is not new,[1] what makes the demands for immigrant labor different today from 50 years ago is the emphasis on highly skilled labor and the global competition over this scarce resource. Given the premium on human capital in today's knowledge economies and as demographic problems due to aging and low fertility are becoming a reality, states, particularly developed countries, are implementing immigration policies to attract this global talent to ultimately attain their interests. This trend is producing a convergence of policy towards liberalizing immigration controls for high skilled migrants among states (Duncan 2008). At the same time, while highly skilled migrants are being courted, low skilled migrants are less mobile and continue to face inordinate barriers to entry.

The contemporary global economic crisis, however, stands to abruptly end states' demand for global talent labor or even reverse it as states make efforts to cope with mounting job loss figures and assuage the public's fear about economic competition from immigrants. History has revealed that in the midst of economic downturn, states tend to tighten immigration controls as demonstrated by France and Germany in the wake of the oil embargo of 1973. In both cases, governments ceased foreign guestworker programs because of economic decline that would make new workers unnecessary (Hammar 1985; Martin 2004). Studies have shown that during economic downturns, the public grows even more concerned about job and resource competition from immigrants as domestic unemployment rises. Ordinarily, in the United States for instance, natives tend to be concerned about the state of the economy, inter alia, when forming attitudes about immigrants (Citrin et al. 1997).

Migration specialists and agencies warn governments against closing channels for labor migration that can later affect economic recovery and post-crisis growth (Papademetriou et al. 2009; Awad 2009; IOM 2009; OECD 2009). The public discourse already identifies a "knowledge crisis" and points to the necessity to invest in education and research (Dijgraaf 2009), thereby becoming less dependent on the import of human capital. Others even point to the opportunities to attract expatriates arising from the fact that states that traditionally have been very successful in attracting global talent, such as the United States, are under pressures of the economic crisis. The Dutch academic Sylvester Eijffinger, for example, sees other state's

[1] Throughout history, there are examples of states recruiting foreign labor to boost economic welfare (Sassen 1999). During WWII, the *Bracero* Program – a bi-lateral agreement between the US and Mexico – provided temporary visas for Mexican workers, to work in the United States and alleviate the severe labor shortage during that time, especially in agriculture. Other examples are the guestworker programs of Western Europe. During the post-World War II reconstruction period, many Western European states experienced what is known as an economic miracle. This period required pools of workers to work in the construction industry and other sectors in which there were rampant shortages. To fuel the economic growth, states like Germany and France recruited workers from abroad under various guest worker schemes.

economic difficulties as an opportunity to lure back knowledge workers that previously left for opportunities abroad (Volkskrant, 21 August 2009).

In this paper, we analyze immigration policies across OECD states with special emphasis on policy choices since the beginning of the global financial crisis in 2008. Substantively, we are concerned with whether earlier correlations between economic recession and tighter immigration restrictions still holds with respect to the high skilled migrants in today's knowledge economies. In the absence of hard data that could substantiate the argument, we will rely on the interpretation of anecdotal evidence of intents and directions expressed by states and international organizations. In addition, we consider why states might continue take in high skilled migrants even during economic downturns. We design a dynamic model to simulate the long-term effects of policies that influence the flow of global talent, focusing on policies and conditions that are geared towards attracting and retaining high-skilled labor, and/or focus on the in-situ growth of human capital.

The paper is divided into five sections. Following this introduction, the second section details public opinion of immigration policy, and focuses on government policies that affect the immigration of low-skilled and high-skilled persons, with a particular emphasis on responses during the contemporary global economic downturn. The third section describes the conceptual model of international circulation of the highly mobile global talent. In the absence of hard data on the effects of these responses, the fourth section presents simulations of long-term consequences of policies that shape the flow of human capital across international borders. We discuss our findings and directions for future research in the last section.

Background

Attitudes toward Immigration

The politics of immigration is not static. Instead, the salience vacillates between good and bad times (Freeman 1995) with the prevailing economic conditions being an indicator of the public debate surrounding immigration. During periods of economic booms, immigration is expansionary and even tolerated by the public. In economic downturns, there are increased pressures for restrictive policies as unemployment rises. Research on public attitudes toward immigration supports this relationship.

Immigrants are often the scapegoats for poor economic conditions they may have no role in creating (Freeman 1995; Hollifield 1992). Periods of economic downturns increase public discontent toward immigration and governments are pressured to close the door to new immigrants and protect the labor market for native workers. The famous strikes in Britain earlier this year with chants of "British jobs for British workers" illustrate this point.[2] In response, the government tightened immigration controls. In defense of the move, Home Secretary Jacqui Smith declared, "It is right in a downturn to be more selective about the skill levels of those migrants and to do more to put British workers first" (UK Border Agency 2009).

[2] These strikes occurred in early 2009 at the height of the contemporary economic downturn. What is fascinating is that the strikes were in response to the employment of European Union workers who have the right of unrestricted access to the British labor market, making them de facto domestic workers. Nonetheless, the government was pressured to take action against immigrant workers.

Studies on public sentiment toward immigration emphasize both non-economic (racism, nativism, for example) and economic factors (e.g., personal or national economic conditions) that shape individuals' attitudes. Researchers who turn to economic explanations rely on the Heckscher-Ohlin model of international trade as the basis of their analysis. The model suggests that individuals in occupations experiencing wage decreases because of immigration-induced increases in labor supply are more likely to oppose immigration. In general, skills and preferences for increased immigration are negatively related. That is, policy preferences are reflective of factoral and/or sectoral divisions as skill and sectoral ties are determinants of one's sentiments toward immigration (Frieden and Rogowski 1996). For example, in a cross-country analysis of public attitudes toward immigration, Mayda (2006) finds that controlling for non-economic factors, economic considerations play an important role in shaping people's attitudes toward immigration. In countries with high GDP per capita, an individual's skill is positively correlated with favorable attitudes toward immigration. In countries with low GDP per capita, however, individuals' skills are negatively correlated with immigration attitudes.

Besides general concerns about job competition from immigrants, economic downturns engender and intensify negative sentiments. Citrin et al. (1997) find that in the United States, individuals' immigration preferences are not shaped by personal finances but by the condition of the national economy. Burns and Gimpel (2000) introduce the role of stereotypes in shaping immigration preferences. They find that individuals' attitudes toward immigration are a function of the stereotypes they hold about a group's work ethic and aptitude. More interestingly, however, economic downturns intensify negative stereotypes about groups. Kessler (2001) identifies both economic and non-economic factors as determinants of individuals' attitudes toward immigration. He finds the public's sentiment toward immigration stems from self-interest regarding personal evaluations of wage effects of immigration and affective orientations. While economic conditions influence individuals' perspective on immigration, however, ethnic and racial affective sentiments have strong effects on immigration attitudes regardless of one's economic situation.

Economic Crises and Migration in Historical Perspective

During economic crises, immigrants tend to be the most vulnerable workers. This is the case for a few reasons. First, as noted earlier, they tend to be scapegoats for rising unemployment and the failing economy. Second, many immigrants are employed in sectors that are most sensitive to booms and busts such as construction, manufacturing, service occupations in the tourism sector (IOM 2009; OECD 2009). The current global economic crisis has uneven effects on migrants in certain industries. Third, immigrants are more likely than non-immigrants to lose their jobs if downsizing is necessary, sometimes because of government mandates that give preferential treatment to native workers.

Modern history has been marked by three global economic crises that had significant impacts on international migrant flows. The common policy responses in these three periods were geared toward protecting domestic workers through increasing controls on inflows and giving incentives for migrant workers to leave, for example. Regional downturns such as the Asian financial crisis had comparable outcomes for migrants. For instance, governments in Malaysia, Thailand, and Singapore planned to or expelled large numbers of foreign workers (Castles 2004; Shiner 1998).

In some cases, however, despite government efforts, employers opposed policies to limit immigration in certain sectors.

The Great Depression – the first major economic crisis with global reach – is notorious for the breadth and depth of its effects, with tremendous adverse impacts on individual economies. Where immigration is concerned, the main countries of immigration (self-identified or de facto) responded by introducing regulations to guard native workers from foreign labor competition (Hammar 1985).

The 1973 oil crisis also had profound economic effects on economies. It was during this period that mass immigration into post-war Europe was halted. During the economic boom of the post-WWII years that preceded the crisis, large inflows of foreign workers were actively supported by employers and sanctioned by governments to alleviate labor shortages Many western European countries imported large numbers of guestworkers as, for example, in Germany, or (former) colonial subjects as, for example, France and the UK. However, due to the adverse effects of the Arab oil embargo on the West European economies, new recruits of immigrant labor became unnecessary and were curtailed (Hammer 1985). Germany, for example, implemented a ban on the recruitment of foreign workers for jobs that extended over more than three months (Martin 2004). Similarly, an immigration stop was enacted in France in 1974 because of economic decline and increases in unemployment (Hollifield 2004).

The third and contemporaneous global recession was front and center on the global stage in the fall of 2008. Moreover, it is described as having the most far reaching effects on international migration since World War II (Fix et al. 2009). Although it is still too early to draw definitive conclusions from the current global economic crisis, anecdotal evidence provides a window into the effects on international migration. What is evident, though, is that policy responses have tended to be primarily directed to low skill immigrants rather than high skilled immigrants. This tentatively suggests that policy responses by governments to the current economic downturn have a skills bias (Papademetriou et al. 2009).

In fact, such a bias is not surprising given today's bifurcation of international migrants where states facilitate the entry of high-skilled labor but increasingly constrain the movement of low skilled migrants. Thus, we expect a difference in the response according to the pre-existing segmentation of international labor as governments must balance public demands for restriction with economic demands for high skilled labor. The growth of knowledge economies has made investments into research and innovation a top priority and increased the demand for human capital. For advanced industrialized countries, to remain competitive also means competing for highly-skilled labor. Turning back policies that are aimed at achieving these goals is not a forward looking strategy and can have adverse effects during the recovery phase (Awad 2009; Fix et al. 2009).

Immigration policies: low-skilled immigrants

The majority of policies aimed at stopping new recruitment and engendering return has targeted low skilled migrants and irregular migrants. For example, the International Organization of Migration (2009) reports that there have been restrictions on new labor migrants and expulsion of existing workers in East, Southeast, Central Asian economies. In Thailand, South Korea,

Malaysia, and Kazakhstan, there has been a suspension of visas for new low skilled immigrants. Earlier this year, Italy made irregular migration a criminal offense (Awad 2009).

Conventional wisdom is that during economic downturns, immigrants tend to leave the host country because of dried up employment opportunities. Evidence, however, suggests the contrary (Papademetriou et al. 2009). The political instruments to control immigration, particularly irregular immigration, decrease the likelihood that migrants will return since the chances of being able to re-enter the host country are slim. An historical example provides a good illustration. Despite dwindling employment opportunities in Germany following the oil embargo, few foreign workers actually left the country. Germany's 1973 recruitment ban and subsequent policies to stop the inflow of guestworkers, especially Turks, eliminated the possibility of re-entering the country and many guestworkers decided to extend their stay, often even bringing in their families. By doing so, Turkish workers effectively switched their roles from being guestworkers (who are expected to leave at some point in time) to being immigrants (who are planting new roots in Germany). Thus, the unintended effect of these immigration restrictions was a large increase in the number of newcomers who entered not as "economic migrants" but who entered under the provisions of family reunification.

Increased propensities to return home during economic downturns are, however, observed in settings where migration is liberalized and allows for unrestricted movement as, for example, is the case for mobility within the European Union. Poles in Britain are a case in point. Since the economic crisis in 2008 began, many Poles have left Britain to return home. The decisions to return home are motivated by comparatively better employment chances in Poland – the Polish economy did not decline as quickly as Britain's – but also by the prospect of being able to return unhampered at a later time.

Some countries have turned to financial incentives to encourage the return of immigrants. Although a failed policy of the past,[3] Spain, Japan, and the Czech Republic are providing financial incentives to encourage unemployed, and in relevant contexts, non-EU migrants to leave. Migrants eligible for this program are paid a portion of the payment before departure and the remainder upon return to the country of origin. In some cases there is also financial assistance with moving expenses. In the case of Spain, unemployed, non-EU migrants are paid 40 percent of their unemployment benefits upfront and the remaining 60 percent within three months of arrival in the home country. Eligible migrants also have to agree not to re-enter Spain for three years. These programs have experienced low acceptance rates: the number of migrants taking up this option is quite low, much less than was anticipated by governments (Fix et al. 2009; Awad 2009). Again, the risk of non-entry weighs on the decision to leave.

[3] In the early 1980s, Germany and France offered direct payments to immigrants to encourage their departure. These programs failed to achieve the expected policy goals (Hammar 1985). Migrants who intended to return anyway, took advantage of the payments, possibly by leaving somewhat earlier than originally planned (Waldorf and Esparza 1991). Thus, while the timing of return was affected, there is no evidence that the policy increased return propensities in general.

Immigration policies: high-skilled immigrants

Over the past ten years, countries have been actively implementing policies to attract high skilled migrants.[4] In an attempt to manage immigration according to their economic interests, countries have been opening temporary and/or permanent channels for high skilled immigration. Studies show that countries prefer high skilled migrants for a variety of socio-economic considerations including aging and shrinking populations, knowledge economies, and integration (e.g., Kapur and McHale 2005; OECD 2008). The United Nations Population Division (2006) reports that as of 2005, the number of states that acknowledge the value of international migrants for their development and are more predisposed to maintaining their existing immigrant intake numbers is growing. Worldwide, 60 percent of states either raised or maintained their intake numbers. Only 22 percent of states lowered intake levels, while 18 percent made no policy interventions. Thirty countries amended immigration policies to attract the highly skilled, more specifically. The profile of this group of states is quite diverse: developed and developing countries alike adjusted their immigration policy to raise the number of highly skilled immigrants allowed entry across their borders. Of those 30 countries, 16 are OECD member countries (see Table 1).

Table 1. Immigration Policy Shifts toward Highly Skilled Migrants, OECD Countries,[a] 2005

Increase Intake	Maintain Current Levels	No Intervention	Non-OECD Countries, Increasing Intake
Australia	Austria	Iceland	Zimbabwe
Canada	Belgium	Italy	Mongolia
Czech Rep	Finland		Kazakhstan
Denmark	Greece		Brunei Darussalam
France	Poland		Lao People's Dem. Republic
Germany	Portugal		Singapore
Japan	Slovak Republic		Russian Federation
Korea	Spain		Lithuania
Mexico	Sweden		Croatia
Netherlands	US		Serbia and Montenegro
New Zealand			Barbados
Norway			Colombia
Switzerland			Suriname
Turkey			Papua New Guinea
UK			

Source: United Nations Population Division of the Department of Economic and Social Affairs (2006)
[a]No information available on Luxembourg and Hungary

During economic downturns, high-skilled migrants also face increasing restrictions, albeit to a lesser degree than low-skilled migrants. As the demand for foreign workers, including high-skilled workers, falls and states attempt to protect the domestic labor market, numerical limits have decreased and bars have been raised. In Australia, for example, the quota for skilled migrants has been lowered. Britain has increased the academic and salary requirements for entry through Tier 1 of its points-based system. Now, applicants must have earned at least a Master's degree and have a previous minimum salary of £20,000. Stricter labor market tests have also

[4] For some countries the emphasis on high skilled migration for economic interests began well ahead of others. For example, in Canada it already started in 1967 and in Australia in 1973.

been implemented for skilled migrants (IOM 2009). In a bid to protect the jobs of high skilled natives, the Indonesian government "adopted measures making it more difficult for foreign workers to acquire jobs at the managerial level" (Awad 2009, 49). The stimulus package in the United States prohibited recipient employers of TARP funds from applying for H-1B visas for foreign workers. Correspondingly, the overall number of applications for H-1B visas in the U.S. fell from 163,000 to 45,000 in 2009 – a total that is much lower than the cap of 65,000. This suggests that the government mandate had an impact on the numbers of H-1B applications filed. However, interestingly enough, the number of applications received for migrants with U.S. advanced degrees reached its 20,000 cap (Fix et al. 2009). Employers may not be looking abroad for migrants but are tapping into the temporary migrant pool, that is, students, already in the country.

Despite the reductions in numbers of admitted high-skilled immigrants and stiffer academic requirements and labor market tests, it is notable that policies which recruit high-skilled migrants have not been suspended nor are these migrants generally facing expulsions or discriminatory firing practices to protect domestic workers. Admission channels remain generally open to this pool of migrants. The demographic and economic structural demands for high skilled workers in knowledge economies persists even through the economic crisis and will continue once the economic crises is over.

There are even examples of pro-active steps to stay ahead in the competition for global talent. For instance, Japanese authorities are "attempting to discourage young unemployed migrants (Brazilian nationals of Japanese origin) from leaving the territory" (IOM 2009, 5). Furthermore, an article in June 2009 reported on Japan's consideration of implementing the points immigration which targets high skilled migrants (*The Japan Times Online* 22 June 2009). In a similar vein, Canada maintained immigration targets and experienced an increase in the demand for temporary workers in the province of Alberta. Alberta "sanctioned a program to entice US temporary skilled workers through a fast-track program for Canadian permanent residency" (Fix et al. 2009, 6). While Australia downsized the number of occupations on its Critical Occupations Skills list – removing some skilled jobs such as bricklayers, welders, carpenters – it kept jobs in engineering, medical and health, and information technology on the list.

The effects of the economic crisis are less likely to have adverse effects on high skilled migrants due to their visa statuses, economic resources, and flexibility in switching to other jobs (Papademetriou et al. 2009). The visa allowances in many countries for highly skilled migrants grant them the flexibility to change employers freely and do not set conditions on their departure in the event of job loss. Increasingly, high skilled migrants are given permanent residence status from the beginning which automatically removes the obligation to leave upon being made redundant. Additionally, highly skilled migrants, tend to be concentrated in occupations that are less vulnerable to economic swings such as education and health. The flexibility of their skills also facilitates them to change sectors or even countries to seek new employment opportunities.
In cases of immigrants with temporary visas, they are sometimes allowed a grace period to find new employment. If, however, their visa is tied to a specific employer, the migrant must leave at the termination of employment. In that event, the comparatively advantageous resources of this pool of migrants – due to high salaries – make voluntary return a viable option.

Conceptual Model: Circulation of Global Talent

Highly skilled labor is extremely mobile. As discussed in the previous section, because of their human capital, the well-educated face fewer obstacles and restrictions to living and working abroad than the average person does. Moreover, their skills and financial resources also enable them to cope far better during economic downturns. Thus, upon completing their education, i.e., after graduating from university with at least a bachelor's degree, the highly educated can extend their job search beyond the boundaries of the domestic labor market and search for jobs abroad. If a highly educated person takes a job in another country, he/she becomes at-risk of returning home. Thus, following graduation (*g*), a person's migration history becomes one of circulation between domestic and international labor markets and can be conceptualized as a sequence of alternate spells of working in the home country (H) and working abroad (A), with each spell being terminated by emigration (*e*) or the return home (*r*). Figure 1 shows a schematic portrayal of an individual's circulation between the domestic labor market and labor markets abroad.

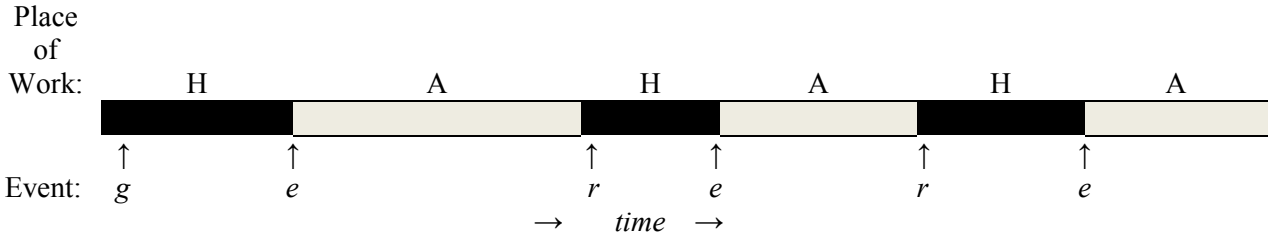

Figure 1. Circulation of a highly-skilled individual

To simplify, we restrict a person to a maximum of three spells: working at home, working abroad, and returning home. However, a person may of course never leave the domestic labor market, or, if a person left to work in another country, may never return home. The aggregate outcome of the multitude of individual decisions creates an intricate population dynamic that can be described by transition rates between various spells and that can ultimately be influenced by policies governing a variety of fields such as education, research and development, immigration, and foreign policy.

As we switch from the individual's migration history to the aggregate dynamic, we start off by dissecting the population of highly-educated people into three groups: those who have not left the country (V), those who emigrated and work abroad (X); and those who returned after terminating their stay abroad (R). To analyze the changing composition of the population over time, we define μ as the rate at which a V-person leaves the domestic labor market and emigrates, and ρ as the rate at which an X person returns home. The exit rate μ can be thought of as the product of two forces: μ_1 which is the intrinsic desire to emigrate, and μ_2 which represents the probability of a network link between a V-person and an X-person that leads to the V-person deciding to emigrate. In addition, we initially assume that the "external" influences, i.e., people graduating and entering the pool on the one hand, and people retiring on the other hand, will cancel each other.

Under these conditions, we can describe the temporal changes in the three sub-populations as follows.[5] Changes in the population working in the domestic labor market are proportional to the exit rate μ and possible encounters between V-persons and X-persons.

$$\frac{dV(t)}{dt} = -\mu\, V(t)X(t)$$

Note that without any net gains due to graduation and retirement, the V population can only diminish over time.

Changes in the number of returnees over time are always positive and are proportional to the population at-risk of returning, i.e., X(t), and the return rate, ρ.

$$\frac{dR(t)}{dt} = \rho X(t)$$

Finally, the changes in the pool of high-skilled labor working abroad are the sum of the losses to the V-population and gains of the R-population:

$$\frac{dX(t)}{dt} = \mu\, V(t)X(t) - \rho X(t)$$

Figure 2 describes the dynamics of the aggregate circulation behaviors. Losses to the V-population, i.e., high-skilled labor that has emigrated are the gains to the high-skilled labor working abroad, and losses to the high-skilled labor working abroad are gains to the pool of returnees. The high-skilled labor working in the domestic labor market is composed of the pool of V-persons and the pool of R-persons.

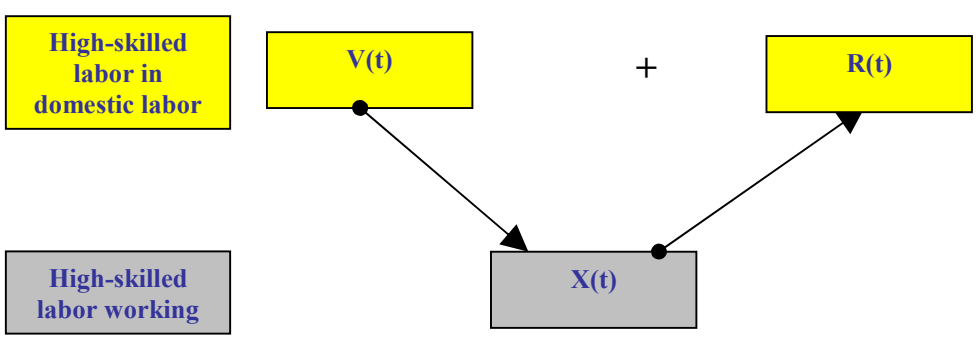

Figure 2: Flows between the domestic labor market and labor working abroad

The size of the parameters μ and ρ not only govern the dynamic of the system, but they also can be influenced by policies and exogenous circumstances. Increases in the exit rate μ imply a drain on the domestic labor force and can be avoided by, for example, stronger investments in research

[5] The conceptualization is akin to the dynamics governing the spread of an infectious disease, and the proposed model mirrors a simple epidemiological model.

and development and improving structural conditions for knowledge workers, such as higher pay and better advancement opportunities. Increases in ρ imply gains to the pool of domestic knowledge workers and may be stimulated either by active recruitment of the former labor and/or by worsening of the economic conditions abroad.

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Simulations

The following scenarios describe the effects of changes in the parameters ρ and μ. We begin by describing the baseline scenario and subsequently move to simulating the effects of three scenarios: (1) a repatriation scheme; (2) a focus on retention; and (3) a focus on attracting and/or in-situ growth of human capital.

Baseline Scenario

As a baseline scenario, we choose the following conditions for time t=0: a domestic pool of knowledge workers of one million people, i.e., V(0) = 1,000,000 and a pool of expatriates of X(0) = 5,000. We also assume that there are no returnees at time t=0, i.e. R(0) = 0. We further choose an exit rate from the domestic labor market of μ = .15 per 1,000,000 V-X encounters per year and a return rate of ρ = 0.1 per year, thus implying that, on average, an expatriate stays abroad for ten years. Figure 3 shows the growth and decline in the three sub-populations over time, assuming the parameters of the baseline scenario.

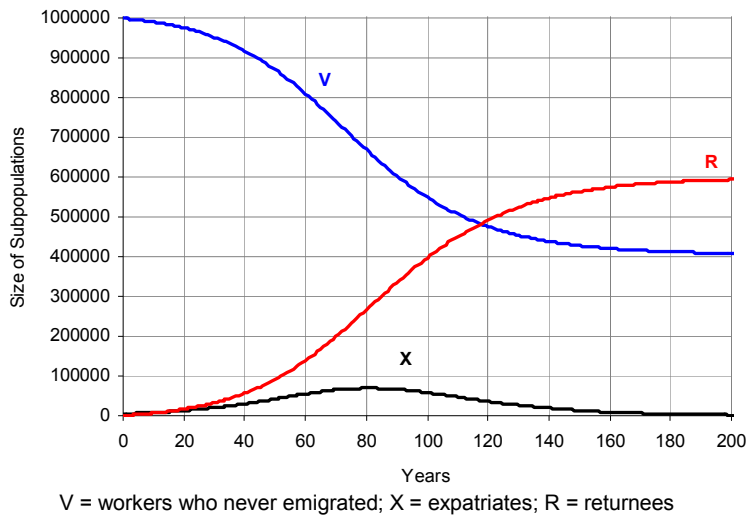

Figure 3. Distribution of knowledge workers over time, baseline scenario

The pool of expatriates increases for 81 years up to a maximum of almost 69,000. Thereafter, it declines as a result of the shrinking population at-risk of emigrating (V). The pool of returnees increases initially at an increasing rate as a result of the increasing population at-risk of returning. After the X-population has reached its maximum, the pool of returnees continues to increase but at a decreasing rate. After 200 years, the system almost reaches a stable state, as the number of expatriates that help attract more emigrants and that are the at-risk population for returning home has been depleted.

Figure 4 shows the ratio of the number of high-skilled workers in the domestic labor market and the number of knowledge workers abroad:

$$DA(t) = \frac{V(t) + R(t)}{X(t)}$$

At time t=0, there are 200 domestic knowledge workers for every high-skilled worker in the non-domestic labor market. It takes 81 years for the ratio to decline to its minimum of 14. Interestingly, its subsequent rise to the initial level of 200 takes 15 years longer than its earlier decline. As the system approaches the terminal stage (that is, as the number of expatriates becomes very small), the ratio quickly increases towards infinity.

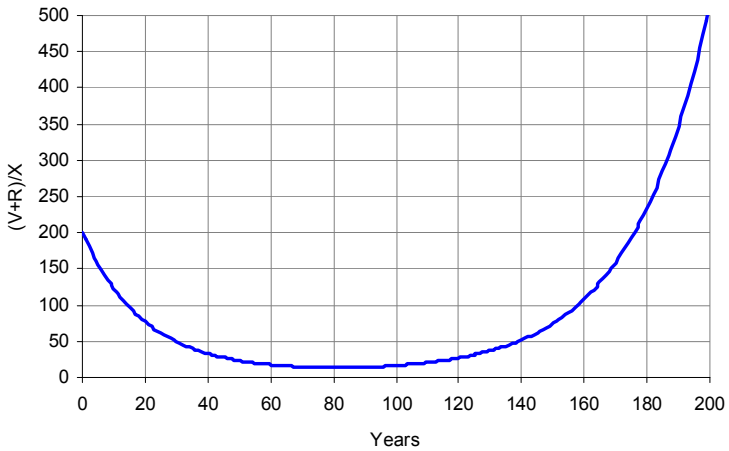

Figure 4. Ratio of knowledge workers in the domestic labor market (V+R) and those abroad (X)

Policy Scenarios

The first scenario involves an increase in the rate at which expatriates return home, ρ. Such an increase may be the result of a concerted effort to lure expatriates back home. Hugo's (2005) study of Australian expatriates working in academia showed that employment-related factors, such as research funding, career advancement and opportunities play a crucial role in their evaluation of whether to stay abroad or return home. Governments can influence these factors, and thereby also the rate at which expatriates return home.

Assuming first a 20% increase, that is ρ increases from ρ=0.1 to ρ = 0.12, the population of expatriates grows only to a maximum of some 27,000 (61% lower than X_{max} in the baseline scenario) but does so at a slightly slower speed than in the baseline scenario. It takes 92 years for the maximum to be reached (Figure 5).

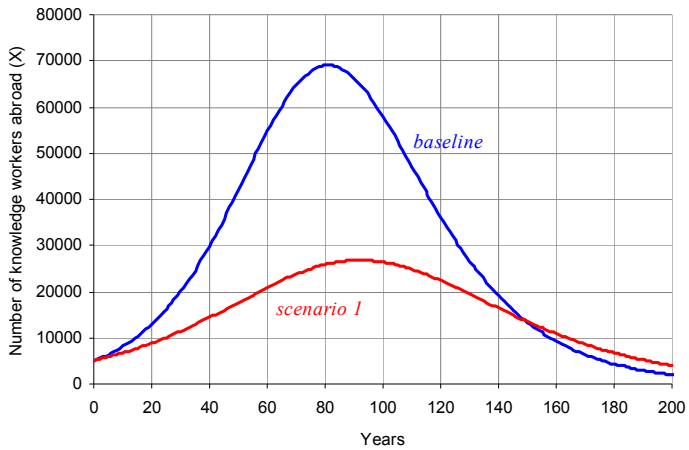

Figure 5. Size of the pool of expatriates over time, baseline and scenario 1

Importantly, given the parameters of the first scenario, the ratio of domestic labor to workers abroad stays substantially above that for the baseline scenario (see Figure 6). The minimum is more than two and a half times bigger than the minimum of the baseline scenario. However, the "recovery" after reaching the minimum is slower than in the baseline scenario. If we only assume a 10% increase of ρ, then X_{max} decreases by 35% and the domestic/abroad ratio increases by 50% (see Table 1). In order to stop the brain drain immediately, that is:

$$\frac{\partial \frac{V(t)+R(t)}{X(t)}}{\partial t} > 0$$

the return rate needs to be increased to ρ = 0.15.

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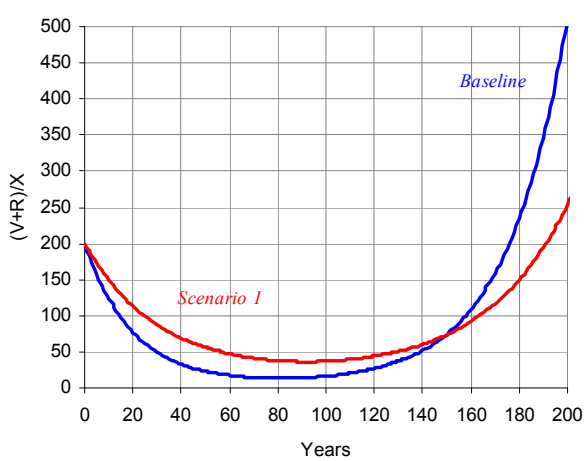

Figure 6. Comparison of (V+R)/X for baseline and scenario 1

In the second scenario, we evaluate changes due to a reduction of emigration. Again, governments can play a key role in influencing the magnitude of the emigration flow as studies

show that economic opportunities and professional infrastructure are salient factors in the decision to leave the country (OECD 2008).

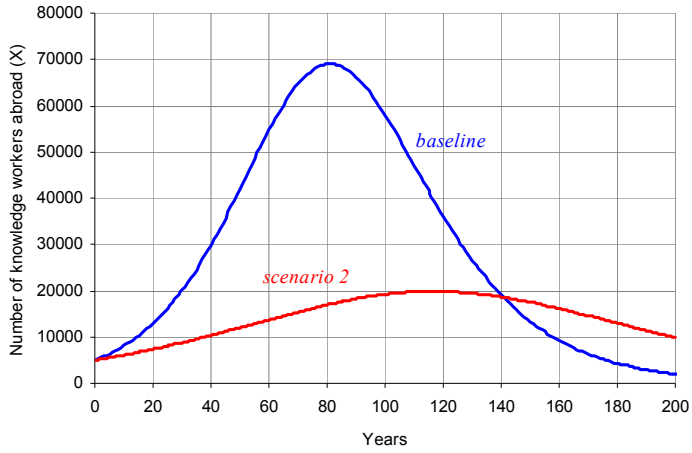

Figure 7. Size of the pool of expatriates over time, baseline and scenario 2

Suppose μ is decreased by 20%. As a result, the X_{max} is reached at t=117 and the value of X_{max} is reduced by 71% compared to the baseline, reaching only 19,864 knowledge workers who are working abroad (see Figure 7). At the maximum, the domestic / abroad ratio is 50 domestic workers for every worker abroad, or a quarter of its initial value at t=0 (see Figure 8).

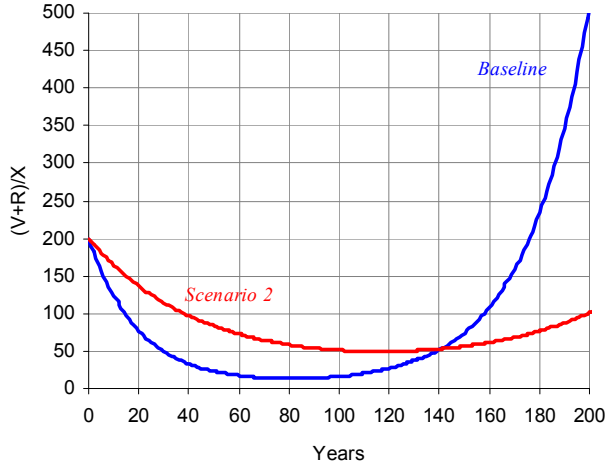

Figure 8. Comparison of (V+R)/X for baseline and scenario 2

In the third scenario, we simulate the attraction of global talent from abroad. Numerically, attracting global talent is similar to in-situ growth of the V-population due to net gains from graduation and retirement. Both strategies imply a steady injection of new additions to the V-population which subsequently is also at- risk of emigration and thus exiting into the X-

population.[6] We assume that these new additions are proportional to the size of the domestic pool of workers (i.e., V(t) + R(t)), with a proportionality factor of 0.003. That is, per year, 1,000 knowledge workers in the domestic labor market attract three new ones (either from abroad or through in-situ growth). As a result, the total pool of labor (V+X+R) increases from its initial size of 1,005,000 at t=0 to 1,783,831 at t=200. Under these conditions, a comparison to the baseline is no longer sufficient and we also make a comparison to scenario 3* that assumes an annual injection of 0.005%.

Figure 9 shows the temporal path of the pool of labor that is working abroad. Interestingly, when the additions are small (0.003%), the shape of the curve looks similar to the baseline scenario albeit it is shifted upward. The maximum of 210,613 is reached a little bit earlier than in the baseline scenario, at t=76. Thereafter, the pool of expatriates declines. But the decline does not lead to a complete depletion of the X-population. Instead, starting at t=199, there is once again a gradual increase. When using a bigger annual injection of 0.005 as in scenario 3*, the increase becomes more distinct. Thus, under the assumption of an overall growing pool of knowledge workers, a stable distribution will not be reached.

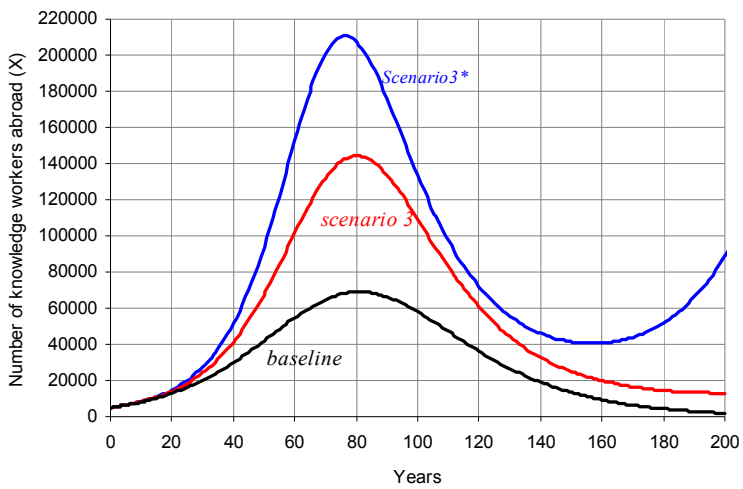

Figure 9. Size of the pool of expatriates over time, baseline, scenarios 3 and 3*

Figure 10 shows the implications for the domestic/abroad ratio which is size-independent. As in the baseline scenario, the ratio initially declines until the pool of labor abroad reaches its maximum. Thereafter it increases, but does not increase to infinity as in the baseline case where eventually the pool of labor abroad is depleted. Instead, it reaches a finite maximum before it declines again.

[6] It is reasonable to assume that exit rates, μ_1 and μ_2, for knowledge workers attracted from abroad and native-born knowledge workers, respectively, differ. In this version of the paper we are ignoring this possible difference and instead assume that the rates are equal, $\mu_1 = \mu_2$.

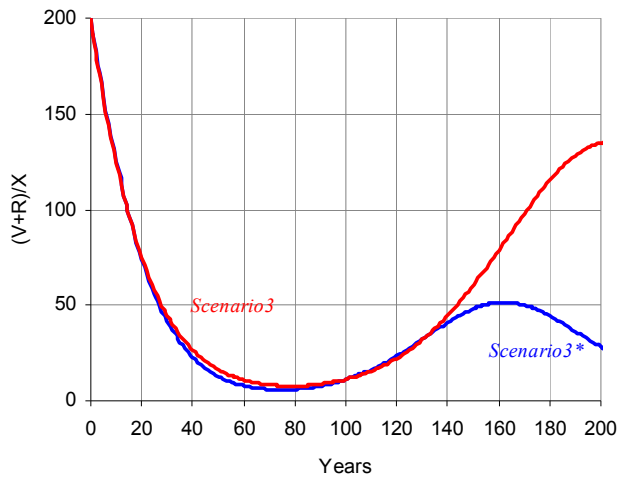

Figure 10. Comparison of (V+R)/X for scenario 3 and scenario 3*

Table 2 summarizes the key characteristics of the baseline scenario and the three policy scenarios. Reducing emigration, as opposed to increasing return migration, emerges as the strategy that is more efficient in maintaining a favorable D/A ratio. The former also slows the process of circulation more substantially than a focus on return migration. This is not surprising as the population at-risk of emigrating is substantially bigger than the population at-risk of returning. Thus, the accumulation of human capital, i.e., the aggregate outcomes, can be more strongly affected by focusing on weakening emigration than by focusing on the return of expatriates.

Table 2. Summary of Policy Simulations

		Scenario 1		Scenario 2		Scenario 3	
Characteristic	Baseline	return migration		emigration		growth of V	
ρ	0.1	↑ 20%	↑ 10%				
μ	0.00015			↓ 20%	↓ 10%		
V(0)	1,000,000					↑ V(t) by .003*(V+R)	↑ V(t) by .005*(V+R)
X(0)	5000						
R(0)	0						
Vmax	69,000	26,747	44,760	19,864	42,401	210,613	210,516
% Δ vs. baseline		-61.2%	-35.1%	-71.2%	-38.5%	205.2%	205.1%
tmax	81	92	88	117	97	76	77
% Δ vs. baseline		13.6%	8.6%	44.4%	19.8%	-6.2%	-4.9%
D/A at tmax	14	37	21	50	23	6	6
% Δ vs. baseline		164.3%	50.0%	257.1%	64.3%	-57.1%	-57.1%

Strategies that aim at enhancing the V-population have a substantial effect within a comparatively short time period. However, enhancing the V-population also implies that the pool of expatriates is substantially enlarged, and the D/A ratio actually reaches quite low levels. This is very problematic if the growth of the V-population is due to in-situ growth. Under those conditions, resources put into education are wasted as many of the new additions to the V-population eventually emigrate.

Conclusion and Discussion

In this paper, we presented an analysis of immigration measures since the beginning of the global economic crisis since 2008. We were concerned with whether the contemporary economic downturn affects international migrants unevenly. Anecdotal evidence suggests that impact of the economic crisis has a skills bias whereby highly skilled migrants incur more favorable outcomes. That is, governments' policy responses to protect the domestic labor market and assuage voters have been aimed at low skilled rather than to highly skilled migrants. The latter has been impacted as well by cuts in numerical intake limits and increases in the qualifications needed to access foreign labor markets. However, their occupations, skill, and financial resources allow them to manage better during the economic crisis. More importantly, countries' interests in accumulating human capital influence their continued demand for and light touch toward high skilled international migrants during these bad economic times. Furthermore, in an age where knowledge economies and aging and declining fertility rates are the norm and the demand for human capital is high, particularly for developed countries, states prefer high skilled migrants even in economic downturns. Reversing policies that aim to attract or retain high skilled migrants might slow recovery or have adverse effects in the recovery phase. Thus, it is important to understand the long-term effects of policies that influence the flow of global talent. To accomplish this, we design a non-linear dynamic model to simulate policies and conditions aimed at attracting or retaining highly skilled workers, and /or on the in-situ growth of human capital. Our models indicate that policies geared towards reducing emigration are a more effective strategy to accumulating human capital than those aimed at attracting expatriates. We also find that polices geared towards attracting high-skilled immigrants may be more cost-effective than training natives since investments in education may be lost as many newly trained individuals may eventually emigrate.

For further research, it would be useful to allow for heterogeneity in the model and, for example, allow exit rates (μ) to vary by age and exit rates (ρ) to vary by duration of stay abroad. Additionally, adding more spells to the model such that returnees are at risk of re-emigrating would expand the analysis. Future research should also extend the analysis by allowing for interdependencies that take into account, for example, whether policies that aim at attracting foreign high-skilled workers also have an effect on reducing μ and increasing ρ.

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