Family Reunification or Point-based Immigration System? The Case of the U.S. and Mexico

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Abstract

While the immigration policy in the U.S. is mainly oriented to family reunification, in Australia, Canada and the U.K. it is a points-based immigration system which main objective is to attract high skilled immigrants. This paper compares both immigration policies through the transition for the U.S. and Mexico. I find that: (i) The point system increases the average years of the immigrants by 3.5 years. (ii) The Mexican immigrants suffer a 10% reduction in their effective hours of labor when they move to the U.S. (iii) Migration reduces inequality, more significantly if the immigration policy is the point system and increases output per capita differences between both countries. (iv) The offspring of the immigrants invest more in human capital than the U.S. natives. (v) The earnings ratio immigrants to the U.S. natives is lower under the quota system than under the point system but along the transition it reverses converging at the steady state.

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Introduction

One immigration debate in the U.S. is the convenience of adopting an immigration policy based on a point system instead of the one that it is in force based on visa quotas and family reunification, which would imply a shift in the philosophy of the U.S immigration system. The last attempt in this direction was the bill Comprehensive Immigration Reform Act of 2007 and found the opposition of President Barack Obama, who was Senator at that time, and defined the bill as a "radical experiment in social engineering."[1] In favor of the point system it is argued that it brings in better-educated, higher-skilled immigrants helping the U.S. to compete in the world economy and it also allows to respond to changing economic needs. The following words of Doris Meissner, director of the Immigration and Naturalization Service under President Bill Clinton, describes well the current state of the knowledge in this topic. When she was asked about the point system she said, "Point systems are known in other countries, and there is certainly a body of written material on it, but it hasn't had any careful research", and she added, "it may be a good idea, but there isn't any evidence to argue one way or the other".[2]

This paper compares the transition for both immigration policies in an international general equilibrium model with heterogeneous agents that invest in human capital and physical capital and decide endogenously migration. I study the effect of both migration policies on years of schooling and on level of ability for U.S. natives, Mexican natives, Mexican immigrants and immigrants' descendants. Through the transition I also compute per capita GDP ratio Mexico to the U.S., the earnings ratio between immigrants and U.S. natives, Mincer returns and Gini indexes.

The immigration policy based on the point system increases the average years of the immigrants by 3.5 years. But through the transition, the difference in years of schooling of the immigrants under both immigration policies decreases being this average roughly 9.4 at the steady state. Along the transition immigrants experience a trade off. On the one hand the international interest rate increases which decreases investment in education. On the other hand the immigrants are positive self-selected on their level of ability which is positively correlated with investment in human capital. Under the point system the first effect dominates the trade off implying that through the transition the years of schooling of the immigrants decrease. But if the immigration policy is the quota system then the second effect dominates and the years of schooling of the immigrants increase through the transition.

[1] Quote from The New York Times. Published: Monday, June 4, 2007 by Robert Pear.
[2] Quote from The Washington Post. Published: Sunday, May 27, 2007 by Michael Abramowitz.

Other results are: (i) The Mexican immigrants suffer a 10% reduction in their effective hours of labor when they move to the U.S. (i1) Migration increases output per capita differences between the U.S. and Mexico. (iii) Migration reduces inequality, more significantly if the immigration policy is the point system. (iv) The offspring of the immigrants invest more in human capital than the U.S. natives. (v) The earnings ratio immigrants to the U.S. natives is lower under the quota system than under the point system but after some periods the former crosses the latter and they converge being roughly 1 at the steady state.

Some facts and figures to see the magnitude of international migration worldwide. There are 214 millions of estimated international migrants worldwide, which means 3.1% of the world's population. This implies that immigrants would be the fifth most populous country in the world. Estimated remittances sent by immigrants add up to 414 billion dollars, going 76% of this quantity to developing countries.[3] The main hosting counties and their inflow shares of immigrants over the OECD countries are the United States (52%), Australia (12%), Canada (11%) and the United Kingdom (9%). These shares have remained quite constant throw time. See figures [1] and [2].

While the immigration policy in the U.S. is mainly oriented to family reunification, in Australia, Canada and the U.K. it is a points-based immigration system which main objective is to attract high skilled immigrants. See figure [3].

In the U.S. the first law to limit the number of immigrant was in 1875 and it prohibited the admission to criminals and prostitutes. The Immigration Act of 1924 implied the first permanent restriction on immigrants into the U.S. by the National Origins Quota which allowed immigrants for any country to 2% of the number of people from that country already living in the U.S. in 1980. Since family reunification was the main target of this immigration policy, immediate relatives of U.S. citizens and other family members were either exempted from this numerical limitation or they had preference. The Immigration and Nationality Act of 1965 replaced the origins quota system and, although with some modifications, still remains in place. It established an annual limitation of 300,000 visas for immigrants with no more than 20,000 per country. This numerical restriction affects the family-sponsored preference admissions and the employment-sponsored admissions but admissions of immediate relatives of U.S. citizens still are admitted without numerical limitation.[4]

[3] Source: International Organization for Migration, 2009.

[4] Other two limited channels for immigrants to gain entry into the country are admission of refugees and asylum-seekers which number is determined by the President in consultation with the Congress and the Diversity Program which allows admission for people from a diverse set of countries with the goal of to increase immigration from countries with historically low immigration levels to the U.S.

On the other hand Canada, Australia and United Kingdom have a points-based immigration system which gives points to specified attributes as education, language, age, recent work experience or occupation. To be accepted the immigrants must acquire a minimum number of points. Under this immigration policy only immediate relatives are admitted without numerical limitation while employment or skill based immigration are point tested and numerically limited.[5]

Census data for 2009/10 shows that U.S. immigrants have lower level of education than Canadian and Australian immigrants. The percentage of permanent immigrants with at the most high school is 56% in the U.S. but 38% in Canada while the percentage of permanent immigrants with at least some college is 44% in the U.S. and 62% in Canada.

The share of admissions based on family reunification (employment necessities) is higher (lower) in the U.S. than in Canada, Australia and the U.k. The share of immigrants with high levels of education is higher in these countries with respect to the U.S.

It seems that Canada, Australia and the U.K. are doing better in international competition for high skilled immigrants. What would be the effect for the U.S. of adopting a points-based immigration system?

1 The Model Economy

1.1 Locations

There are two locations, the North and the South indexed by $i \in \{N,S\}$ respectively. In this paper the North is the U.S. while the South is Mexico but for the moment and only for practical reasons allow me to use this notation instead of the one that may seem more natural as $\{US,MEX\}$. Both locations differ in their TFP level, their population parameters and their labor market specifications. Physical capital is perfectly mobile between them.

1.2 Technologies

Output is produced according to the technology

$$Y_i = A_i K_i^{\alpha} H_i^{1-\alpha} \quad for \quad i \in \{N,S\}, \tag{1}$$

where Y_i is aggregate output and K_i and H_i are aggregate physical capital and aggregate human capital respectively in country i. When calibrated, the U.S. will be more productive than Mexico, so $A_N > A_S$.

[5] As in the U.S. humanitarian or refugee immigrants are also admitted.

The production function for human capital is

$$h' = z'(s^{\eta}e^{1-\eta})^{\xi} + \psi_{i'} \quad \eta,\xi \in (0,1) \quad for \quad i' \in \{N,S\}. \tag{2}$$

Human capital is produced with two inputs, time, $s \in [0,1]$, and expenditure on goods allocated to education, e. The parameter $\psi_{i'}$ stands for the labor market productivity independently of the level of human capital. It is specific for each country and depends on the national regulation of the labor market and also on the intrinsic characteristics of the national labor market. In the model $\psi_S > \psi_N$ but this will be discussed in the calibration section. Finally, z' is a stochastic parameter that refers to the individual ability to accumulate human capital.

1.3 Demographic Structure

The model economy is defined as an overlapping generation of dynasties that are altruistic toward the offsprings. There is a large number of dynasties which in turn are formed by households. Agents live for two periods. In the first period they are young agents while in the second period they are old agents. Inside a household there are a certain number of young agents and also there is an old agent who makes all the decisions. Each time that a young agent becomes old, a new household appears.

One of the decision that the old agent makes is to migrate. If the old agent decides to migrate this actually happens with probability p. In this model migration is unidirectional from the South to the North. Taking in advance this result, the population dynamics are:

$$N_N' = (1+n_N)N_N + m\mathrm{p}(1+n_S)N_S \tag{3}$$
$$N_S' = (1+n_S)(1-\mathrm{p}m)N_S. \tag{4}$$

Where N_i and n_i stand for total population and natural population growth rate respectively in country i. The migration rate is denoted by m.[6] Both locations have different natural population growth rates being $n_S > n_N$.

1.4 Preferences and Endowments

The household gets utility from consumption. The instantaneous utility function takes the form:

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma}. \tag{5}$$

[6] Due to unidirectionality of the migration flow, m stands for the proportion of households in the South that decide to leave the native country and to establish in the North. Since the number of young agents per household is constant and equal for all the dynasties the proportion of households that migrate is the same that the proportion of population migrating.

Young agents receive an idiosyncratic shock to their ability $z \in \mathscr{Z} = \{z_1, ..., z_n\}$. The shock is the same for all the members of the household and it is unobservable for old agents. It follows a markov process with transition matrix $\pi_{z,z'}$ and, for simplicity, I assume that the markov process is common in both locations.

1.5 The Household's Problem

The old agent decides per capita consumption c and per capita assets for the next period a' which can be seen as a bequest to the offspring. The old agent also decides the investment in human capital of the descendants. This implies to allocate time s and expenditure on goods e in the human capital production function of the children. Finally, the old agent makes the decision of migration for the descendants. It means that the old agent decides where all its descendants are going to start their new households the next period.[7] Household income consists of earnings from the old agent, earnings form the young agents and income from assets.

If the decision made is to migrate then with a certain probability p the migration actually happens but with a probability $(1-\mathrm{p})$ although the old agent decides to migrate its descendants do not migrate. This mechanism captures the immigration policy based on visa quotas and family reunification because with certain probability you may or may not get the visa.

I denote by i the current location and by i' the location next period. So, if $i' \neq i$ it means migration from location i to location i'. The model economy considers two migration costs. The first one is a pecuniary migration cost θ_p which can be interpreted as the travel expenses between the two locations. Traditionally in the migration literature this cost has been related to the distance between the source country and the host country and some other factor as, for instance, the cost of keeping in contact with the native country. The second cost θ_s represents a loss in the effective labor hours of the immigrants, so to their productivity when they are abroad. Problems derived from adaptation to a new culture, different language or skill portability are good examples of this cost. I assume that this migration cost only affects the first generation of immigrants. It means that the immigrants' descendants are exactly equal to the natives.

The state of a household is completely characterized by its initial assets, its human capital, its current value of the stochastic shock, its native country and its current location which is given by (a, h, z, j, i). If $j = i = S$ it means a household that has born in the South and still is living there, so migration is feasible. For immigrants $j = S$ but $i = N$ and for the North natives $j = i = N$.

[7] It is the old agent who decides if the young agents migrate. The alternative that young agents decide to migrate does not distort the results but it is computationally costlier.

The problem of a South native, $j = S$ and $i = S$, becomes:

$$V(a,h,z,S,S) = \max \{V^M(a,h,z,S,S), V^{\overline{M}}(a,h,z,S,S)\} \tag{6}$$

where

$$V^M(a,h,z,S,S) = \max_{c,e,s,a'} \{u(c)+$$
$$+\beta(1+n_S)\sum_{z'} \pi_{z,z'}[\mathrm{p} \quad V(a',h',z',S,N) \quad +(1-\mathrm{p})V(a',h',z',S,S)]\}$$

s.t

$$c+(1+n_S)e+(1+n_S)a' \leq w_S h+(1+n_S)(1-s)w_S\psi_S+Ra-\theta_p,$$
$$h' = z'(s^\eta e^{1-\eta})^\xi+\psi_{i'},$$
$$a',e \geq 0 \quad and \quad s \in [0,1].$$

$$V^{\overline{M}}(a,h,z,S,S) = \max_{c,e,s,a'} \{u(c)+\beta(1+n_S)\sum_{z'} \pi_{z,z'} V(a',h',z',S,S)\}$$

s.t

$$c+(1+n_S)e+(1+n_S)a' \leq w_S h+(1+n_S)(1-s)w_S\psi_S+Ra,$$
$$h' = z'(s^\eta e^{1-\eta})^\xi+\psi_S,$$
$$a',e \geq 0 \quad and \quad s \in [0,1].$$

And the policy function for migration is defined as:

$$i' = \begin{cases} N & if \quad V^M(a,h,z,S,S) \geq V^{\overline{M}}(a,h,z,S,S), \\ S & otherwise. \end{cases}$$

A household in the South in addition to c,e,s,a' decides whether to migrate and this is done by comparing the present value of migration, V^M, with no migration $V^{\overline{M}}$. First, note that the main differences between these two value functions are the next period value functions. If no migration is chosen, then the problem faced by a household the next period is exactly the same. Second, if the decision is to migrate then the pecuniary cost θ_p has to be paid. And, third, although the decision can be to migrate it does not mean that migration actually takes place. This only happens with probability p. So if the household decides to migrate to the North and it migrates, then their descendants start their own household in the North as immigrants and, consistent with the previous notation, $j = S$ and $i = N$ and they solve the following problem:

$$V(a,h,z,S,N) = \max_{c,e,s,a'} \{u(c) + \beta(1+n_N) \sum_{z'} \pi_{z,z'} V(a',h',z',N,N)\} \tag{7}$$

s.t

$$c + (1+n_N)e + (1+n_N)a' \leq w_N \theta_s h + (1+n_N)(1-s) w_N \psi_N + Ra,$$
$$h' = z'(s^\eta e^{1-\eta})^\xi + \psi_N,$$
$$a', e \geq 0 \quad and \quad s \in [0,1].$$

The immigrants are less productive than natives with the same level of human capital due to the parameter $\theta_s \in [0,1]$. Finally the problem faced by a native household in the North, $j = N$ and $i = N$, is:

$$V(a,h,z,N,N) = \max_{c,e,s,a'} \{u(c) + \beta(1+n_N) \sum_{z'} \pi_{z,z'} V(a',h',z',N,N)\} \tag{8}$$

s.t

$$c + (1+n_N)e + (1+n_N)a' \leq w_N h + (1+n_N)(1-s) w_N \psi_N + Ra,$$
$$h' = z'(s^\eta e^{1-\eta})^\xi + \psi_N,$$
$$a', e \geq 0 \quad and \quad s \in [0,1].$$

1.6 Definition of Competitive Equilibrium

In this section I define a competitive equilibrium and a steady state equilibrium. For notation purpose I set $x = \{a,h,z,j,i\}$ and $X = \{[0,\infty] \times [0,\infty] \times \mathscr{Z} \times \{N,S\} \times \{N,S\}\}$. Let $\mathscr{B}$ be the $\sigma - algebra$ generated in X by the Borel subsets. A probability measure μ over $\mathscr{B}$ describes the economy by stating how many households there are of each type. Let $P(x,B)$ denote the transition function. Function P describes the conditional probability for a type x household to have a type in the set $B \subset \mathscr{B}$ tomorrow and describes how the economy moves over time by generating a probability measure for tomorrow, μ', given a probability measure, μ today. So, $\mu'(B) = \int_X P(x,B) d\mu$ is tomorrow's distribution of households μ' as a function of today's distribution μ and the Markov chain. Let X_S be $X \mid_{i=S}$, X_N be $X \mid_{i=N}$ and X_I be $X \mid_{j=S,i=N}$ and equivalently for x_i. Set $g^j(x)$ as the policy function for $j = \{c,a',h',e,s,i'\}$.

Definition 1. The competitive equilibrium for this economy is a set of functions for the household's problem $\{V_t(x),\ g_t^c(x),\ g_t^{a'}(x),\ g_t^{h'}(x),\ g_t^e(x),\ g_t^s(x),\ g_t^{i'}(x)\}_{t=1}^{\infty}$, prices $\{w_{it}\}_{t=1}^{\infty}$ and $\{r_t\}_{t=1}^{\infty}$, a measure of households, $\{\mu_t\}_{t=1}^{1}$, and a migration probability, $\{\mathrm{p}_t\}_{t=1}^{\infty}$ such that:

1. Markets are competitive and there are no arbitrage opportunities. Note that since capital is perfectly mobile, capital rental price must equalize across countries. Factors prices are given by:

$$r_t = \alpha A_S \left(\frac{K_{St}}{H_{St}}\right)^{\alpha-1} = \alpha A_N \left(\frac{K_{Nt}}{H_{Nt}}\right)^{\alpha-1} \tag{9}$$

and

$$w_{it} = (1-\alpha)A_i \left(\frac{K_{it}}{H_{it}}\right)^{\alpha} fori \in \{N,S\}. \tag{10}$$

2. Given prices and migration probability, the functions $\{V_t(x)$, $g_t^c(x)$, $g_t^{a'}(x)$, $g_t^{h'}(x)$, $g_t^e(x)$, $g_t^s(x)$, $g_t^{i'}(x)\}$ solve the household's problem for each t.

3. Markets clear:

$$H_{Nt} = \int_{X_N} h_t d\mu_t(x_N) + \int_{X_N} (1-g_t^s(x_N))\psi_N d\mu_t(x_N) - \tag{11}$$

$$- \int_{X_I} h_t(x_I)\theta_s d\mu_t \tag{12}$$

$$H_{St} = \int_{X_S} h_t d\mu_t(x_S) + \int_{X_S} (1-g_t^s(x_S))\psi_S d\mu_t(x_S), \tag{13}$$

$$K_{St} + K_{Nt} = \int_X a_t d\mu_t(x), \tag{14}$$

and

$$I_t = \int_X [g_t^{a'}(x) - (1-\delta)a_t] d\mu_t(x). \tag{15}$$

4. The world resource constraint is satisfied:

$$Y_{St} + Y_{Nt} = \int_X [g_t^c(x) + g_t^e(x)] d\mu_t(x) + I_t + \int_{X_S} g_t^{i'}(x_S)\mathrm{p}_t\theta_p d\mu_t(x_S). \tag{16}$$

5. The measure of households is $\mu_{t+1}(B) = \int_X P(x,B) \quad d\mu_t$.[8]

[8] The function $P(x,B)$ is determined by the optimal decisions on assets, human capital and migration and by the exogenous transition probabilities on the ability shock z. So $P(x,B) = Prob[\{z' \in \mathscr{Z} : (g^{a'}(x), g^{h'}(x), g^{i'}(x), z') \in B\} \mid z]$, where the relevant probability is the conditional probability that describes the behavior of the Markov process z.

Definition 2. A stationary equilibrium is a competitive equilibrium in which variables and functions, as well as prices and policies, are constant. Note that population growth rates are equal in both economies. I define $\aleph$ as total world population and the fraction of people living in country i as $\phi_i = \frac{N_i}{\aleph}$ for $i = \{N, S\}$. Then I do the following normalization $\phi_S + \phi_N = 1$. Using these definitions and equations the population dynamics can be written as:

$$\phi_N^{'} = \frac{(1+n_N)\phi_N + (1+n_S)m\mathrm{p}\phi_S}{(1+n_N)\phi_N + (1+n_S)\phi_S} \tag{17}$$

$$\phi_S^{'} = \frac{(1+n_S)(1-m\mathrm{p})\phi_S}{(1+n_N)\phi_N + (1+n_S)\phi_S} \tag{18}$$

Equilibrium at the steady state implies that $\phi_i^{'} = \phi_i$ for $i = \{S, N\}$. It means that the size of the population relative to the world population must be constant in each economy. Equivalently, it means that population growth rates are equal in both economies at the steady state. So, the necessary condition for the steady state equilibrium is:

$$m = \frac{\phi_N}{\mathrm{p}}\left(\frac{n_S - n_N}{1+n_S}\right) \tag{19}$$

The intuition is simple. Since population ratios must be constant at the steady state, if natural population growth rates are different the migration rate must equalize the population growth rate across countries.

2 Calibration

2.1 Parameters and Targets

The calibration follows three steps. In the first two I calibrate the benchmark economy for the U.S. and the the benchmark economy for Mexico as closed economies. Then, the third step calibrates the parameters that appear in the model once migration is available which is in the international economy model.[9] So, first I focus on the North and I calibrate all the parameters, either country specific or not, using U.S. cross-sectional data. Second, I calibrate the country specific parameters of the South using data from Mexico. And, finally, I calibrate the parameters directly linked to migration in the international economy model.

[9] In fact, which it is crucial for the calibration procedure it is not to consider both locations as closed economies, which it is important for practical computational reasons is to calibrate them without migration flows between them. But since the size of the migration flows is relatively very small compared to the size of both economies, its effect in the calibration of the parameter values is insignificant.

Parameter		Value
TFP	A_N	1
U.S. natural population growth rate	n_N	0.6%
Discount Factor	β	0.95
CRRA	γ	2
Physical capital share	α	0.33
Physical capital depreciation	δ	0.0668

Table 1: *Parameters and values.*

I model the life of an agent from age 6 to age 66 with each period lasting 30 years. The model starts from age 6 to better capture the human capital investment decision, as this is a common strategy in human capital literature. Age 66 is chosen as it is roughly the age of retirement. The North annual natural population growth rate n_N is 0.6%.[10] I set $\delta = 0.0668$ and $\alpha = 0.33$ following Cooley and Prescott (1995). The North TFP is normalized to 1 ($A_N = 1$). The coefficient of the CRRA utility function γ is set equal to 2, which is in the range of usually accepted values in this literature. Finally β is calibrated to match an annual interest rate of 5%. The parameters and their values are presented in table (1). All the values are in annual terms.

The production function of human capital involves the parameters η, ξ, ψ_N and the shock z for the ability which follows in logs an AR(1) process.[11] This process is approximated by 5 shocks using a Markov chain following the procedure in Tauchen (1986) which in turn implies two additional parameters values ρ_z and σ_z^2. To sum up, there are 5 parameter values related to the human capital investment to be calibrated using U.S. cross-sectional data.

The targets used to calibrate these 5 parameter values are: (i) The average years of education in the U.S. is 12.6 from the U.S. Department of Education (2008). (ii) The intergenerational correlation of log-earnings is 0.5 from Mulligan (1997).[12] (iii) The percentage of people with at least some college or university education or higher is equal to 54%, taken from the U.S. Census Bureau, Current Population Survey (2008).[13] (iv) The ratio of earnings primary to secondary for full time

[10] U.S. Census Bureau, International Data Base, year 2010.
[11] The AR(1) process in logs for ability is the following:

$$log(z') = \rho_z log(z) + \varepsilon_z, \quad where \quad \varepsilon_z \sim N(0, \sigma_z^2).$$

[12] See Mulligan (1997), table 7.5, page 202.
[13] Primary school is from the age of 6 years to 14 and Secondary, or High School, is from the age of 14 to 18. Finally, up 18 I consider College, Bachelor's degree, Master's degree, Doctoral degree

	U.S. Data	U.S. Model Data	Par.	Val.
Target				
Av. years of schooling	12.6	12.6	ψ_N	0.116
Intergenerational corr. of log-earnings	0.5	0.5	ρ_z	0.46
Expenditure in education as a ratio to GDP	3.77%	3.3%	ξ	0.71
Ratio earnings primary to secondary	0.65	0.68	σ_z	0.1
% with college education or higher	54%	56%	η	0.71

Table 2: *Targets, U.S. data, U.S. benchmark economy data, parameters and parameters' values.*

workers is 0.65 taken from the U.S. Department of Education (2005). Institute of Education Sciences.[14] (v) The expenditure in education as a ratio to GDP is 3.77% from Seshadri and Manuelli (2007).

2.2 Results in the Benchmark Economy for the U.S. and Mexico

Table (2) shows each target linked to its parameter value, also reminds the U.S. data and compares this data with the data generated from the model. The U.S. benchmark economy replicates well all the targets.

Once the benchmark economy for the U.S. has been calibrated it is the turn for the benchmark economy of Mexico. The country specific parameters for Mexico that still must be calibrated are A_S, n_S and ψ_S. The TFP for Mexico is set to 0.77 from Ferreira et al. (2008) and the Mexican natural population growth rate is 1.4%.[15]. The parameter ψ_S is calibrated to match the target of average years of schooling in Mexico equal to 6.3 from Hendricks (2002) and its value is 0.133. So, the calibration process implies that $\psi_S > \psi_N$. There are two complementary explanations to argue this. First, the ratio low skill jobs to high skill jobs is higher in Mexico than in the U.S. and, second, the regulation of the labor market in Mexico is more relaxed in the sense that there is more children's labor or more opportunities to children's labor. Finally, since the discount factor is fixed to be the same in Mexico and in the U.S. the equilibrium interest rate in Mexico is 5.014%.

Table (3) sums up some results from the benchmark economy of the U.S. and results from the benchmark economy of Mexico and also shows results for

and Professional degree. Note that in this model the age of a young agent starts at 6 years old, when primary school begins.

[14] Table: Distribution of earnings and median earnings of persons 25 years old and over, by highest level of education attainment (2005).

[15] U.S. Census Bureau, International Data Base, year 2010.

	U.S.	Mexico
Av. years of schooling	12.6	6.3
r	5%	5.014%
Expenditure in education as a ratio to GDP	3.3%	2.8%
Mincer returns	7.5%	14.4%
Gini index	15%	18%
GPD ratio MEX/US	0.55	

Table 3: *Results in the benchmark economies for the U.S. and Mexico.*

which the model economy has not been calibrated. I calculate Mincer returns for both countries and find that they are 7.5% for the U.S. and 14.4% for Mexico. Psacharopoulos (1994) estimates a Mincer return of 10% for the U.S. and 14.1% for Mexico. Hendricks (2002) reports a per capita GDP ratio Mexico to US of 0.46 while in the model this ratio is 0.55. Finally I compute the gini index which is 15% and 18% for the U.S. and Mexico respectively. It is not obvious how to compare these Gini indexes with data because the length of one period in the model is 30 years so it is expected that computed Gini indexes are lower.

2.3 Parameters Related to Migration in the General Model

In this section I do the third and last step of the calibration which is to calibrate those parameters of the model directly linked with migration. The parameters that still need to be fixed are the migration costs θ_p and θ_s and parameters related to the population dynamics which due to their relevance need to be treated separately.

I define the pecuniary migration cost proportionally to the average annual earnings in the U.S. benchmark economy. It means that the pecuniary cost is defined as $\theta_p = \theta \bar{w}_1$ where $\bar{w}_1$ is annual average earnings of an old agent in the U.S. The literature about estimations of the migration costs is scarce and not conclusive. There are few recent works that report estimates for migration costs between the U.S. states. Davies et al. (2001) and Kennan and Walker (2003) estimate that migration costs are between 4 and 6 times U.S. average annual household income. In these papers the main variable is the distance between states which is used to estimated the migration cost and also it is used as a proxy for the unobserved component of the moving cost as the psychic cost (leaving the family and friends) and the time cost (packing and unpacking).[16] Bayer and Juessen

[16] It is possible to use the distance between the U.S. and the sending country as a proxy, however it is not necessarily the case that the pecuniary migration cost is exactly proportional to the distance between locations. In fact, Davies et al. (2001) explain that the negative effect of distance declines because the marginal cost of migration a unit farther is lower at greater distances.

(2008) estimate a lower number in a structural model because they consider a dynamic self-selection in the migration process but they keep the same definition for the migration cost. They find migration costs to be less than one-half of U.S. average annual household income. There is no obvious relation between these estimates for migration costs between the U.S. states and migration costs across countries, the estimates may be a good proxy for a lower bound of migration costs since it is unlikely that migration costs across countries are lower than across U.S. states, especially when these costs are estimated using the distance as the main explanatory variable.

The main controversy is that since we do not observe large number of people migrating from one country to another, when the migration cost is estimated this must be quite high. I assume that $\theta = 1$ which means that the pecuniary migration cost is one year of the average earnings of an old agent in the U.S.[17]

The productivity loss also presents a challenge. For instance, one interpretation is that the distance also may affect this cost since two countries that are closer may have more similar cultures lowering the cost. Another interpretation stems from the theory of networks. Once there is a sizeable community from the native country in the host country, migration is easier. Furthermore, as migration starts the risk and cost for new immigrants from the same native country (such as friends and relatives) decreases. Gradual accumulation of network connections and migratory knowledge creates spill-over effects which make migration less selective. This argument is established in Durand et al. (1996). So the size of the immigrants' communities in the host country may be a proxy to estimate the migration costs. To calibrate this migration cost I find the θ_s that better reproduces the self-selection pattern observed in data between Mexican natives and Mexican immigrants. Chiquiar and Hanson (2005) estimate that "Mexican immigrants, while much less educated than U.S. natives, are on average more educated than residents of Mexico" and Hendricks (2002) reports 7.5 average years of schooling for immigrants from Mexico to the U.S. while the average years of schooling of Mexican natives is 6.3. I find that the θ_s which better reproduces this self-selection in average years of schooling is 0.9 which implies a 10% of productivity loss.

Finally, and related to the population dynamics, the probability of migration p is calibrated to get a migration rate of 1% with respect to the South population which means roughly an annual migration rate of 0.033%. The migration rate from Mexico to the U.S. is 0.15% and the net migration rate for Mexico is -0.3% (from U.S. Census Bureau, 2010).

[17] This parameter value is consistent with the one calibrated in my previous work, López-Real (2010), where it was 0.9 and it is also consistent with the data previously showed.

3 Results

3.1 Results on Self-selection

The exercise in this paper is the following. Taking as the starting point the equilibrium where each benchmark economy is a closed economy, I allow for mobility of physical capital and human capital between them, so I open both economies and they behave as in an international economy. Then I compute the transition to the new steady state in the international economy but under two different immigration policies. One immigration policy is based on visa quotas and family reunification, the one that is currently running in the U.S. and the alternative immigration policy is based on a point system which gives points to education. Under this alternative immigration policy only those with at least completed high school can decide to migrate.

Some previous remarks before the exposition of the results. For each immigration policy the probability of migration is endogenously determined in order that the migration flow never exceeds 1%. So, in this sense the results for both immigration policies are perfectly comparable. Second, through the transition I can distinguish four different population groups: the U.S. natives, the Mexican natives, the immigrants and the offspring of the immigrants which are like the U.S. natives but with the unique particularity that they belong to a dynasty that at some moment decided to migrate to the U.S. Finally the human capital depends on the observed years of schooling and expenditure in education but also in the unobserved level of ability. This paper allows to distinguish between this two dimensions, so immigrants are self-selected in years of schooling and in their level of ability. To understand the self-selection on years of schooling it is worthy to analyse first what happens with the international interest rate and with the self-selection on ability.

Figure [4] shows the evolution of the international interest rate through the transition for both immigration policies, the quota system and the point system. Consistent with the calibration, the interest rate increases during the transition. Note that the Mexican interest rate in the benchmark economy was 5.014% while the U.S. benchmark economy was calibrated for a target of 5%. So when both economies open to the international market the equilibrium interest rate increases and thought the transition it continues increasing because the relative size of Mexico is also increasing due to the population dynamics.[18] Their evolution it is not the same for both immigration policies because of the self-selection for each policy.

The immigrants are self-selected in their years of schooling and in their level of ability. The ability is approximated by 5 parameter values $(z_1, z_2, z_3, z_4, z_5)$ being z_1 the lowest level of ability and z_5 the highest. Figure [5] shows the distribution

[18] The natural population growth rate is higher in Mexico than in the U.S.

of the parameters z_1 and z_2 among the immigrants through the transition under both immigration policies. Figure [6] does it but for higher levels of ability (z_3, z_4, z_5). In overall comparing the distribution of ability for Mexican natives with the distribution of ability for immigrants it is observed that the immigrants are positively self-selected in their level of ability.[19] It means that the ratio of agents with high values of ability with respect to low levels of ability is higher among immigrants than among Mexican natives. Figures [5] and [6] show how the share of immigrants with low levels of ability decreases while the opposite happens for high ability levels.

Comparing both immigration policies it must be remarked that the positive self-selection on the level of ability is more significant for the immigration policy based on visa quotas and family reunification that the one based on the point system. This can be seen in figure [6] which shows that the share of immigrants with an ability level z_4 increases through the transition under the quota system. Something similar although less significant happens for the ability level z_5.

Figures [7] and [8] show the evolution in the average years of schooling of the Mexican natives and the immigrants. First, it is worthy of mention that under the quota system the pattern of self-selection in the average years of schooling between the Mexican natives and the immigrants replicates well that observed in the data. In the first period, just one migration starts to be feasible, the average years of schooling for the immigrants is 7.4 while for the Mexican natives it is 6.3.

Comparing the self-selection on average years of schooling between both immigration policies, the self-selection on years of schooling is higher under the point system. While the average years of schooling is very similar for the Mexican natives under both immigration policies, the immigrants have, under the point system and in the first period of the transition, 10.9 average years of schooling. So, as it is expected by definition, the immigration policy based on a point system increases the average years of schooling of the immigrants but it does it by 3.5 years in the first period of the transition. Through the transition this difference between both immigration policies is reduced, while the immigrants' average years of schooling decreases for a point system it increases for a quota system. The result is that in the course of the transition the average years of schooling of the immigrants converges between both immigration policies.

Through the transition the immigrants are suffering a trade off. On the one hand the interest rate is increasing which affects the optimal decision between investment in human capital and physical capital lowering the investment in education. On the other hand there is a positive self-selection on the level of ability which is

[19] Note that these graphs give in the first period information of the initial distribution of ability in Mexico when the economy is closed. So, if there is any self-selection the graph for each level of ability should be a flat line.

positively correlated with investment in human capital. Under the quota system the latter effect dominates the former and this explains why the immigrants' average years of schooling increases through the transition. Note that figure [6] showed that the share of immigrants with z_4 and z_5 is more significant under the quota system. But figure [4] showed that the interest rate reacts more to the point system than to the quota system so the interest rate dominates the trade off and makes that immigrants' average years of schooling decreases through the transition. This mechanism implies that at the steady state the effect on the immigrants' years of schooling is quite similar under both policies, so there is a convergence.

Figure [8] shows the average years of schooling of the U.S. natives and the offspring of the immigrants. In this case the immigration policy imposed does not imply a substantial difference. The years of schooling decrease due to the interest rate. What it is remarkable is that the average years of schooling of the immigrants' descendants is higher than the one of the U.S. natives. This is because immigrants are positively self-selected on years of schooling but also on ability and the investment in education is positively correlated with both.

3.2 Results on GDP and Earnings

The GDP per capita ratio Mexico to the U.S. is shown in figure [9]. Once migration is feasible this ratio falls which means that the difference in output per capita between the U.S. and Mexico increases. This jump is due to the positive self-selection of the immigrants in their years of schooling and their level of ability. After the first period the main driving force that explains the evolution of this ratio is the interest rate. Since there is an international interest rate and its evolution is not very sensitive to the immigration policy adopted, the GDP ratio does not depend significantly on the immigration policy.

Figure [10] shows the earnings ratio between the immigrants and the population in the U.S. (considering U.S. natives and immigrants' descendants). This ratio is mainly explained by the type and evolution of the immigrants under each policy. The earnings ratio immigrants to the U.S. natives starts being higher for the point system because under this regime the immigrants have more years of schooling than with the quota system. But, as it was shown, this difference in the immigrants years of schooling decreases through the transition explaining that at some point the ratio for the quota system crosses the graph for the one of the point system. It is worthy to remark that at the steady state the ratio is similar for both immigration policies and close to one which means a convergence between the immigrants and the U.S. natives.

3.3 Results on Mincer Returns and Inequality

Figure [11] shows the evolution of the Mincer returns through the transition for the U.S., the U.S. natives, the descendants of the immigrants and the Mexican natives. The evolution along the transition does not depend significantly on the immigration policy. The main effect takes place in the Mincer returns of the Mexican natives which decrease because of the positive self-selection of the immigrants. Due to this migration flow positively self-selected the Mincer returns increase in the U.S.

Finally, figure [12] shows the Gini indexes for both countries under both immigration policies. I find that inequality decreases due to migration and it does it more significantly when the immigration policy is the point system. Under the quota system the immigrants can be selected from any place of the distribution as soon as they can afford the pecuniary migration cost, so they are affecting the distribution in Mexico more proportionally. The opposite happens with the point system. Since immigrants are selected from the top of years of schooling the Mexican benchmark economy gets more affected and the resulting distribution is more uniform.

4 Conclusions

In the U.S. there exists a debate about the convenience of adopting an immigration policy based on a point system instead of the one that it is based on family reunification and visa quotas. Data on skills of the immigrants supports the idea that the point system is a better policy to compete for high skill immigrants. One question naturally arises. What would be the effect for the U.S. of adopting a points-based immigration system?

I find that the point system increases the average years of schooling by 3.5 years. But through the transition, years of schooling of the immigrants decrease for the point system while increase for the quota system, converging at the steady state. Migration increases differences in output per capita between the U.S. and Mexico and decreases inequality. The offspring of the immigrants invest more in human capital than the U.S. natives. Finally, the immigrants effective hours of labor are decreased by 10% when they move to the U.S.

This paper also provides two learnings. First, both immigration policies almost converge at the same point at the steady state which justifies the necessity of computing the transition when we try to evaluate these two difference immigration policies. Moreover, leaving aside the effect of the immigration policies on the self-selection of the immigrants, the effect of these two immigration policies on the rest of variables does not differ significantly. This is because the quantitative exercise has been run in such a way that the migration flow is the one observed in the data which size is quite insignificant if we consider the relative size of both economies.

In this model the migration costs do not vary through time. An extension of the model is to make endogenous these migration costs, they could depend on previous migration flows or on the quantity of immigrants from the native country residing in the host country. The study of the transitions in a model with these features could capture Durand's idea. Also differences in TFP are fixed but can be expected that they decrease through the transition and, finally, to add complementarity and substitutability of skills between the immigrants and the natives would imply a much richer analysis.

5 Appendix

5.1 Introduction Figures

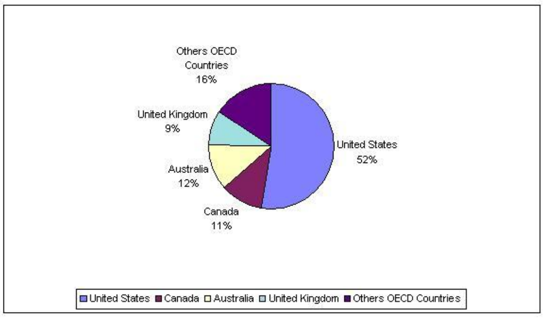

Figure 1: *Inflow shares of foreign population into OECD countries.*

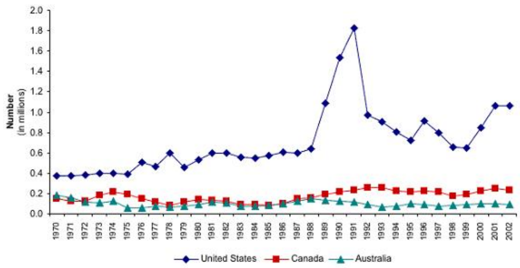

Figure 2: *Number of permanent immigrants to Australia, Canada, and the U.S., 1970 to 2002.*

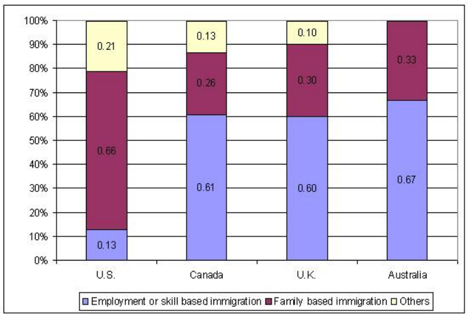

Figure 3: *Shares by type of admission and by country.*

5.2 Transition Figures

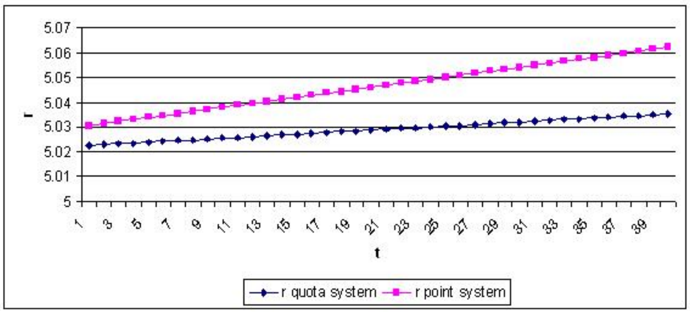

Figure 4: *Interest rate.*

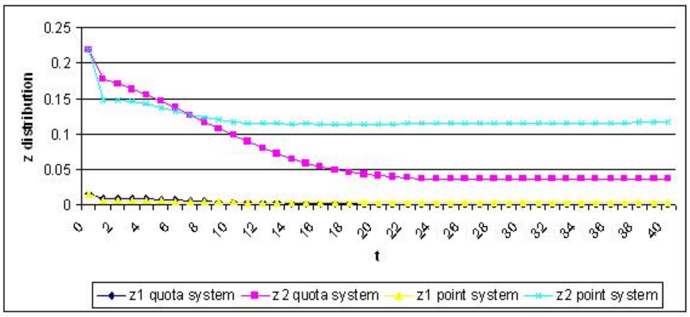

Figure 5: *Ability distribution, z_1 and z_2.*

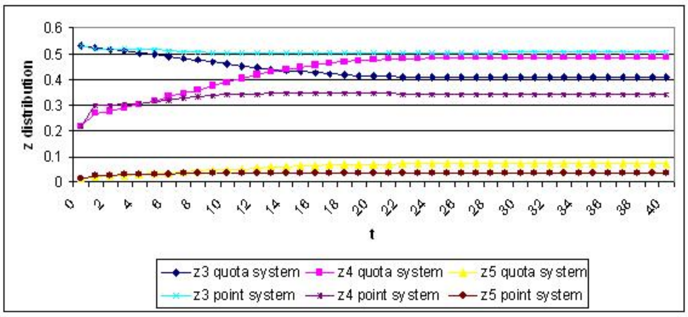

Figure 6: *Ability distribution, z_3, z_4 and z_5.*

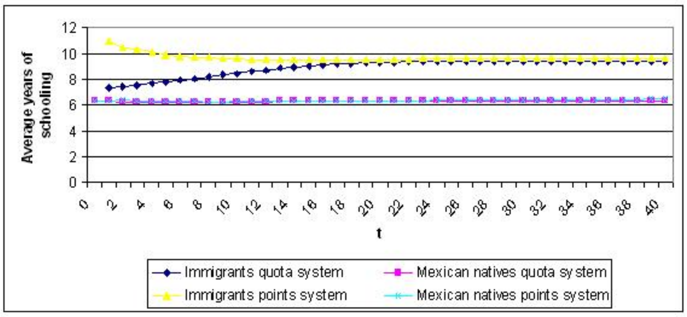

Figure 7: *Average years of schooling Mexican natives and immigrants.*

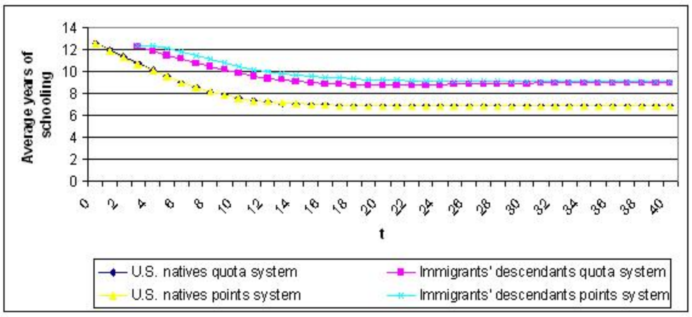

Figure 8: *Average years of schooling U.S. natives and immigrants' descendants.*

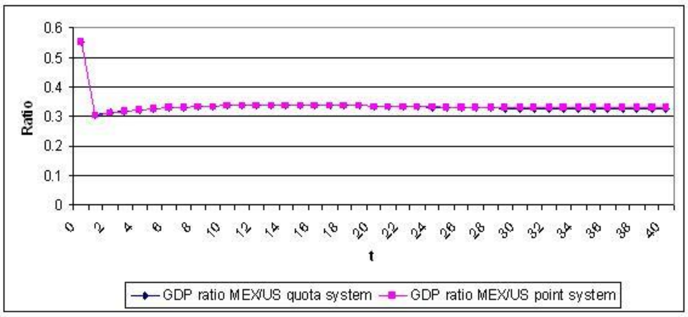

Figure 9: *Per capita GDP ratio Mexico to U.S.*

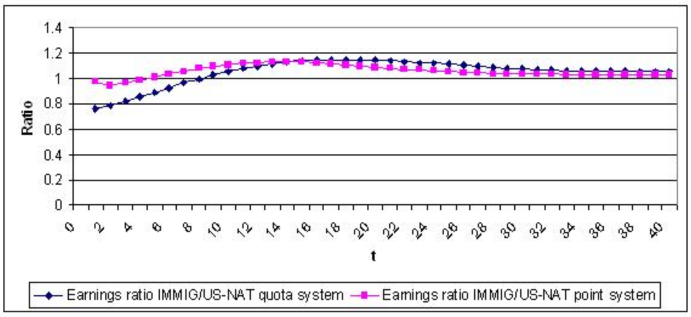

Figure 10: *Earnings ratio immigrants to U.S. natives.*

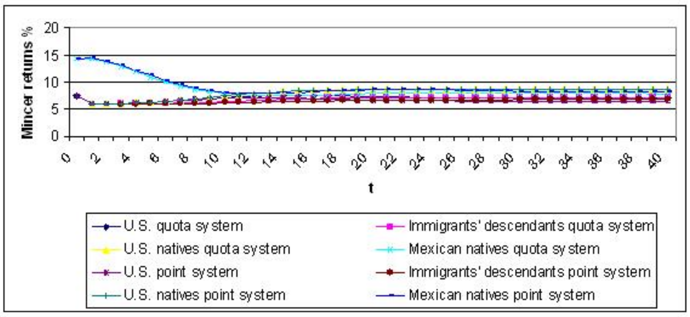

Figure 11: *Mincer returns.*

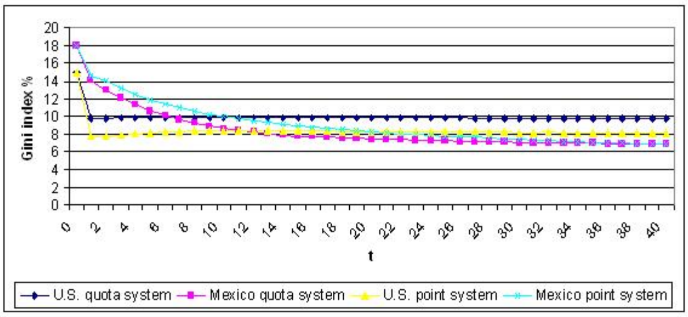

Figure 12: *Gini indexes.*

5.3 Steady State Equilibrium in a Closed Economy

The steady state equilibrium for a closed economy is a set of functions for the household's problem $\{V(x),\ g^c(x),\ g^{a'}(x),\ g^{h'}(x),\ g^e(x),\ g^s(x),\ g^{i'}(x)\}$, prices w_i and r_i and a measure of households, μ, such that:

1. Markets are competitive and there are no arbitrage opportunities. Factors prices are given by:

$$r_i = \alpha A_i \left(\frac{K_i}{H_i}\right)^{\alpha-1} \tag{20}$$

and

$$w_i = (1-\alpha)A_i \left(\frac{K_i}{H_i}\right)^{\alpha} \quad for \quad i \in \{S,N\}. \tag{21}$$

2. Given prices, the functions $\{V(x),\ g^c(x),\ g^{a'}(x),\ g^{h'}(x),\ g^e(x),\ g^s(x),\ g^{i'}(x)\}$ solve the household's problem.

3. Markets clear:

$$H_i = \int_{X_i} h \quad d\mu(x_i) + \int_{X_i} (1-g^s(x_i))\psi \quad d\mu(x_i), \tag{22}$$

$$K_i = \int_{X_i} a \quad d\mu(x_i), \tag{23}$$

$$I_i = \int_{X_i} [g^{a'}(x_i) - (1-\delta)a] \quad d\mu(x_i) \quad for \quad i \in \{S,N\}. \tag{24}$$

4. The economy resource constraint is satisfied:

$$Y_i = \int_{X_i} [g^c(x_i) + g^e(x_i)] \quad d\mu(x_i) + I \quad for \quad i \in \{S,N\}. \tag{25}$$

5. The measure of households is stationary $\mu(B) = \int_{X_i} P(x_i, B) \quad d\mu$.

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