IMMIGRATION IN A SEGMENTED LABOR MARKET: THE EFFECTS ON WELFARE STATE (preliminary)

JAVIER VÁZQUEZ GRENNO *

January 17, 2007

Abstract

Using an overlapping generations model with pension system and unemployment insurance, this paper analyses the effect of low skilled immigration (regular and irregular) shock on the well-being of the native people. We show that low skilled immigration benefits the pensioners of the initial period and skilled native workers and damages the low skilled ones'. These results are obtained in presence of two labor inputs in the production function and under both full employment and unemployment frameworks. In addition, we show that the unskilled immigration decreases the pension and unemployment benefits and increases the unemployment rate. Furthermore, the composition of immigration, between regular and irregular, does not affect the unemployment rate nor the economy in the long run. However, during the transition the effects are greater whichever greater is the proportion of irregular immigrants.

Keywords: migration; dynamic system; public pensions; unemployment.

JEL clasification: F22, H55, J61

1 Introduction

The population in the most developed countries has experienced an aging process during the last years, which is expected to become more serious in the next decades. The Organization for Economic Cooperation and Development (OECD (2005b)) estimates that the dependency ratio will double in the next five decades (see Figure 1).

*Departament d'Economia Aplicada. Universitat Autònoma de Barcelona. Edifici B, 08193 Campus de Bellaterra, Barcelona, Spain and Universidad de la República, Uruguay. e-mail: javier.vazquez@uab.es

The problem of the population aging has been a topic of intense research as well as on the focus of policy makers. The interest is focused on the strong pressures that the aged population generates in the public budgets, through the financing, education, health care programs and pensions systems. In particular, the financing of the public pensions systems (which represents an important part of the welfare state in the industrialized countries) has been threatened by this aging, raising doubts on the long term viability.

At the same time, the immigration flows (regular and irregular) to developed areas has been increased drastically. The United Nations (United-Nations (2006)) estimated that more than one hundred and ninety million persons [1] were living outside their country of birth in 2005 and that the proportion of foreigners in developed countries in relation to the total international immigration, was increased from 42% to 61% between 1960 and 2005 (see Figure 1). In addition, the composition of immigration flows towards the developed countries has been characterized by a younger age structure when is compared with the native population.[2]

In this context, several papers have proposed an inflow of immigration as a suitable mechanism to mitigate the negative impacts of population aging in the pay-as-you-go pensions systems. The idea behind is the following: as immigrants to developed areas are younger and with higher population growth rates than natives, financing problems are mitigated by improving, in short and long run, the dependency ratio.

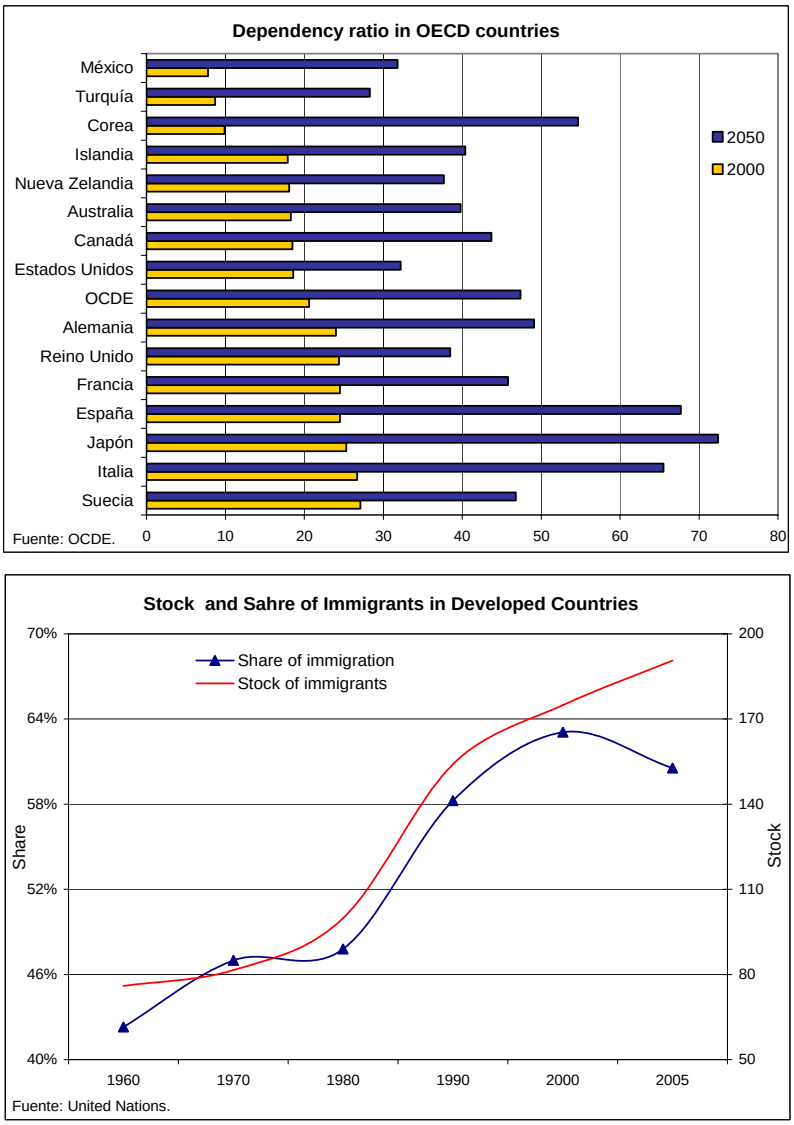
The empirical analysis on the economic effects of immigration has been focused on the impacts on labor markets outcomes and on the fiscal budgets.

Respect to labor market outcomes, in theory, one would expect that the increase in the labor supply via immigration would give rise to lower wages for the natives and an increasing competition for the available jobs. However the international empirical evidence shows that the impact on both wages and employment are, in fact, small. Nevertheless, there are evidence that migration affects the wages of those natives with similar characteristics to the immigrants, i.e. those who compete with the immigrants in the labor market. With different methodologies several works support these results, between others, Lalonde and Topel (1991), Gang and Rivera-Batiz (1994), Borjas, Freeman and Katz (1997) and

[1] Including regular and irregular immigrants.

[2] See Lalonde and Topel (1997)and Card (2005) for U.S. case and see Brucker, Epstein, McCormick, Saint-Paul, Venturini and Zimmermann (2002)for European countries.

Figure 1



Bauer and Zimmermann (1997).

On the other hand, several quantitative studies analyze the fiscal impacts of immigration. For instance, using a calibrated general equilibrium overlapping generations model, Storesletten (2000) analyzed whether a reform of immigration policies in the U.S. can resolve the fiscal problems associated with the aging of the baby boom generation. The main finding was that a selective policy of immigration towards individuals with high and medium qualification and middle aged can sustain the fiscal policy in the long run.

From a theoretical perspective, Razin and Sadka (1999) using an overlapping generations model, under the assumption of a full employment economy and that the prices of

the factors remain fixed, showed that unskilled immigration is beneficial to the welfare of all income and age groups (or at least, does not harm anybody) in the host country. However, when flexibility in the factor prices is allowed Razin and Sadka (2000) (R-S from now on) showed that the previous result cannot be maintained. The R-S analysis rest in some restrictive assumptions that had been partially solved by Krieger (2004) and Kemnitz (2003).[3]

Bearing in mind Storeslettens' suggestions and empirical evidence [4] we propose a generalization of the R-S model in a flexible factor prices framework. Then the objective of this work is to analyze the short and long run impact of a low skilled migratory shock (regular and irregular)on the well-being [5] of the native individuals in a more realistic framework than the R-S and in a general equilibrium context.

With this objective, first we segment the labor market differentiating between workers with high and low qualification, more specifically we consider that these two types of labor are imperfect substitutes.[6] Then we introduce heterogeneity in the population growth rates between natives and immigrants and finally we assume different skills distribution between the immigrants' and the natives' offspring.[7] In a second stage, following Kemnitz (2003) we analyze the model in presence of unemployment. We called it a generalization of the R-S model in the sense that it includes the version presented by R-S and this one with the Kriegers' and Kemnitz' modifications -in a flexible factor prices framework.

The main results are as follows. Not all the generations born in the period that the low skilled immigration takes place and beyond lose well-being, rather there are winners and losers among the host country population. Consequently, our model, under both full employment and unemployment frameworks, captures the empirical evidence that an inflow of low skilled immigration affects negatively the well-being of native workers with

[3]Krieger (2004) introduce heterogeneity in the population growth rates between natives and immigrants and assume different skills distribution between the immigrants' and the natives' offspring. On the other hand, Kemnitz (2003) analyzes the model in an unemployment framework.

[4]Storesletten (2000) recommend that a general equilibrium analysis is required to capture the effects of the interest rate and wages on public finances -due to the change in labor-capital ratio.

[5]Initially (full employment) the welfare state, will be represented by a pay-as-you-go pension system and in the second part (unemployment), we will add an unemployment insurance.

[6]R-S assume that skilled and unskilled workers are perfect substitutes.

[7]The two last modifications was introduced in a R-S model by Krieger (2004) only in a fixed factor prices context.

whom they compete for the same jobs and affect positively the native skilled workers. The immigration increase the pension benefit in the first period and reduce in the following periods, therefore pensioners of the first period gain with low skilled migration. In addition, under disequilibrium we show that the unskilled shock increase the unemployment rate and decrease the unemployment benefit. Finally, the composition of the immigration does not affect the economy in the long run, however, during the transition the effects are greater whichever greater is the proportion of irregular immigrants.

The paper is organized as follows. In the section two we describe the model. First segmenting the labor market and adding the other two modifications and then we present the model with unemployment. In the third section we parameterize and simulate the model and comment the results. Finally, we conclude in section four.

2 The Model

2.1 Full Employment

The base model, in a flexible factor prices context, was developed by R-S. The individuals have finite life (two periods). In each period a new generation with a continuum of individuals is born (this implies that the economy has an infinite horizon because this process is repeated by always). Each individual possesses a time endowment of one unit when is young (first period) and nothing when is old (second period).

There is a pay-as-you-go defined-benefit public pension system as the central pillar of the welfare state ($\tau > 0$ is a flat social security contribution (tax) rate).[8]

In the working age the individuals obtain a salary, consuming part of it and saving the rest. In the second period (when the individual is old) they consume from their savings in work period plus the pension benefits.

The model considers individuals with two levels of work skills, denoted by high and low qualification.[9] For simplicity, we normalize the number of native individuals born

[8]In each period, the pensions paid to the retirees are fully financed by the contributions made by the current working population, and there is no fund accumulated.

[9]During this work we will refer, skilled and high qualified as synonymous and also unskilled, low skilled and low qualified.

in period zero to one. Let s_0 be the share of skilled workers and let u_0 be the share of unskilled workers in the period zero, then we have $s_0 + u_0 = 1$.[10]

The individuals have a life cycle behavior, then intergenerational transferences do not exist and their utility depends on consumption in the first and in the second period. We assume that the preferences over different periods consumption are identical for all individuals and are given by a Cob-Douglas log-linear utility function:

$$u(c_t, c_{t+1}) = log(c_t) + \delta log(c_{t+1}) \tag{2.1}$$

δ is the subjective intertemporal discount factor.

The intertemporal constraint that individuals born in the period zero and beyond face is represented by:

$$c_t + \frac{c_{t+1}}{1 + r_{t+1}} = W(s,u)(1-\tau) + \frac{b_{t+1}}{1 + r_{t+1}} \tag{2.2}$$

c_t and c_{t+1} are the consume in the first and the second period. r_{t+1} is the interest rate in $t+1$, b_{t+1} is the pension benefit for the individuals born in t and $W(s,u)$ represent the pre tax wages for an individual skilled or unskilled.

$$W(s,u) = \begin{cases} w_t^s & \text{if the worker is skilled} \\ w_t^u & \text{if the worker is unskilled} \end{cases} \tag{2.3}$$

The behavior is represented by the maximization of utility function (equation 2.1) subject to the life cycle budget constraint (equation 2.2).

Solving this problem we obtain the optimal consumption path. Then, we obtain the saving.

$$c_t = \frac{1}{1+\delta}[W(s,u)(1-\tau) + \frac{b_{t+1}}{1 + r_{t+1}}] \tag{2.4}$$

$$c_{t+1} = \frac{\delta}{1+\delta}[W(s,u)(1-\tau)(1 + r_{t+1}) + b_{t+1}] \tag{2.5}$$

$$S = W(s,u)(1-\tau)c_t = \frac{\delta}{1+\delta}W(s,u)(1-\tau) - \frac{b_{t+1}}{(1+\delta)(1+r_{t+1})} \tag{2.6}$$

[10] We use a version of the R-S model which neglects the education decision of workers.

In period zero there are $\frac{1}{1+n_N}$old individuals (who were young at the period -1) and their consumption is given by their savings, plus the pension benefits (b_0).[11] In each period the aggregate saving of the old generation constitutes the aggregate stock of capital.

We consider that in the period zero there is an inflow of m_0 immigrants. These migrants are all low skilled with two types of legal status, regular (χ) and irregular (μ). The irregular migrants do not pay social security taxes and do not have right to perceive a pension when they retire. Finally, we consider that the immigrants can not be change your qualification level and they do not have capital.

We allow for heterogeneity in the population growth rates between natives and immigrants and different skills distribution of natives' and immigrants' offspring. Concretely, we assume a population growth rate for the natives (n_N) and other different for the immigrants (n_I), with $n_I > n_N$.[12] We also assume different skill distribution of the natives' and the immigrants' offspring. That means only a proportion $\theta\ \varepsilon[0,s_0]$ of the immigrants' offspring are transformed into skilled.[13]

The supply of effective labor of native and immigrants in period zero are given by the following expressions:

$$L_0^s = s_0 \tag{2.7}$$

$$L_0^u = u_0 + m_0 \tag{2.8}$$

The equation (2.7) shows that the effective labor supply of the skilled workers is given only by natives. The first term on the right hand side of the equation (2.8) is the effective labor supply of the native unskilled workers and the second term is the effective labor supply of the foreign workers. Whereas, the supply of effective labor in period one and onward are given by:

$$L_t^s = (1+n_N)^{t-1}((1+n_N)s_0 + (1+n_I)m_0\theta) \text{ for } t \geq 1 \tag{2.9}$$

[11]Where n_N represent the population growth rate for the natives.

[12]Storesletten (2000) estimate that the total fertility rate of medium and low skilled immigrants is 7% and 50% higher than the natives respectively, whereas for high skilled immigrants is 16% lower than the natives counterparts.

[13]Some papers document that the second generation of migrants has a lower education level as the same cohort of natives: see van Ours and Veenman (2003) and Riphahn (2003).

$$L_t^u = (1+n_N)^{t-1}((1+n_N)u_0 + (1+n_I)m_0(1-\theta)) \text{ for } t \geq 1 \tag{2.10}$$

In order to capture the downward pressure on wages caused by the immigration in the labor market in which these workers compete, we segment the labor market. Concretely, we assume that the production technology comes represented through a Cobb-Douglas constant return to scale production function with three productive factors, capital (K_t) , skilled (L_t^s) and unskilled (L_t^u) labor.[14]

In terms of skilled labor supply, the production function is given by:

$$y_t = f(k_t, l_t^u) = {k_t}^{\alpha}\, l_t^{u\gamma} \tag{2.11}$$

where: $y_t = \frac{Y_t}{L_t^s}$, $k_t = \frac{K_t}{L_t^s}$ and $l_t^u = \frac{L_t^u}{L_t^s}$

Under competitive conditions the factor prices are:

$$1 + r_t = \alpha {k_t}^{\alpha-1} l_t^{u\gamma} \tag{2.12}$$

$$w_t^s = \beta {k_t}^{\alpha} l_t^{u\gamma} \tag{2.13}$$

$$w_t^u = \gamma {k_t}^{\alpha} l_t^{u\gamma-1} \tag{2.14}$$

The pension benefits for the retirees in the period zero and later are given by the following expressions:

$$b_0 = \tau(1+n_N)[w_0^s s_0 + w_0^u(u_0 + m_0\chi)] \tag{2.15}$$

$$\begin{aligned} b_1 = \frac{\tau}{(1+m_0(\chi))}[&w_1^s((1+n_N)s_0 \\ &+(1+n_I)m_0\theta)) + \; w_1^u((1+n_N)u_0 + (1+n_I)m_0(1-\theta))] \end{aligned} \tag{2.16}$$

[14] As mentioned above, we consider that skilled and unskilled workers are imperfect substitutes. With the introduction of two types of labor in the production function, we overcame the limitation that the change in wages affect all the population groups in equal proportion. We also assume that capital fully depreciates at the end of each period.

$$b_t = \frac{\tau(1+n_N)}{((1+n_N)s_0+(1+n_I)m_0)}[w_t^s((1+n_N)s_0+ \\ (1+n_I)m_0\theta)+w_t^u((1+n_N)u_0+(1+n_I)m_0(1-\theta))]; \text{for } t \geq 2 \tag{2.17}$$

As mentioned above, the every period capital is property owned by the old generation and comes determined by their saving in the previous period. The aggregate stock of capital in period zero is denoted by K_0. For the period one (from the savings of both the natives and migrants) it is equal to:

$$K_1 = \frac{\delta(1-\tau)}{(1+\delta)}[w_0^s s_0 + w_0^u(u_0+\chi m_0)] - \frac{b_1(1+m_0\chi)}{(1+\delta)(1+r_1)} \tag{2.18}$$

From the equation(2.18) and the corresponding labor supply of skilled workers (equation(2.9))we can obtain the expression of the capital skilled labor ratio in the period one.

$$k_1 = \frac{\alpha\delta(1-\tau)\left(w_0^s s_0 + w_0^u\left(u_0+\chi m_0\right)\right)}{D_1} \tag{2.19}$$

Where D_1 is:

$$D_1 = \alpha(1+\delta)((1+n_N)s_0+(1+n_I)m_0\theta)+ \\ \tau[\beta((1+n_N)s_0+(1+n_I)m_0\theta)+\gamma l_1^{u-1}((1+n_N)u_0+(1+n_I)m_0(1-\theta))]$$

Then the capital skilled labor ratio for the subsequent periods is given by:

$$k_t = \frac{N_t}{D_t}; \text{for } t \geq 2 \tag{2.20}$$

Where N_t and D_t are:

$$N_t = \alpha\delta(1-\tau)[w_{t-1}^s((1+n_N)s_0+(1+n_I)m_0\theta)+ \\ w_{t-1}^u((1+n_N)u_0+(1+n_I)m_0(1-\theta))]$$

$$D_t = (1+n_N)\{\alpha(1+\delta)((1+n_N)s_0+(1+n_I)m_0\theta)+ \\ \tau[\beta((1+n_N)s_0+(1+n_I)m_0\theta)+\gamma l_t^{u-1}((1+n_N)u_0+(1+n_I)m_0(1-\theta))]\}$$

The wages (skilled and unskilled) in period $t-1$ depend on the capital in that period, then the equation 2.20 can be expressed as a first order nonlinear difference equation. This equation governs the dynamics of this economy from the period two onwards. In the steady state the capital in terms of skilled workers will remain constant, therefore, replacing the wages by (2.13) and (2.14) and imposing $k_t = k_{t-1} = k_{ss}$ in the equation (2.20) we obtain the capital skilled labor ratio in steady state.[15] This situation will take place after an infinite number of periods [16] and is given by:

$$k_{ss} = [\frac{N_{ss}}{D_t}]^{\frac{1}{(1-\alpha)}} \tag{2.21}$$

Where N_{ss} is:

$$\begin{aligned} N_{ss} = \alpha\delta(1-\tau)[\beta {l^u_{t-1}}^{\gamma}((1+n_N)s_0 + \\ (1+n_I)m_0\theta) + \gamma {l^u_{t-1}}^{(\gamma-1)}((1+n_N)u_0 + (1+n_I)m_0(1-\theta))] \end{aligned}$$

From the previous expression (2.21)we can obtain the steady state of the others endogenous variables, b_t, w_t, r_t and y_t. The endogeneity of these variables implies that they will change during the transition to the steady state. The absence of χ and μ in the final steady state equation implies that in the long run the composition of immigration (regular and irregular) will not have affects on capital labor skilled ratio. Behind this result is the assumption of total integration of the immigrants offsprings' independently of the legal situation of their parents.

Finally, to capture the contribution made by immigrants to the pension system, we compute the net benefit from pension system that is given by the following expression:

$$NB = \begin{cases} \frac{b_1}{(1+r_1)} - \tau w_0^u & \text{if the immigrant regular} \\ 0 & \text{if the immigrant is irregular} \end{cases} \tag{2.22}$$

2.2 Unemployment

In order to make more realistic the model, we introduce frictions in the unskilled labor market. Concretely, following Kemnitz (2003) we assume that the low qualified workers

[15] It was verified in the equation (2.20) that the steady state equilibrium is locally stable: $\frac{\partial k_t}{\partial k_{t-1}(k^{ss})} \varepsilon (0,1)$.

[16] The characteristics of the model ensure that the economy reaches a steady state again.

are represented by trade unions which operate at the firm level in order to maximize their members' utility.[17] Furthermore, we consider a competitive skilled labor market, that means there is not unemployment between skilled workers.

In addition, we assume that the low skilled regular workers contribute to an unemployment insurance that provides an unemployment benefit (d_t) for regular unemployed workers.[18] Then the net wage of regular unskilled employed is $(1-\tau-\rho)w_t^u$ where ρ represent the contribution rate to the unemployment insurance.[19]. Thus, the maximization [20] problem of the representative union member is:

$$\max L_t^{ud}[(1-\tau-\rho)w_t^u - d_t] \tag{2.23}$$

$s.t.$ the labor demand from the equation (2.14).

Solving this problem we obtain that the union chooses the unskilled wage (w_t^u) such that is a constant mark-up on d_t and it is superior to the wage obtained in the previous section (equation 2.14).

$$d_t = \gamma(1-\tau-\rho)w_t^u \tag{2.24}$$

In each period the unemployment benefit paid to the unemployed are fully financed by the contribution made by low skilled employees. Then with the budget constraint and the relation between unemployment insurance and unskilled wage, we can obtain the unskilled employment L_t^{ud} which is a constant fraction of the total unskilled labor supply. [21]

$$L_t^{ud} = (\frac{\gamma(1-\tau-\rho)}{\rho+\gamma(1-\tau-\rho)})L_t^u \tag{2.25}$$

[17]The union represent all unskilled regular workers, regardless of wether they are natives or immigrants.

[18]Irregular workers benefit from the union bargain, although they do not contribute and therefore they do not have right to the unemployment benefit.

[19]We also assume that $\rho \geq 0$ and $\rho + \tau \leq 1$

[20]In the maximization we neglect a constant that encompass a reference utility and future pension benefits

[21]Taking de corespondent derivatives, respect to τ and ρ, we can see that, greater well-being parameters (ρ,τ) imply lower employment. In addition, if we consider $\rho = 0$ we obtain the model in a full employment framework, this result is consequence of which the unemployment insurance is the origin of unemployment.

From the equations (2.24 and 2.25) we can deduct two important results. First, the composition of immigration does not affect the unemployment rate.[22] Second, these composition affect all the others economy outcomes trough the general equilibrium effects (wages and interest rate).

In order to illustrate the transition until the new steady state, we resort to a numerical simulations in the full employment and unemployment frameworks.

Before simulating our model it is important to stand out that the model presented in this section is a version that includes the one developed by R-S. Considering, μ=0 and $\chi = 1$(all migrants regular), the equality in the population growth rates ($n_I = n_N = n$), that the ability in favor of the native's offspring does not exist ($\theta = s_0$) and we do not consider the existence of two types of labor in the production function (supposing that the skilled and unskilled workers perfect substitutes) we obtain the R-S model.

3 Simulation and Parametrization

3.1 Parametrization

As was already mentioned, to make the simulation we consider that in the first period (zero) there is an affluence of m_0 foreigner workers. In addition we assume that, in the period before that the immigration shock happens the economy was in a steady state.

The changes in the well-being, for the different generations and qualifications groups, are measured as the percentage that will restore the utility to initial steady state level (pre-migration situation).

The calculations were carried out for a Cobb-Douglas production function with constant returns to scale. The capital share (α) is assumed to be 0,29, the high qualified labor share (β) 0,453, and the low qualified labor share ($\gamma = 1 - \alpha - \beta$) 0,257.[23] The distribution of qualifications considered was: the share of skilled workers (s_0) 0,47 and the share of unskilled (u_0) 0,53. [24] The immigrants are distributed as follows, regular (χ)

[22] Unemployment rate $= \frac{\rho}{\rho+\gamma(1-\tau-\rho)}$.

[23] This calibration, based on EU data, was used by Bauer and Zimmermann (1997).

[24] OECD (2005a) estimate the distribution of the 25-64 years old population by highest level of education attained. We consider as skilled worker the upper secondary (with labor market destination), post-secondary and tertiary education. The mean for the EU-15 countries is 47%.

70% and irregular (μ) 30 %. We assume the subjective discount rate is 5 % annually, the social security contribution rate (τ) is 30 % and each period lasts 25 years.

In addition, we assume that the annual population growth rates are equal to 1 % for the natives (n_N) and 3 % for the immigrants (n_I). On the other hand, to make operative the different skill distribution we assume that the share θ equal 70 % of s_0. To simulate the unemployment framework we assume ρ equal to 2%. The following table resume the set of parameters.

Set of parameters

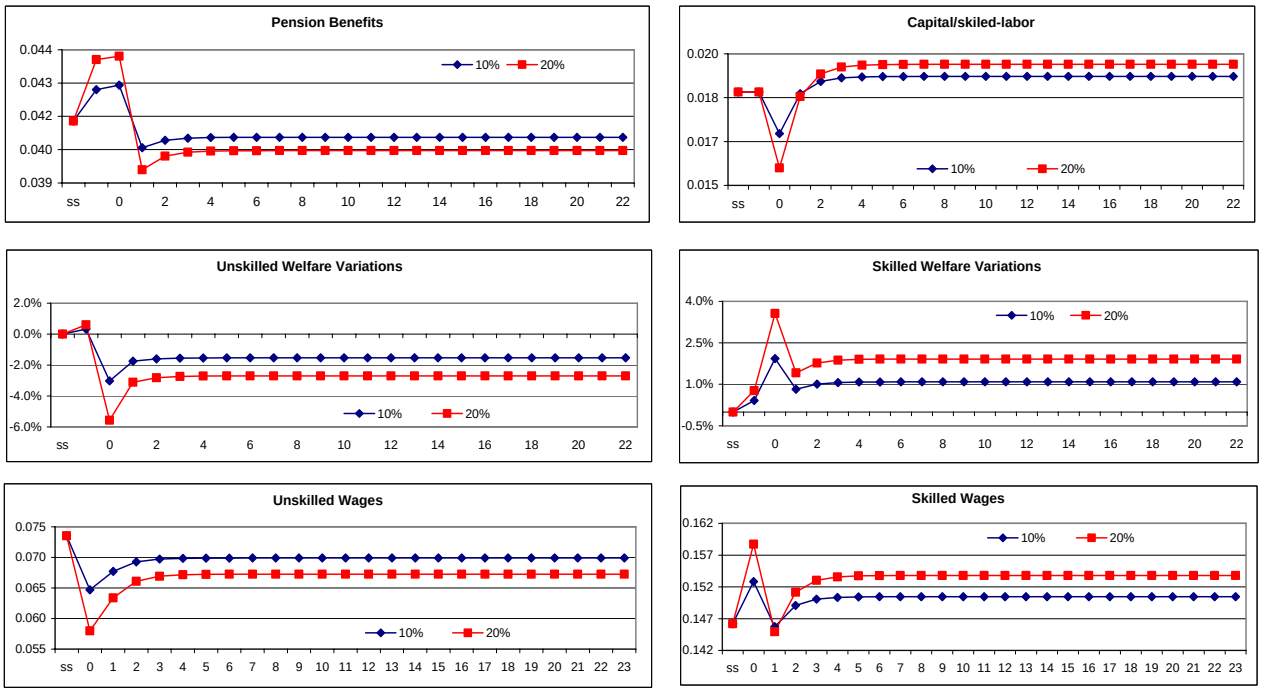
	Values	Definition
General Model		
τ	30%	social security contribution
α	0.29	share of capital
β	0.453	share of skilled work
γ	0.257	share of unskilled work
s_0	0.47	percentaje of skilled workers
u_0	0.53	percentaje of unskilled workers
δ	5%	discount rate
ρ	2%	unemployment insurance contribution
χ	70% of m_0	regular immigration
μ	30% of m_0	irregular immigration
n_N	1%	population growth rate of natives
n_I	3%	population growth rate of immigrants
θ	70% of s_0	skill distribution bias

3.2 Simulation Results

The simulation results for the main variables and the variations in the well-being of the different population groups are shown in Figures two, for the economy with full employment (subsection 2.1) and three for the model with unemployment (subsection 2.2). Also the Table three of the appendix summarize these results. In both cases, we simulate considering migratory shocks (m_0) of 10 and 20 % this means that at the beginning of period zero there is an inflow of a 10 or 20 % of the economically active population.

The evolution showed by the main variables of the economy during the transition to the steady state, after the migratory shock, are similar in both cases.

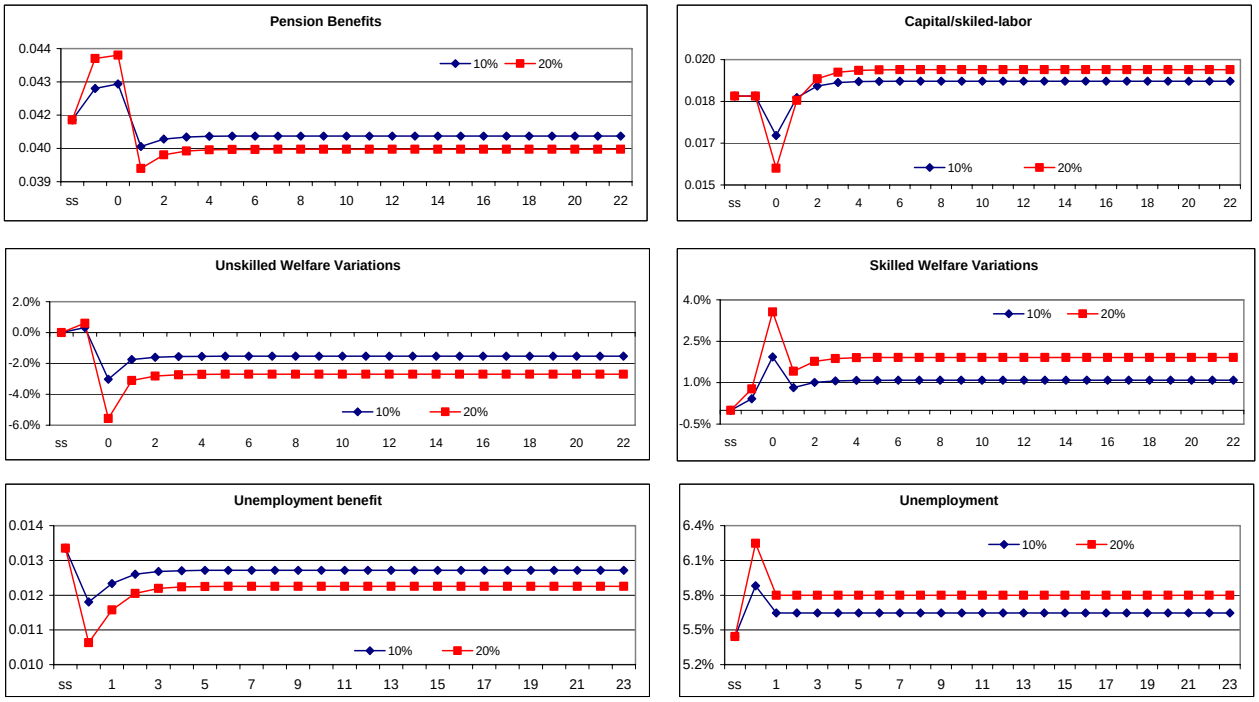
Figure 2
Transition to the stationary state of the main variables of the model
Full employment



As can be observed from figures one and two, in the period that the migration takes place the capital skilled labor ratio remains constant. This is a consequence that neither the investment decisions nor the labor supply of skilled workers has been affected by the unskilled migration. In period one the ratio falls and in the subsequent periods rises monotonically until it reaches the steady state, which it is superior to the initial one. The interest rate rises in period zero and one, then it falls until the steady state level.

At the same time, the downward pressure on the wages generated by immigrants affects from the period zero, negatively in unskilled sector, nevertheless in the skilled sector the wages grow. From period one and beyond the trajectories of the different wages are not the same, although, in both cases the respective wages converge monotonically to a new steady state. The unskilled wages converge to a steady state that is inferior to the initial one, whereas the wages in the skilled sector tend to a higher level with respect to the initial one.

Figure 3
Transition to the stationary state of the main variables of the model
Unemployment



In the period that the migrants come in, the benefits of the pension system raises consequence of the increase in the contributors to the pension system. Thereafter falls, converging to an inferior steady state.

This particular evolution on wages, interest rate and the pension benefits contrasts with the results obtained by R-S, therefore the impact of the immigration shock (in well-being terms) on the different considered groups, will not be the same.

In both cases, the old generation of period zero gains on two grounds. First, b_0 rises and second, for an increases in the rate of return to their capital. The people of the generations born in periods zero and later will be beneficed or harmed by the migratory shock depending if they are high or low qualified workers. The results are the following, all the skilled individuals win from migration whereas the unskilled loose. This is consequence of a raise and a fall on the respective wages since the pension benefits are the same for all. In addition, the unskilled workers and the unemployed will be harmed by the increase in

unemployment rate and the decrease in unemployment benefit, respectively.

Consequently, in the two frameworks of the model presented here, the result that all the agents who live at the moment in the migratory shock takes place are benefited is not sustained. Nevertheless, in contrast to R-S, some groups of the population win and other loose well-being. More specifically, between the individuals that live in period zero and beyond, all retirees in zero and all workers with high qualification will be benefited from migration, whereas all workers with low qualification will be harmed. Two elements are responsible for these results. First, the skilled and unskilled wages are determined separately in different labor markets and second, the heterogeneity in skills distribution has permanent effects on the productivity. The gains and the losses are increasing with the size of the migration (m_0).

Other result is that the different population growth rates, between natives and immigrants, do not affect qualitatively in the long run equilibrium. If we eliminate the differences in population growth rates ($n_N = n_I$) the results do not change qualitatively, only quantitatively.

It is important to stress that the skilled individuals that were born in period one (after the shock) is the generation that obtains the smallest gain as a result of the fall of wages and pension benefits. This is a consequence of the increase on skilled labor supply in relation to the total labor supply and because the migrants become old.

The net benefit of the immigrants appears in the inferior part of the tables one and two presented in the appendix. As can be seen, the results are similar. In both tables, under the particularities of the proposed model and according to the parameterization made, the immigrants are net contributors to the pension system (net benefit lower than zero).

Unlike in the R-S model, in our general model the net contribution that the immigrants do jointly with the lower welfare of the unskilled workers, allows to finance the gain to all the retirees in the period zero and skilled workers born in zero and beyond.

Finally, the two versions of the model proposed here leads to different results that those obtained by the R-S model. In addition, our model has a greater correspondence with the empirical evidence. That is, even in a context of flexible factor prices, not all the individuals that are born in the period that the immigration take place and beyond will

be harmed, there will be winners and losers and that will be a result of the qualification level that the workers have.

4 Final Comments

In this paper we have generalized R-S model introducing a segmented labor market and relaxing the assumptions that immigrants have the same population growth rate than natives and that the immigrants' offspring have the same distribution of skills as the natives' offspring. We present the model in two different frameworks, full employment and unemployment. We show that the result of original R-S model, that all future generations loose with unskilled migration, is not maintained. We obtain the same result in both frameworks.

The main strength of the model is that it put into relief the empirical evidence that an inflow of unskilled immigration affects negatively the well-being of native workers with whom they compete for the same jobs. On the other hand, the native skilled workers are affected positively. In our model the downward pressure that the unskilled immigration produces on unskilled wages is not enough to worse off all the future generations.

As a consequence of the previous result in our model, unlike R-S, there will not be a unanimous rejection to the low qualified migration. The existence of winners and losers between the native population will incite that the foreign workers with low qualification will be welcome depending on the winners' power, for instance, in a voting process. In others words, the pro-migration feature can be weakened but not overturned as in the flexible factor prices R-S model.

Another important result is that the composition of low skilled immigration does not affect the unemployment rate nor the economy in the long run. Nevertheless, during the transition the effects in the economy are greater whichever greater is the proportion of irregular immigration.

Also, in our model, the migratory shock generates an increase in wage inequality between the different skill groups on the native population. This grater inequality could be reverted, totally or partially, through compensations from the winning groups to the losers ones. This is related with the demonstration made by Razin and Sadka (1999)

where unskilled migration could generate a Pareto-improving for all generations.

However, as in R-S, our results show that immigration has important implications for the financial support of the pensions system. In other words, the increase in the contributions to the pensions system, as a consequence of the entrance of low qualified immigrants can help the society to pay the benefits to the current retirees.

References

Bauer, Thomas and Klaus F. Zimmermann, *Looking South and East: Labor Market Implications of Migration in Europe and Developing Countries* , in Globalization of Labour Markets; Challenges, Adjustment and Policy Response in the European Union and the Less Developed Countries, Olga Memedovic, Arie Kuyvenhoven and Willem T.M. Molle (editors), pp. 75-103, Kluwer Academic Publishers, 1997.

Borjas, George J., Richard B. Freeman, and Lawrence F. Katz, "How much do immigration and trade affect labor market outcomes," *Brookings Papers on Economic Activity*, 1997, *1*, 1–67.

Brucker, Herbert, Gil S. Epstein, Barry McCormick, Giles Saint-Paul, Alessandra Venturini, and Klaus Zimmermann, *Managing Migration in European Welfare State* , in Immigration Policy and the Welfare System,Tito Boeri and Gordon Hanson and Barry McCormick (editors), pp.1-167, Oxford University Press, 2002.

Card, David, "Is the New Immigration Really so Bad?," *Economic Journal*, November 2005, *115* (507), F300–F323.

Gang, Ira N and Francisco L Rivera-Batiz, "Labor Market Effects of Immigration in the United States and Europe: Substitution vs. Complementarity.," *Journal of Population Economics*, 1994, *7* (2), 157–75.

Kemnitz, Alexander, "Immigration, Unemployment and Pensions," *Scandinavian Journal of Economics*, 03 2003, *105* (1), 31–48.

Krieger, Tim, "Fertility rates and skill distribution in Razin and Sadka's migration-pension model: A note," *Journal of Poplation Economics*, 2004, *17*, 177–192.

Lalonde, Robert J. and Robert H. Topel, *Labor Market Adjustments to Increased Immigration* ,in Immigration, Trade, and the Labor Market, John M. Abowd and Richard B. Freeman (editors), pp.167-200, NBER, 1991.

___ **and** ___ , *Economic Impact of International Migration and the Economic Performance of Migrants.* , in Handbook of Population and Family Economics, vol. 1B, Mark R. Rosenzweig and Oded Stark (editors), pp.799-850, Elsevier, 1997.

OECD, *Education at a Glance: OECD INDICATORS 2005*, Paris: OECD, 2005.

___ , *Society at a Glance: OECD social indicators*, Paris: OECD, 2005.

Razin, Assaf and Efraim Sadka, "Migration and Pension with International Capital Mobility," *Journal of Public Economics*, 1999, *74* (1), 141–150.

___ **and** ___ , "Unskilled Migration: A Burden or a Boon for the Welfare State?," *Scandinavian Journal of Economics*, 2000, *102* (3), 463–479.

Riphahn, Regina, "Cohort effects in the educational attainment of second generation immigrants in Germany: An analysis of census data," *Journal of Poplation Economics*, 2003, *16*, 711–737.

Storesletten, Kjetil, "Sustaining Fiscal Policy through Immigration," *Journal of Political Economy*, 2000, *108* (2), 300–323.

United-Nations, "Report of the Secretary-General on world population monitoring, focusing on international migration and development," Technical Report, Economic and Social Council, Commission on Population and Development 2006. Thirty-ninth session, 3-7 April.

van Ours, Jan C. and Justus Veenman, "The Educational Attainment of Second Generation Immigrants in The Netherlands," *Journal of Poplation Economics*, 2003, *16*, 739–753.

Appendix

TABLE 1
Migratory shock in Full employment framework

	Capital/skiled-labor		Skilled wages		Unskilled wages		Pension benefit		Welfare variations: Skilled		Welfare variations: Unskilled	
	m **0 = 0,1**	***m*** **0 = 0,2**	***m*** **0 = 0,1**	***m*** **0 = 0,2**	***m*** **0 = 0,1**	***m*** **0 = 0,2**	***m*** **0 = 0,1**	***m*** **0 = 0,2**	***m*** **0 = 0,1**	***m*** **0 = 0,2**	***m*** **0 = 0,1**	***m*** **0 = 0,2**
SS	0.0182	0.0182	0.1462	0.1462	0.0735	0.0735	0.0414	0.0414	0.00%	0.00%	0.00%	0.00%
retired	…	…	…	…	…	0.0426	0.0426	0.0436	0.42%	0.77%	0.32%	0.60%
0	0.0182	0.0182	0.1528	0.1587	0.0647	0.0580	0.0427	0.0438	1.93%	3.56%	-3.03%	-5.57%
1	0.0168	0.0156	0.1457	0.1449	0.0677	0.0634	0.0405	0.0397	0.82%	1.42%	-1.75%	-3.10%
2	0.0181	0.0180	0.1491	0.1512	0.0693	0.0661	0.0407	0.0402	1.01%	1.77%	-1.60%	-2.82%
3	0.0186	0.0188	0.1501	0.1530	0.0697	0.0669	0.0408	0.0403	1.07%	1.87%	-1.55%	-2.73%
4	0.0187	0.0190	0.1503	0.1536	0.0698	0.0672	0.0408	0.0403	1.08%	1.90%	-1.54%	-2.71%
5	0.0187	0.0191	0.1504	0.1537	0.0699	0.0672	0.0408	0.0404	1.09%	1.91%	-1.54%	-2.70%
6	0.0187	0.0191	0.1505	0.1538	0.0699	0.0672	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
7	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
8	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
9	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
10	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
11	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
12	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
infinitely	0.0187	0.0191	0.1505	0.1538	0.0699	0.0673	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%

Net Benefit	***m*** **0 = 0,1**	-0.0117
	m **0 = 0,2**	-0.0100

TABLE 2
Migratory Shock in Unemployment framework

	Capital/skiled-labor		Unemp. benefit		Unemp. rate		Pension benefit		Welfare variations: Skilled		Welfare variations: Unskilled	
	$m_0 = 0,1$	$m_0 = 0,2$	$m_0 = 0,1$	$m_0 = 0,2$	$m_0 = 0,1$	$m_0 = 0,2$	$m_0 = 0,1$	$m_0 = 0,2$	$m_0 = 0,1$	$m_0 = 0,2$	$m_0 = 0,1$	$m_0 = 0,2$
SS	0.0182	0.0182	0.0129	0.0129	5.44%	5.44%	0.0414	0.0414	0.00%	0.00%	0.00%	0.00%
retired	…	…	…	…	…	…	0.0426	0.0436	0.42%	0.77%	0.32%	0.60%
0	0.0182	0.0182	0.0113	0.0101	5.88%	6.25%	0.0427	0.0438	1.93%	3.56%	-3.03%	-5.57%
1	0.0168	0.0156	0.0118	0.0111	5.65%	5.80%	0.0405	0.0397	0.82%	1.42%	-1.75%	-3.10%
2	0.0181	0.0180	0.0121	0.0116	5.65%	5.80%	0.0407	0.0402	1.01%	1.77%	-1.60%	-2.82%
3	0.0186	0.0188	0.0122	0.0117	5.65%	5.80%	0.0408	0.0403	1.07%	1.87%	-1.55%	-2.73%
4	0.0187	0.0190	0.0122	0.0117	5.65%	5.80%	0.0408	0.0403	1.08%	1.90%	-1.54%	-2.71%
5	0.0187	0.0191	0.0122	0.0117	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.54%	-2.70%
6	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
7	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
8	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
9	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
10	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
11	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
12	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
infinitely	0.0187	0.0191	0.0122	0.0118	5.65%	5.80%	0.0408	0.0404	1.09%	1.91%	-1.53%	-2.70%

Net Ben emp	$m_0 = 0,1$	-0.0130
	$m_0 = 0,2$	-0.0123

TABLE 3

	Full employment		Unemployment	
	short run	**long run**	**short run**	**long run**
Pension benefit	increase	decrease	increase	decrease
Pensioners welfare	increase	**	increase	increase
Skilled welfare	increase	increase	increase	increase
Unskilled welfare	decrease	decrease	decrease	decrease
Unemployment	**	**	increase	increase
Unemployment benefit	**	**	decrease	decrease