IMMIGRATION IN A SEGMENTED LABOR MARKET: THE EFFECTS ON WELFARE

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P. T. N.° 8/07

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I wish to thank Francesc Ortega, Claudia Sanguinetti, José Ignacio Silva, Antonia López, Javier Asencio, Pau Johé, María Cervini, Evans Jadotte and Ángel Melguizo for helpful comments and discussion. We also acknowledge the financial support of the Spanish Ministerio de Educacion y Ciencia (BEC 2003-01831).

N.B.: Las opiniones expresadas en este trabajo son de la exclusiva responsabilidad del autor, pudiendo no coincidir con las del Instituto de Estudios Fiscales.

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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 of immigration are greater whichever greater is the proportion of irregular immigrants.

**Keywords**: migration, dynamic system, public pensions, unemployment.

**JEL classification**: F22, H55, J61.
1. INTRODUCTION

The population in the most developed countries has experienced an aging process during the last years and this problem is expected to become more serious in the next decades. The Organization for Economic Cooperation and Development [OECD (2005b)] estimates that the old-age dependency ratio in the OECD countries will double in the next five decades (see Figure 1.1).

The problem of the population aging has been a topic of intense research and has been a concern for policy makers. Their main focus has been on the pressure generated by the aged population on the public budget via the financing of health programs and pension system. In particular, the financing of the public pension systems (which represents an important part of the welfare state in the industrialized countries) has been threatened by this aging, casting doubts on the long term viability of the system.

Figure 1.1
OLD-AGE DEPENDENCY RATIO IN OECD COUNTRIES

At the same time, the immigration flows (regular and irregular) to developed nations has been increasing 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

\(^1\) Including regular and irregular immigrants.
in developed countries in relation to the total international immigration has increased from 42% to 61% between 1960 and 2005 (see Figure 1.2). Additionally, the composition of immigration flows towards the developed countries has been characterized by a younger age structure when compared with the native population.2

**Figure 1.2**

**STOCK AND SHARE OF IMMIGRANTS IN DEVELOPED COUNTRIES**

In this context, several papers have proposed an inflow of immigration as a suitable mechanism to mitigate the negative impacts of population aging on the pay-as-you-go pension system. The idea behind is the following: as immigrants to developed countries 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.

With 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 em-

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ployment are, in fact, small. Nevertheless, there is 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, among others, Lalonde and Topel (1991), Gang and Rivera-Batiz (1994), Borjas, Freeman and Katz (1997), and 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 solve 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 henceforth) showed that the previous result cannot be maintained. The R-S analysis rests on some restrictive assumptions that had been partially solved by Krieger (2004) and Kemnitz (2003).

Bearing in mind Storesletten's suggestions and empirical evidence we propose a generalization of the R-S model in a flexible factor prices framework. Differently from Krieger (2004) and Kemnitz (2003) that obtain your results in a static model, we found the impact of immigration in a dynamic context (short and long run). Thus the objective of the present paper is to analyze the short and long run impact of a low skilled migratory shock (regular and irregular) on the well-being of the native individuals in a more realistic framework than the R-S and in a general equilibrium context.

In that vein, first we segment the labor market differentiating between workers with high and low qualification. More specifically, we consider that

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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 defined-benefit pension system and in the second part (unemployment), we will add an unemployment insurance.
these two types of labor are imperfect substitutes. 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. 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 other modifications proposed by Kriegers' and Kemnitz'—in a flexible factor prices framework.

The reasons for simulating the model are twofold. Firstly, analyze the short and long run effects of an immigration shock. Secondly, because there are conflicting forces and no apriori prediction can be obtained. We parameterize the model using Spanish data. 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 in 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 whom they compete for the same jobs and affect positively the native skilled workers. The immigration increases the pension benefit in the first period and reduces it 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. Section two describes 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

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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.
with a continuum of individuals is born (this implies that the economy has an infinite horizon because this process is repeated ad infinitum). Each individual possesses a time endowment of one unit when young (first period) and nothing at old age (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) he consumes 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 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 period zero, then we have \(S_0 + U_0 = 1\).\(^{10}\)

The individuals have a life cycle behavior, then intergenerational transfers 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:

\[
u(c_t, c_{t+1}) = \log(c_t) + \delta \log(c_{t+1})
\]  

(2.1)

where \(\delta\) is the subjective intertemporal discount factor.

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

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

(2.2)

where \(c_t\) and \(c_{t+1}\) are the consumption 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, respectively.

\[
W_{s, u} = \begin{cases} w^s_t & \text{if the worker is skilled} \\ w^u_t & \text{if the worker is unskilled} \end{cases}
\]

(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.

\(^8\) 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.

\(^{10}\) We use a version of the R-S model which neglects the education decision of workers.
\( c_t = \frac{1}{1+\delta} \left[ W(s,u)(1-\tau) + \frac{b_{t+1}}{1+r_{t+1}} \right] \) \hfill (2.4)

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

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

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 period zero there is an inflow of \( m_0 \) immigrants. These migrants are all low skilled with two types of legal status, regular \((\chi)\) and irregular \((\mu)\). The irregular migrants do not pay social security taxes and do not have the right to perceive a pension when they retire. Finally, we consider that the immigrants can not change their qualification status once entered 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 \( \theta \in [0,s_0] \) 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:

\[ L^s_0 = s_0 \] \hfill (2.7)

\[ L^u_0 = u_0 + m_0 \] \hfill (2.8)

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 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:

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\(^{11}\) 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).
\[
L_t^s = (1+n_N)^{t-1}(((1+n_N) s_0 + (1+n_I) m_0 \theta) \text{ for } t \geq 1 \quad (2.9)
\]

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

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 is given by 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:

\[
y_t = f(k_t, l_t^s) = k_t^{\alpha} l_t^{(\gamma-1)} \quad (2.11)
\]

where: \(y_t = \frac{Y_t}{L_t^s}\), \(k_t = \frac{K_t}{L_t^s}\) and \(l_t^s = \frac{L_t^s}{L_t^s} \).

Under competitive conditions the factor prices are:

\[
1 + r_t = \alpha k_t^{\alpha-1} l_t^{\gamma} \quad (2.12)
\]

\[
w_t^s = \beta k_t^{\alpha} l_t^{\gamma} \quad (2.13)
\]

\[
w_t^u = \gamma k_t^{\alpha} l_t^{\gamma-1} \quad (2.14)
\]

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

\[
b_0 = \tau (1+n_N) \left[ w_0^s \left( s_0 + w_0^u \left( u_0 + m_0 \theta \right) \right) \right] \quad (2.15)
\]

\[
b_t = \frac{\tau}{(1+n_N) \left( \chi + m_0 \theta \right)} \left[ w_t^s \left( (1+n_N) s_0 + (1+n_I) m_0 \theta \right) + w_t^u \left( (1+n_N) u_0 + (1+n_I) m_0 (1-\theta) \right) \right] \quad (2.16)
\]

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

As mentioned above, the capital stock is owned by the old generation and is determined by their savings 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:

\(^{14}\) 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.
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 period one.

\[
k_1 = \frac{\alpha \delta (1 - \tau) (w^s_0 s_0 + w^u_0 (u_0 + \chi m_0))}{D_1}
\]

(2.19)

Where \( D_1 \) is formulated as follows:

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

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

\[
k_t = \frac{N_t}{D_t}; \text{ for } t \geq 2
\]

(2.20)

Where \( N_t \) and \( D_t \) are defined as:

\[
N_t = \alpha \delta (1 - \tau) \left[ w^s_{t-1} ((1 + n_N) s_0 + (1 + n_I) m_0(\theta)) + w^u_{t-1} ((1 + n_N) u_0 + (1 + n_I) m_0 (1 - \theta)) \right]
\]

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

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 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 Equation (2.20) we obtain the capital skilled labor ratio in the steady state.\(^{15}\) This situation will take place after an infinite number of periods\(^ {16}\) and is given by:

\[
k_{ss} = \left[ \frac{N_{ss}}{D_t} \right]^{\frac{1}{(1 - \alpha)}}
\]

(2.21)

Where \( N_{ss} \) is:

\[
N_{ss} = \alpha \delta (1 - \tau) \left[ \beta l_t^{\alpha - 1} \gamma ((1 + n_N) s_0 + (1 + n_I) m_0(\theta)) + \gamma l_t^{\alpha - 1} ((1 + n_N) u_0 + (1 + n_I) m_0 (1 - \theta)) \right]
\]

---

\(^{15}\) It was verified in the Equation (2.20) that the steady state equilibrium is locally stable:

\[
\frac{\partial k_t}{\partial k_{t-1}} \epsilon (0,1).
\]

\(^{16}\) The characteristics of the model ensure that the economy reaches a steady state again.
From the previous expression (2.21) we can obtain the steady state of the other 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 $\chi$ and $\mu$ in the final steady state expression implies that in the long run the composition of immigration (regular and irregular) will not have effects on capital labor skilled ratio. Behind this result is the assumption of total integration of the immigrants’ offspring independently of the legal situation of their parents.

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

\[
NB = \begin{cases} 
\frac{b_t}{1 + r_t} + \tau w_t^0 & \text{if the immigrant regular} \\
0 & \text{if the immigrant irregular}
\end{cases}
\]  

(2.22)

2.2. Unemployment

In order to make the model more realistic, we introduce frictions in the unskilled labor market. Concretely, following Kemnitz (2003) we assume that the low qualified workers 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 no unemployment among the 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 $\rho$ represent the contribution rate to the unemployment insurance.\(^ {19}\) Thus, the maximization\(^ {20}\) problem of the representative union member is:

\[
\max L_t^{ud} \left[ (1 - \tau - \rho)w_t^u + d_t \right] 
\]  

(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 it is a constant mark-up on $d$, and it is superior to the wage obtained in the previous section (Equation 2.14).

\(^{17}\) The union represent all unskilled regular workers, regardless of whether 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.
\( d_t = \gamma (1 - \tau - \rho) w_t^{u} \) \hspace{1cm} (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.\(^{21}\)

\[
L_t^{ud} = \left( \frac{1}{\rho + \gamma (1 - \tau - \rho)} \right) L_t^{u} \hspace{1cm} (2.25)
\]

From Equations (2.24) and (2.25) we can deduct two important results. The composition of immigration does not affect the unemployment rate.\(^{22}\) However, they do affect all other outcomes of the economy through the general equilibrium effects (wages and interest rate).

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

Before simulating our model it is important to stress that the model presented in this section is a version that includes the one developed by R-S. Considering, \( \mu = 0 \) 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 (assuming that the skilled and unskilled workers are perfect substitutes) we obtain the R-S model.

3. PARAMETRIZATION AND SIMULATION

3.1. Parametrization

As was already mentioned, the parametrization of the model were carried out using Spanish data. Due to the lack of available information, the values of some parameters were taken from previous studies.

We consider that in the first period (zero) there is an affluence of \( m_0 \) foreign workers. In addition we assume that, in the period before the immigration shock

\(^{21}\) Taking the correspondent derivatives, respect to \( \tau \) and \( \rho \), we can see that, greater well-being parameters \( (\rho, \tau) \) imply lower employment. In addition, if we considered \( \rho = 0 \) we obtain the model in a full employment framework, this result is consequence of which the unemployment insurance is the origin of unemployment.

\(^{22}\) Unemployment rate = \( \frac{\rho}{\rho + \gamma (1 - \tau - \rho)} \).
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 percent-
age 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. Following the estimates of Bauer and
Zimmermann (1997), the capital share ($\alpha$) is assumed to be 0, 29, the highly
qualified labor share ($\beta$) 0, 453, and the poorly qualified labor share ($\gamma = 1 - \alpha - \beta$)
0, 257. The distribution of qualifications considered was: the share of skilled
workers ($s_0$) 0, 37 and the share of unskilled ($u_0$) 0, 63.23 The immigrants are dis-
tributed as follows, regular ($\chi$) 70% and irregular ($\mu$) 30%.24 We assume that
the social security contribution rate ($\tau$) is 28.3%25, the subjective discount rate is
5% annually, and each period lasts 25 years.

Table 3.1

<table>
<thead>
<tr>
<th>SET OF PARAMETERS</th>
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<tr>
<td><strong>Values Definition</strong></td>
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23 OECD (2005a) estimate the distribution of the 25-64 years old population by highest level of
education attained for the Spanish economy. We consider as skilled workers, the individuals who
reached upper secondary (with labor market destination), post-secondary and tertiary education.

24 We calculate the stock of irregular immigration in Spain, as the as the difference between
foreigners registered in the local administrations (Padrón Municipal) and those who have resi-
dence permit. At the beginning of the year 2006 the difference was about 1.4 millions on a
whole of 4.15 millions of registered foreigners. These date were obtained from the Spanish
Instituto Nacional de Estadística (INE) and Spanish Ministerio de Trabajo y Asuntos Sociales.

25 The contribution rate in the “General Regimen”, who represents more than 75% of the
contributors to the Spanish pension system, is 28.3%. 

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In addition, we assume that the annual population growth rate is equal to 1,5% for the natives \((n_n)\), and 3% for the immigrants \((n_i)\), these rates have been calculated from the Spanish Labor Force Survey (Encuesta de Población Activa) and the Probabilities of surviving published by the INE. On the other hand, to make the different skill distribution operative we assume that the share \(\theta\) equal 70% of \(s_0\). To simulate the unemployment framework we assume \(\rho\) (the contribution rate to the unemployment insurance) equal to 2.5%. The Table 3.1 summarizes the set of parameters.

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 3.1, for the economy with full employment (subsection 2.1) and 3.2 for the model with unemployment (subsection 2.2). Also Table A.3 in appendix summarizes these results. In both cases, we simulate the model 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 3.1**

**Transition to the stationary state of the main variables of the model Full Employment**
As can be observed from Figures 3.1 and 3.2, in the period that the migration takes place the capital skilled labor ratio remains constant. This is due to the fact 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 ones it rises monotonically until it reaches the steady state, which is superior to its initial value. The interest rate rises in period zero and one, then it falls until the steady state level.

By the same token, the downward pressure on the wages caused by immigrants affects negatively in unskilled sector from period zero. Nevertheless the wages grow in the skilled sector. 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 3.2**

**Transition to the stationary state of the main variables of the model Unemployment**

In the period that the migrants arrive, the benefits of the pension system raises as a consequence of the increase of the contributors to the pension system. Thereafter they fall, and converge 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 immigra-
tion shock (in terms of well-being) 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, because of the increase of the rate of return to their capital. The individuals born in periods zero and later will be benefited or harmed by the migratory shock depending on whether they are highly or poorly qualified workers. The results are the following: all the skilled individuals win from migration whereas the unskilled loose. This is because of a rise and a fall of 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 the migratory shock takes place are benefited is not sustained. Nevertheless, in contrast to R-S, some groups of the population win and other lose well-being. More specifically, among the individuals that live in period zero and beyond, all retirees in zero and all workers with high qualification will benefit 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 the results 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; but they do so quantitatively.

It is important to emphasize 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 of skilled labor supply in relation to total labor supply and because the migrants become old.

The net benefit of the immigrants appears in the inferior part of Tables A.1 and A.2 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 parametrization made, the immigrants are net contributors to the pension system (their net benefit are negative).

Unlike the R-S model, in our general model the net contribution that the immigrants make along with the lower welfare of the unskilled workers, allows to finance the pensions of all the retirees in period zero, and those of the skilled workers born in the subsequent periods.
Finally, the two versions of the model proposed here lead to different results than those obtained by R-S. Moreover, our model is supported by empirical evidence. That is, even in the context of flexible factor prices, not all the individuals that are born in the period in which the immigration takes place and beyond will be harmed, there will be winners and losers which will depend on the qualification level of the worker.

4. FINAL COMMENTS

In this paper we have analyzed the effects of low skilled immigration shock in a dynamic model. In that vein, we have generalized the R-S model by introducing a segmented labor market and relaxing the assumptions that immigrants have the same population growth rate as natives, and that the immigrants’ offspring have the same distribution of skills as the natives’. We present the model in two different frameworks, full employment and unemployment. We show that the result of the 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 puts into relief the empirical evidence that an inflow of low skilled immigration affects negatively the well-being of native workers with whom they compete for the same jobs (via lower wages and an increase in the unemployment rate). On the other hand, the native skilled workers and all the pensioners of the initial period are affected positively.

Concretely, according to our simulation, we found that the long run welfare worsening of the low skilled workers is between 1 and 2%, depending on the framework considered and magnitude of the shock. On the other hand, the welfare improvement of the high skilled workers and the pensioners of the initial period is between 0, 9 and 1, 6% and 0, 2 and 0, 65%, respectively.

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 neither 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 greater
inequality could be reverted, totally or partially, through compensation mechanisms (e.g. transfers from winners to losers). This is related with the demonstration made by Razin and Sadka (1999) where unskilled migration could generate a Pareto-improving situation for all generations.

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

### MIGRATORY SHOCK IN FULL EMPLOYMENT FRAMEWORK

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**RESULTS**

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SÍNTESIS
PRINCIPALES IMPLICACIONES DE POLÍTICA ECONÓMICA

El envejecimiento poblacional en las economías desarrolladas es una de las principales amenazas para la sostenibilidad de largo plazo de los programas de bienestar y, en particular, de los sistemas de pensiones de reparto. Por otra parte, la movilidad internacional de las personas se ha incrementado considerablemente en los últimos años. En este contexto, son muchos los trabajos que han propuesto la inmigración como una posible solución a dicho problema. Éstos sostienen que la inmigración, más joven y con tasas de fertilidad mayores que la población nativa, puede mitigar, en el corto y largo plazo, los problemas financieros de los sistemas de pensiones de reparto.

Este trabajo tiene por objetivo investigar el impacto de un shock de inmigración (regular e irregular) con baja calificación sobre el bienestar de los individuos nativos. El análisis se realiza para el corto y largo plazo, considerando el precio de los factores flexibles. Concretamente, se modifica el modelo desarrollado por Razin and Sadka (2000) segmentando el mercado de trabajo: se supone la existencia de dos tipos de trabajo como sustitutos imperfectos –alta y baja calificación–. Además se considera heterogeneidad en las tasas de crecimiento poblacional entre nativos e inmigrantes y diferencias en la distribución de habilidades de sus descendientes. En primera instancia, el análisis se realiza en un contexto de pleno empleo, para luego suponer la existencia de desempleo. Se calibra el modelo de acuerdo a las principales características de la economía española y, en especial, del actual sistema de pensiones.

Un primer resultado es que no todas las generaciones nacidas con posterioridad al shock migratorio pierden bienestar, sino que existen ganadores y perdedores dentro de la población nativa. El modelo aquí desarrollado captura la evidencia empírica que un shock de inmigrantes con baja calificación afecta negativamente el bienestar de los nativos que compiten con dichos inmigrantes, pero afecta positivamente a los trabajadores con alta calificación y a los retirados del periodo en que se produce el shock. Estos resultados son válidos con pleno empleo y desempleo.

Las magnitudes de las pérdidas y ganancias de bienestar dependen del tamaño del shock –se simularon shocks del 10% y 20% de la población– y del contexto analizado. La pérdida para los trabajadores con baja calificación varía entre 1% y 2%, mientras que las ganancias para los trabajadores con alta calificación y los pensionistas del período cero varían entre 0,9% y 1,6% y 0,2% y 0,65%, respectivamente.

Otro resultado, es que la composición de la inmigración –entre regular e irregular– no afecta la economía en el largo plazo. Sin embargo, durante la transición los efectos –tanto positivos como negativos– son mayores cuanto mayor es la proporción de inmigrantes en situación irregular.

Por otra parte, la inmigración con baja calificación genera un incremento de la desigualdad salarial entre los diferentes grupos de trabajadores de la población nativa. Esta
mayor desigualdad podría ser revertida –total o parcialmente– a través de mecanismos de compensación desde los ganadores a los perdedores.

Por último, los resultados de las simulaciones muestran que la inmigración afecta la sostenibilidad del sistema de pensiones. El incremento en las contribuciones generado por el ingreso de inmigrantes con baja calificación ayuda a la generación de los jóvenes actuales a pagar las prestaciones que reciben los retirados.
NORMAS DE PUBLICACIÓN DE PAPELES DE TRABAJO DEL INSTITUTO DE ESTUDIOS FISCALES

Esta colección de Papeles de Trabajo tiene como objetivo ofrecer un vehículo de expresión a todas aquellas personas interesadas en los temas de Economía Pública. Las normas para la presentación y selección de originales son las siguientes:

1. Todos los originales que se presenten estarán sometidos a evaluación y podrán ser directamente aceptados para su publicación, aceptados sujetos a revisión, o rechazados.


3. La extensión máxima de texto escrito, incluidos apéndices y referencias bibliográficas será de 7000 palabras.

4. Los originales deberán presentarse mecanografiados a doble espacio. En la primera página deberá aparecer el título del trabajo, el nombre del autor(es) y la institución a la que pertenece, así como su dirección postal y electrónica. Además, en la primera página aparecerá también un abstract de no más de 125 palabras, los códigos JEL y las palabras clave.

5. Los epígrafes irán numerados secuencialmente siguiendo la numeración arábiga. Las notas al texto irán numeradas correlativamente y aparecerán al pie de la correspondiente página. Las fórmulas matemáticas se numerarán secuencialmente ajustadas al margen derecho de las mismas. La bibliografía aparecerá al final del trabajo, bajo la inscripción “Referencias” por orden alfabético de autores y, en cada una, ajustándose al siguiente orden: autor(es), año de publicación (distinguiendo a, b, c si hay varias correspondientes al mismo autor(es) y año), título del artículo o libro, título de la revista en cursiva, número de la revista y páginas.

6. En caso de que aparezcan tablas y gráficos, éstos podrán incorporarse directamente al texto o, alternativamente, presentarse todos juntos y debidamente numerados al final del trabajo, antes de la bibliografía.

7. En cualquier caso, se deberá adjuntar un disquete con el trabajo en formato Word. Siempre que el documento presente tablas y/o gráficos, éstos deberán aparecer en ficheros independientes. Asimismo, en caso de que los gráficos procedan de tablas creadas en Excel, estas deberán incorporarse en el disquete debidamente identificadas.

Junto al original del Papel de Trabajo se entregará también un resumen de un máximo de dos folios que contenga las principales implicaciones de política económica que se deriven de la investigación realizada.
PUBLISHING GUIDELINES OF WORKING PAPERS AT THE INSTITUTE FOR FISCAL STUDIES

This serie of Papeles de Trabajo (working papers) aims to provide those having an interest in Public Economics with a vehicle to publicize their ideas. The rules governing submission and selection of papers are the following:

1. The manuscripts submitted will all be assessed and may be directly accepted for publication, accepted with subjections for revision or rejected.

2. The papers shall be sent in duplicate to Subdirección General de Estudios Tributarios (The Deputy Direction of Tax Studies), Instituto de Estudios Fiscales (Institute for Fiscal Studies), Avenida del Cardenal Herrera Oria, nº 378, Madrid 28035.

3. The maximum length of the text including appendices and bibliography will be no more than 7000 words.

4. The originals should be double spaced. The first page of the manuscript should contain the following information: (1) the title; (2) the name and the institutional affiliation of the author(s); (3) an abstract of no more than 125 words; (4) JEL codes and keywords; (5) the postal and e-mail address of the corresponding author.

5. Sections will be numbered in sequence with arabic numerals. Footnotes will be numbered correlatively and will appear at the foot of the corresponding page. Mathematical formulae will be numbered on the right margin of the page in sequence. Bibliographical references will appear at the end of the paper under the heading “References” in alphabetical order of authors. Each reference will have to include in this order the following terms of references: author(s), publishing date (with an a, b or c in case there are several references to the same author(s) and year), title of the article or book, name of the journal in italics, number of the issue and pages.

6. If tables and graphs are necessary, they may be included directly in the text or alternatively presented altogether and duly numbered at the end of the paper, before the bibliography.

7. In any case, a floppy disk will be enclosed in Word format. Whenever the document provides tables and/or graphs, they must be contained in separate files. Furthermore, if graphs are drawn from tables within the Excell package, these must be included in the floppy disk and duly identified.

Together with the original copy of the working paper a brief two-page summary highlighting the main policy implications derived from the research is also requested.
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2004

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