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THE EFFECTS OF MIGRATION ON THE RELATIVE DEMAND OF SKILLED VERSUS UNSKILLED LABOUR: EVIDENCE FROM SPAIN

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ABSTRACT

The Effects of Migration on the Relative Demand of Skilled versus Unskilled Labour: Evidence from Spain*

In this paper we construct a simple model of the effects of immigration on the labour market outcomes of natives. In this model, skilled and unskilled labour are substitutes, immigrants are complementary to the former, and wages are determined by bargaining. We are able to prove that, irrespective of the degree of competition in the market for skilled labour, there are sufficient conditions for immigration to raise total employment. We then estimate the effects of immigration on wages and employment of both types of workers across Spanish provinces following the lifting of some restrictions on migration policy in 1991. We find little evidence that the subsequent inflows of immigrants are associated with negative effects on both wages and employment of less-skilled natives.

JEL Classification: H30, J51, J61
Keywords: immigration, heterogeneous labour, wages, unions

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NON-TECHNICAL SUMMARY

Mainstream migration literature often analyses the effects of immigration on the labour market of the receiving country in models with heterogeneous labour, namely, skilled and unskilled workers. In this paper, we follow this tradition, studying the impact of the lifting of some important migration policy restrictions in Spain in June 1991. As a result, the number of legally registered immigrants increased substantially between 1990 and 1992. The legalization process thus offers an interesting opportunity to test the effects of immigration on the relative demand for skilled and unskilled workers and their wages.

Our approach adopts the assumption that immigrants are substitutes for native unskilled workers, but complementary to skilled workers. Since a sizeable proportion of immigrants in Spain work in the home-help sector, the previous assumption seems to be well-suited to the empirical problem at hand. Moreover, in contrast to many studies on the effects of immigration in the United States, we analyse these effects in a framework where wages are not determined in a competitive labour market, but are rather the outcome of bargaining between unions and firms. In this respect, we find that the immigration rate (as a proportion of total employment) affects the alternative wage which, in turn, determines wages. The intuition is that the larger the immigration rate, the lower the reservation wage will be, since competition in the labour market is higher.

We consider two alternatives of the model: one in which the market for skilled workers is competitive and their wages adjust to achieve full employment, and another in which unions aim at achieving a given wage gap between both types of workers. In both cases we find sufficient conditions in terms of threshold immigration rates, by which immigration can raise the wage bills of native workers and total employment. These threshold values depend on the elasticity of substitution between both types of workers, the share of labour, the degree of competition in the product market, the effect of immigration on the marginal productivity of skilled workers, and on the target relative wage gap. The analytical results in the paper thus indicate the existence of non-monotonic effects of immigration on the labour market fortunes of native workers.

Using information from the administrative register of work permits across Spanish provinces before and after the change in legislation in 1991, we estimate the effects of immigration on the employment and wages of unskilled

workers, the wages of skilled workers and total employment. We tend to find significant positive effects on unskilled workers' wages and total employment.

In sum, the results point to positive – albeit weak – effects of immigration on the labour market outcomes of Spanish native workers. Specifically, we find little evidence that larger inflows of immigrants are associated with negative effects on employment of less-skilled natives. This does not imply, however, that immigration should be favoured at any cost, since our analysis indicates that, beyond certain thresholds, the previous favourable effects could be overturned.

- Model II

From equation (12) in the text

$$\ln L = \ln \chi + \frac{\sigma^*}{\sigma - 1} \ln |1 + (\delta + m)^\sigma| - \frac{\sigma}{\sigma - 1} \ln \left| z^{\sigma - 1} + (\delta + m)^\sigma \right| + \ln |z^\sigma + (\delta + m)^\sigma|$$

and

$$\begin{aligned} sign\left(\frac{\partial \ln L}{\partial m}\right) &= sign\left[-\frac{\sigma}{\sigma - 1}\left(\frac{\frac{\sigma}{\sigma-1}}{z^{\sigma-1} + (\delta+m)^\sigma} - \frac{\frac{\sigma^*}{\sigma-1}}{1 + (\delta+m)^\sigma} - \frac{1}{z^\sigma + (\delta+m)^\sigma}\right)\right] \\ &= sign\left(\frac{(\sigma - 1)}{z^\sigma + (\delta+m)^\sigma} + \frac{\sigma^*}{1 + (\delta+m)^\sigma} - \frac{\sigma}{z^{\sigma-1} + (\delta+m)^\sigma}\right) \end{aligned}$$

which is positive if $z \to 1$ or $z \to \infty$. Letting $a = (\delta + m)^\sigma$,

$$sign\left(\frac{\partial \ln L}{\partial m}\right) = sign\left\{(z^\sigma + az)\left|\sigma^*(z^\sigma + a) + (1 + a)(\sigma - 1)\right| - \sigma z(z^\sigma + a)(1 + a)\right\}$$

Thus, a sufficient condition for total employment being increasing in m, assuming $\lambda > 0$, is

$$\sigma^*(z^{\sigma-1} + a) > \sigma(1 + a) \Rightarrow a < \frac{\sigma^*(z^{\sigma-1} - 1)}{\lambda} - 1$$

which gives condition (13)in the text.

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and

$$sign\left[\frac{\partial \ln(w_u N_u)}{\partial m}\right] = sign\left\{ \begin{array}{c} \left[\sigma^* - \frac{\lambda}{\sigma-1}\right]\left(\frac{w}{\alpha\kappa}\right)^{-\frac{\sigma-1}{\sigma(1-\alpha\kappa)}} - \\ \left[\frac{1+(\delta+m)^\sigma}{(\delta+m)^\sigma} - \frac{\lambda}{\sigma-1}\right](\delta+m)S^{\frac{\sigma-1}{\sigma}} \end{array} \right\}$$

Since both coefficients in brackets are positive, $sign\left[\frac{\partial \ln(w_u N_u)}{\partial m}\right] > 0$ if

$$\sigma^* > \frac{1+(\delta+m)^\sigma}{(\delta+m)^\sigma}$$

which again is condition (11) in the text.

1 Introduction

In the mainstream of the migration literature, the effects of immigration on the labour market of the receiving country are often analyzed in models with two-types of labour, namely, skilled and unskilled (see, *inter alia*, Johnson, 1980, Borjas, 1987, 1994a and 1994b, and Razin and Sadka, 1995). Furthermore, recent studies with focus on the consequence of a potentially unbounded influx of immigrants in Western countries, add the assumption that immigrants are substitutes for native unskilled labour, but complementary with skilled labour (or complementary with capital which, in turn, is assumed to be complementary with skilled labour) Papers of this sort include Schmidt *et. al.* (1991) and Bauer and Zimmermann (1995). The intuition behind this assumption is that immigrants are unskilled workers whose labour input is cooperative with skilled labour in the production process. In this kind of analysis, on the one hand, immigrants increase the relative demand for skilled labour, and, since the short-term supply of skilled labour is assumed to be inelastic, also increase the wages of skilled workers. On the other hand, immigrants should cause a fall in the real wages of unskilled workers, through the usual labour supply increase channel. Overall, the economic gains from immigration may depend upon the rigidity of the real wage of unskilled workers. In particular, if the role of unions in the wage determination process makes these wages rigid, then unemployment increases and immigration may imply social losses.

Empirical tests of the implications of this analysis are, however, less common in the economic literature. Altonji and Card (1991) have estimated the effects of immigration on the labour market outcomes of less-skilled natives in the US and find that the degree of competition between immigrants and less-skilled natives is "modest" They conclude that the inflows of immigrants do not produce large or systematic effects on the employment and unemployment rates of less-skilled natives. According to their estimates, after a 1% point increase in the fraction of immigrants, the fall in wages is between .3% and 1.2 %.[1]

In this paper, following previous work by Schmidt *et. al.* (1991), we extend the analysis of the effects of immigration in a competitive labour market, as in the US, to a non-competitive one, as in Europe, where an ex-

[1] See also Borjas (1987) and LaLonde and Topel (1991). A recent survey of empirical results on the effects of immigration can be found in Borjas(1994b).

plicit wage determination process is set up. Specifically, we study the effects of immigration in the Spanish labour market. Although the immigration rate in Spain is low, relative to other European countries, in June 1991 the Spanish government lifted some restrictions on migration policy allowing the legalization of illegal immigrants under certain conditions. As a result, the number of legally registered migrants increased substantially between 1990 and 1992. Thus, this legalization process provides an interesting experiment to test the effects of a significant increase in the proportion of legal migrants on the relative demand of skilled and unskilled workers. Furthermore, since the number of migrants increased because there was a number of illegal migrants, previously living and working in the Spanish underground economy, which were legalized, we can also address another interesting policy-related issues: To what extent is a legal migrant different to an illegal migrant in regard to their effects on the labour market? Does the concession of work permits to illegal immigrants have labour market effects?.

The outline of the rest of the paper is as follows. Section 2 presents a simple theoretical model of the effects of immigration on wages and employment outcomes of native skilled and unskilled workers. This model modifies previous work in the literature in at least two ways. First, we establish a set of weak sufficient conditions for immigration to be beneficial from the viewpoint of native workers. Secondly, we adapt the model in various dimension (e.g., wage bargaining, role of wage dispersion in unions' utility function) to some Spanish institutional characteristics. Section 3, in turn, reports on the characteristics of immigration to Spain, as regards to regional variability, country of origin, and work status regarding occupation and sector of activity. In Section 4 we estimate the effects of immigration on the wages and employment level of skilled and unskilled workers using information from the register of legal immigrants across Spanish provinces over the period 1989-1992. Finally, Section 5 offers some concluding remarks.

2 A theoretical framework

In this section, we present a simple model on the effects of immigration on the relative demand and relative wages of skilled and unskilled labour. Since we are specifically interested in this problem, we abstract from other production factors. Furthermore, given that in the empirical case that we study in this paper the immigration rate is low, we also abstract from the extra aggregate

6 Appendix

- Model I

Proof of sufficient condition for $\frac{\partial \ln w_u}{\partial m} < 0$, $\frac{\partial \ln N_u}{\partial m} > 0$, and $\frac{\partial \ln(w_u N_u)}{\partial m} > 0$. From equation (8) in the text,

$$\ln w_u = \frac{\lambda}{\sigma} \ln w - \frac{1}{\sigma - 1} D, \quad D = \left[\left(\frac{w}{\alpha\kappa} \right)^{-\frac{\sigma-1}{\sigma(1-\alpha\kappa)}} - (\delta + m) S^{\frac{\sigma-1}{\sigma}} \right] > 0$$

Hence,

$$\frac{\partial \ln w_u}{\partial m} = \frac{\lambda}{\sigma} \frac{\partial \ln w}{\partial m} - \frac{1}{\sigma - 1} \frac{\partial \ln w}{\partial m} \frac{w}{D} + \frac{1}{\sigma - 1} \frac{S^{\frac{\sigma-1}{\sigma}}}{D}$$

where

$$\frac{\partial \ln w}{\partial m} = \frac{\partial \ln w}{\partial \ln w_A} \frac{\partial \ln w_A}{\partial m} = -\frac{\sigma}{\sigma - 1} \frac{\delta + m}{1 + (\delta + m)^\sigma}$$

Therefore,

$$\begin{aligned} \frac{\partial \ln w_u}{\partial m} &= -\frac{\lambda}{\sigma} \frac{\delta + m}{1 + (\delta + m)^\sigma} - \frac{1}{\sigma - 1} \left[\frac{1}{1 - \alpha\kappa} \frac{(\delta + m)^{\sigma - 1}}{1 + (\delta + m)^\sigma} \left(\frac{w}{\alpha\kappa} \right)^{-\frac{\sigma-1}{\sigma(1-\alpha\kappa)}} - S^{\frac{\sigma-1}{\sigma}} \right] = \\ &= -\frac{\lambda}{\sigma} \frac{\delta + m}{1 + (\delta + m)^\sigma} - \frac{1}{\sigma - 1} \frac{1}{\delta + m} B, \end{aligned}$$

where $B = \left[\frac{1}{1-\alpha\kappa} \frac{(\delta+m)^\sigma}{1+(\delta+m)^\sigma} \left(\frac{w}{\alpha\kappa} \right)^{-\frac{\sigma-1}{\sigma(1-\alpha\kappa)}} - (\delta + m) S^{\frac{\sigma-1}{\sigma}} \right]$

Since $D > 0$, $B > 0$ if $\frac{1}{(1-\alpha\kappa)} \frac{(\delta+m)^\sigma}{1+(\delta+m)^\sigma} > 1$, which implies condition (11) in the text.

Doing similar calculations for N_u,

$$\ln N_u = \frac{\sigma}{\sigma - 1} \ln \left[\left(\frac{w}{\alpha\kappa} \right)^{-\frac{\sigma-1}{\sigma(1-\alpha\kappa)}} - (\delta + m) S^{\frac{\sigma-1}{\sigma}} \right]$$

we get $\frac{\partial \ln N_u}{\partial m} > 0$ if condition (11) holds.

To check that condition (11) is also a sufficient condition for $\frac{\partial \ln(w_u N_u)}{\partial m} > 0$, notice that

$$\ln(w_u N_u) = \text{constant} + \frac{\lambda}{\sigma} \ln w + \ln D$$

imply a elasticity between .024 and .036, that is, a one per cent increase in immigration increases the wage bill of unskilled workers by around $\frac{1}{30}$ of one per cent. In turn, the estimated semielasticity of w_s with respect to m, implies a corresponding increase in the wages of skilled workers of around $\frac{1}{20}$ of one per cent. Finally, the semielasticity of employment with respect to the immigration rate turns also to be positive and significant, with a value between 5.0 and 7.0, implying an elasticity of .05 according to model II. This result would be consistent with $m < m_-^*$, which to yield positive values for m_-^* imply either values of z around 2.0 or sizeable values of σ^*

In sum, these results point towards positive -albeit weak- effects of immigration on the labour market outcomes of Spanish native workers. Specifically, we find little evidence that inflows of immigrants are associated with large effects on employment of less-skilled natives. This does not imply, however, that immigration inflows should be favoured at any cost, since our analysis also points out that there are certain immigration thresholds beyond which the previous favourable effects could be overturned.

5 Concluding remarks

In this paper we have analyzed the effects of immigration on the labour market outcomes of natives when wages are determined by bargaining. We have derived some conditions under which we can sign the changes in wages, employment, and the wage bill of unskilled workers after a raise in the proportion of immigrants. Interestingly, there are threshold effects, so that for low immigration rates it can be the case the labour market outcomes of unskilled natives improve.

Additionally, we have used Spanish data on legal immigration to obtain empirical estimates of the response of wages of skilled and unskilled workers and of the employment level of unskilled workers to immigration rates. Although legal immigration to Spain is low, even for European standards, a legalization process which took place in mid-1991 provides some basis for this empirical analysis. Our results suggest that the labour market outcomes of Spanish unskilled workers did not worsen after this legalization process (the elasticity of wages with respect to the immigration rate is small but positive, and the elasticity of employment of unskilled workers is negative but not significant). This is consistent with the threshold effects of immigration which arise from by the theoretical model.

demand effects stemming from immigration in the receiving country. Thus, we consider an economy where firms are identical and have a CES production function:

$$Y = ((\delta + m)N_s^\rho + N_u^\rho)^{\frac{\alpha}{\rho}}, \qquad \alpha < 1, \qquad 0 \leq \rho \leq 1, \qquad \delta > 1$$

where Y is production, N_s is skilled labour, N_u unskilled labour, m is the immigration rate ($m = \frac{M}{N_s+N_u}$, being M the number of immigrants), and δ is an index of the productivity of skilled workers relative to the productivity of unskilled workers. Hence, the elasticity of substitution between skilled and unskilled labour is $\sigma = \frac{1}{1-\rho} > 1$, skilled and unskilled labour are substitutes, and immigrants, which are assumed to be less-skilled, rise the productivity of skilled labour, while they turn out to be substitutes for native unskilled workers. The marginal rate of substitution between skilled and unskilled labour is given by

$$MRS = (\delta + m)\Phi^{\frac{1}{\sigma}}, \qquad \Phi = \frac{N_u}{N_s}$$

and by cost minimization we have that

$$\Phi = \left(\frac{w_s}{(\delta + m)w_u}\right)^\sigma \tag{1}$$

Firms are assumed to face a constant-elasticity demand function[2], so that

$$Y = P^{-\theta}$$

and to maximise profits, which are given by

$$\Pi = Y^{1-\frac{1}{\theta}} - wN$$

where $N = ((\delta + m)N_s^\rho + N_u^\rho)^{\frac{1}{\rho}}$ is an employment index, and w is the associated labour cost index, which is equal to

$$w = \left((\delta + m)^\sigma w_s^{1-\sigma} + w_u^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \tag{2}$$

[2]We could have modelled the demand effects of immigrants by adding a demand shift parameter D, depending on the relative wages of both types of workers, to the demand function. However, we failed to obtain closed-form solutions in this case. For this reason, and given the low proportion of immigrants in the Spanish economy, we simply assume that the demand effects are negligible.

being w_s and w_u the labour cost of skilled and unskilled labour, respectively. It is easy to prove that $wN = w_u N_u + w_s N_s$. Then, profit maximisation yields the following labour demand functions:

$$N_s = (\alpha\kappa)^{\frac{1}{1-\alpha\kappa}} w^{\lambda} \left(\frac{w_s}{\delta + m}\right)^{-\sigma} \tag{3}$$

$$N_u = (\alpha\kappa)^{\frac{1}{1-\alpha\kappa}} w^{\lambda} w_u^{-\sigma} \tag{4}$$

with $\kappa = 1 - \frac{1}{\theta}$, $\lambda = \sigma - \sigma^*$, $\sigma^* = \frac{1}{1-\alpha\kappa}$ The parameter λ can be interpreted as a measure of the degree of substitution between skilled and unskilled labour, and κ is an index of the degree of competition in the product market. If $\lambda > 0$, then both types of labour are *strong* substitutes and, given its own-labour cost, the demand of one type of labour is increasing in the labour cost of the other type of labour. If $\lambda < 0$, then skilled and unskilled labour are *weak* substitutes and labour demand are decreasing in the labour costs of the alternative input. In other words, when $\lambda > 0$, the substitution effect dominates over the output effect, and when $\lambda < 0$ the output effect dominates over the substitution effect. Notice that for a given σ, the larger is the labour share, α, or the degree of competition, κ, the more likely is that $\lambda < 0$.

2.1 Wage Determination: Model I

In this version of the model, we will start considering, for simplicity, that the market for skilled workers is competitive and, hence, skilled workers' wages adjust to achieve full employment. Hence,

$$S = (\alpha\kappa)^{\frac{1}{1-\alpha\kappa}} w^{\lambda} \left(\frac{w_s}{\delta + m}\right)^{-\sigma} \tag{5}$$

being S the supply of skilled workers. By inverting (5),the labour cost of skilled labour is given by:

$$w_s = (\delta + m)(\alpha\kappa)^{\frac{1}{\sigma(1-\alpha\kappa)}} w^{\frac{\lambda}{\sigma}} S^{-\frac{1}{\sigma}} \tag{6}$$

As for the determination of the labour cost of unskilled labour, we will assume, for simplicity, that there is centralized bargaining between trade unions and employers. Trade unions care for the wage bill at the aggregate

Table 1
Effects of immigration on Labour Market Outcomes of Natives

Outcome Variable/Estimation	(1) (OLS)	(2) (IV)	(3) (IV')
1. $\Delta \ln w_u$	4.19	4.23	3.47
	(1.39)	(3.57)	(1.77)
2. $\Delta \ln w_s$	1.38	1.84	1.60
	(1.48)	(1.79)	(2.02)
3. $\Delta \ln N_u$	-3.84	-2.70	-0.88
	(2.22)	(3.78)	(1.74)
4. $\Delta \ln N$	5.75	6.85	6.24
	(2.14)	(2.94)	(2.63)

Notes: Robust standard errors in parenthesis. Control variables are described in the text.

- *Equation (1) has been estimated by OLS.*
- *Equation (2) has been estimated by IV (a constant, lagged immigration rate and its square, lagged unemployment change and predetermined variables), instrumenting the unemployment change and the immigration rate change.*
- *Equation (3) is as equation (2) with the immigration rate current change replaced by its lagged value.*

The results in Table 1 have to be interpreted with care, given the small sample size (50 provinces) , and the short length of the analysed change (2 years). Nonetheless, we find that, irrespectively of the estimation method, increases in m induce increases in w_u and in w_s, whereas the point estimates of the semielasticity of N_u with respect to m are negative but not significant. In view of our previous discussion in section 2, these results would be consistent with $m < m_c^*$. In fact, the average immigration rate was about .7% in 1990, and about 1,1% in 1992, which are equal or below the values of m_c^* obtained under plausible values for σ, σ^*, and δ. Noteworthy is also the fact that, according to the previous estimates, the net effect of immigration on the wage bill of less-skilled workers, $w_u N_u$, seems to be positive. Assuming that the semielasticity of N_u with respect to m is nil, the results in Table 2

4 Empirical analysis

We now turn to a brief discussion of our estimating equations, which take the form of cross-sectional equations in differenced form for 50 provinces in Spain, regarding aggregate employment, employment of unskilled workers, and the wage gap between skilled and unskilled workers. Due to scarcity of data, the differences refer to the changes in the variables in each province between 1990 (before the lift of the restrictions on immigrants) and 1992 (after the lift of the restrictions on immigrants) so that potential instrumental variables are lagged variables dated in 1989. The differenced specification has the advantage of eliminating any biases introduced by province-specific fixed-effects that could be correlated with the proportion of immigrants in a province and the labour outcomes of natives, having the following form:

$$\Delta Y_j = c\Delta m_j + \Delta X_j b + e_j \qquad (j = 1, 2, ...50) \tag{14}$$

where Y_j is the labour market outcome for native groups in province j which, according to the previous analysis in section 2, will refer to the log transformations of L, w_u, w_s and N_u. In turn, X_j is a vector of control variables containing the (log of) employment of skilled workers, N_s, the reservation wage, $\bar{w}_A$, approximated by the (log of) the minimum bargained wage in each province, the provincial unemployment rate, and the sectoral composition of employment in each province. The variable m_j refers to the proportion of immigrants in each province (out of total employment) and e_j is a disturbance term. In the regression model for total employment, the control variables are $\bar{w}_A$, z (the logarithm of $\frac{w_s}{w_u}$), m, and the sectoral composition of employment in each province. The regressands refer to manual (blue-collar) workers' wages and employment, w_u and N_u, non-manual (white-collar) workers' wages, w_s, and total employment, N. Following Bartel (1989) and Altonji and Card (1991) we use the proportion of immigrants in a province in 1989 to instrument Δm_j over 1990-92, and lagged unemployment changes to instrument current changes.

Table 1 presents OLS and IV estimates of the immigration effects in both equation (14) and a version of it where Δm_j has been replaced by $\Delta m_{j,-1}$, i.e., the difference between 1989 and 1991 of the immigration rate, so that this variable is taken to be independent and, thus, is not instrumented.

level (net of the alternative opportunities) and the employers are risk-neutral. Therefore, the corresponding Nash maximand is

$$[(w - w_A)N]^{\beta}\,\Pi$$

where Π is the profit function, β is workers' relative bargaining power, and w_A is the alternative value of the use of labour. From the corresponding first-order condition with respect to wages, and taking into account that

$$N = \left(\frac{w}{\alpha\kappa}\right)^{-\frac{1}{1-\alpha\kappa}}$$

we get

$$\frac{w - w_A}{w} = \frac{\beta(1-\alpha\kappa)}{\beta + \alpha\kappa}$$

and therefore

$$w = \frac{(\beta + \alpha\kappa)}{\alpha\kappa(1+\beta)} w_A \tag{7}$$

Hence, the bargained wage is an increasing function of the alternative wage, w_A, and of the union's bargaining power, β, and a decreasing function of the labour share, α, and of the degree of competitiveness in the product market, κ. Given this aggregate labour cost index, the labour cost and the demand of unskilled labour are, respectively

$$w_u = \frac{(\alpha\kappa)^{\frac{1}{\sigma(1-\alpha\kappa)}} w^{\frac{\beta}{\sigma}}}{\left[\left(\frac{w}{\alpha\kappa}\right)^{-\frac{(\sigma-1)}{\sigma(1-\alpha\kappa)}} - (\delta+m)S^{\frac{\sigma-1}{\sigma}}\right]^{\frac{1}{\sigma-1}}} \tag{8}$$

$$N_u = \left[\left(\frac{w}{\alpha\kappa}\right)^{-\frac{\sigma-1}{\sigma(1-\alpha\kappa)}} - (\delta+m)S^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{9}$$

The alternative wage w_A, in turn, can be written in terms of the migration rate, m, and a further reservation wage, $\bar{w}_A$, which we assume to be equal for all workers. Indeed, by using the definition in (2.1) we get

$$w_A = (1 + (\delta+m)^{\sigma})^{-\frac{1}{\sigma-1}}\,\bar{w}_A \tag{10}$$

Thus, the alternative wage, w_A, depends negatively on the migration rate, m, the intution being that the larger is the migration rate the lower will be the reservation wage since competition in the labour market is higher.

Next, making use of (6), (8), (9), and (10), we get the following comparative statics results:

$$\begin{array}{lll} \frac{\partial \ln w_s}{\partial \ln S} < 0 & \frac{\partial \ln w_s}{\partial \ln \bar{w}_A} > 0 \text{ (if } \lambda > 0) & \frac{\partial \ln w_s}{\partial m} > 0 \\ \frac{\partial \ln w_u}{\partial \ln S} > 0 & \frac{\partial \ln w_u}{\partial \ln \bar{w}_A} > 0 \text{ (if } \lambda > 0) & \frac{\partial \ln w_u}{\partial m} = ? \\ \frac{\partial \ln N_u}{\partial \ln S} < 0 & \frac{\partial \ln N_u}{\partial \ln \bar{w}_A} < 0 & \frac{\partial \ln N_u}{\partial m} = ? \end{array}$$

The interpretation of the previous signs is as follows. First, on the one hand, since the market for skilled workers is competitive, an increase in labour supply, S, reduces wages, w_s. Second, an increase in the reservation wage, $\bar{w}_A$, increases the wages of both types of workers, w_s and w_u, if labour inputs in the production function are *strong* substitutes. Third, an increase in the immigration rate, m, increases the wage of skilled workers, again due to complementarity. Finally, and most importantly, an increase in m, can increase or decrease the wage and the employment level of unskilled workers, depending on whether the *discipline effect* on the alternative wage dominate the effects of w_A on w_u and N_u, and the direct effects of m on both variables for given w_A. To see this in more detail, notice that the previous derivatives with respect to m can be decomposed as follows

$$\frac{\partial \ln w_u}{\partial m} = \underset{(+)\ (-)}{\frac{\partial \ln w_u}{\partial \ln w_A} \frac{\partial \ln w_A}{\partial m}} + \underset{(+)}{\left(\frac{\partial \ln w_u}{\partial m}\right)_{w_A}}$$

and

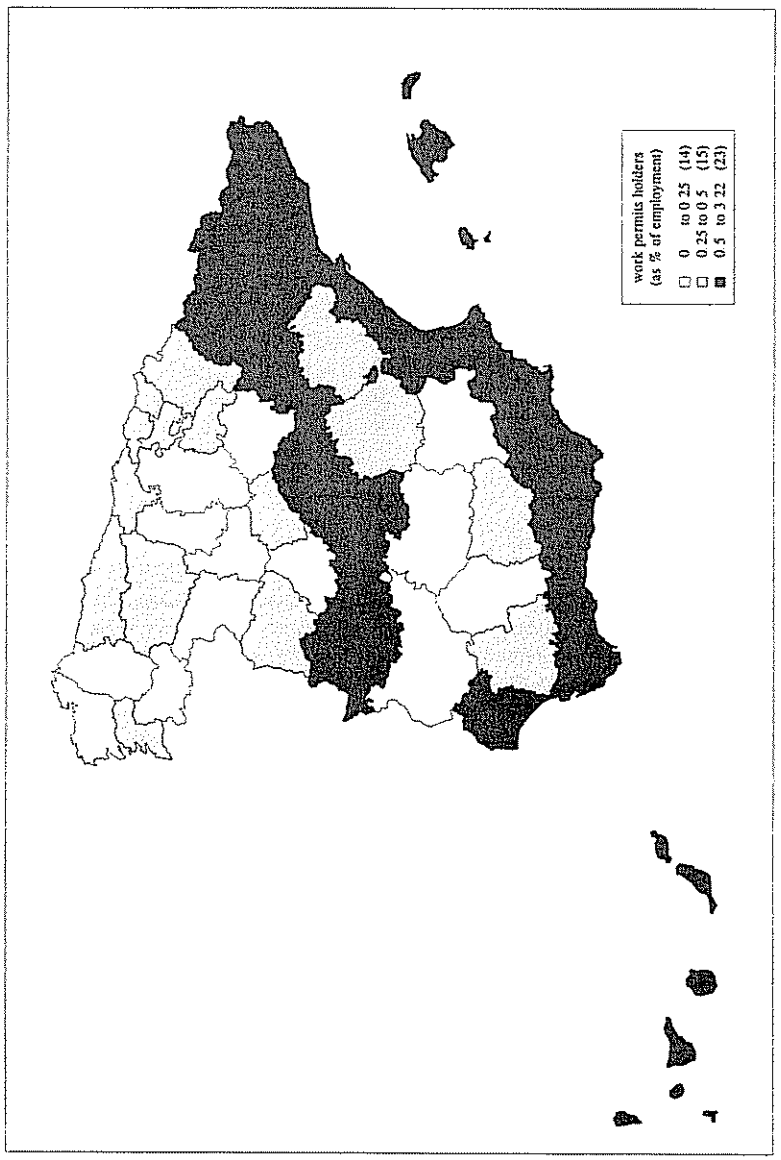
$$\frac{\partial \ln N_u}{\partial m} = \underset{(-)\ (-)}{\frac{d \ln N_u}{d \ln w_A} \frac{\partial \ln w_A}{\partial m}} + \underset{(-)}{\left(\frac{\partial \ln N_u}{\partial m}\right)_{w_A}}$$

where $(\cdot)_{w_A}$ denotes the semielasticities for given w_A, and the signs are given below the expressions. If $\left(\frac{\partial \ln w_A}{\partial m}\right)$ is sufficiently large (small) , then an increase in m, can decrease (increase) w_u and increase (decrease) N_u. Indeed, there are configurations of the parameters where both w_u and N_u could increase. A sufficient condition to get a negative effect of m on w_u and a positive effect on N_u (see Appendix) is

$$m > (\sigma^* - 1)^{-\frac{\lambda}{\sigma}} - \delta \equiv m_c^* \tag{11}$$

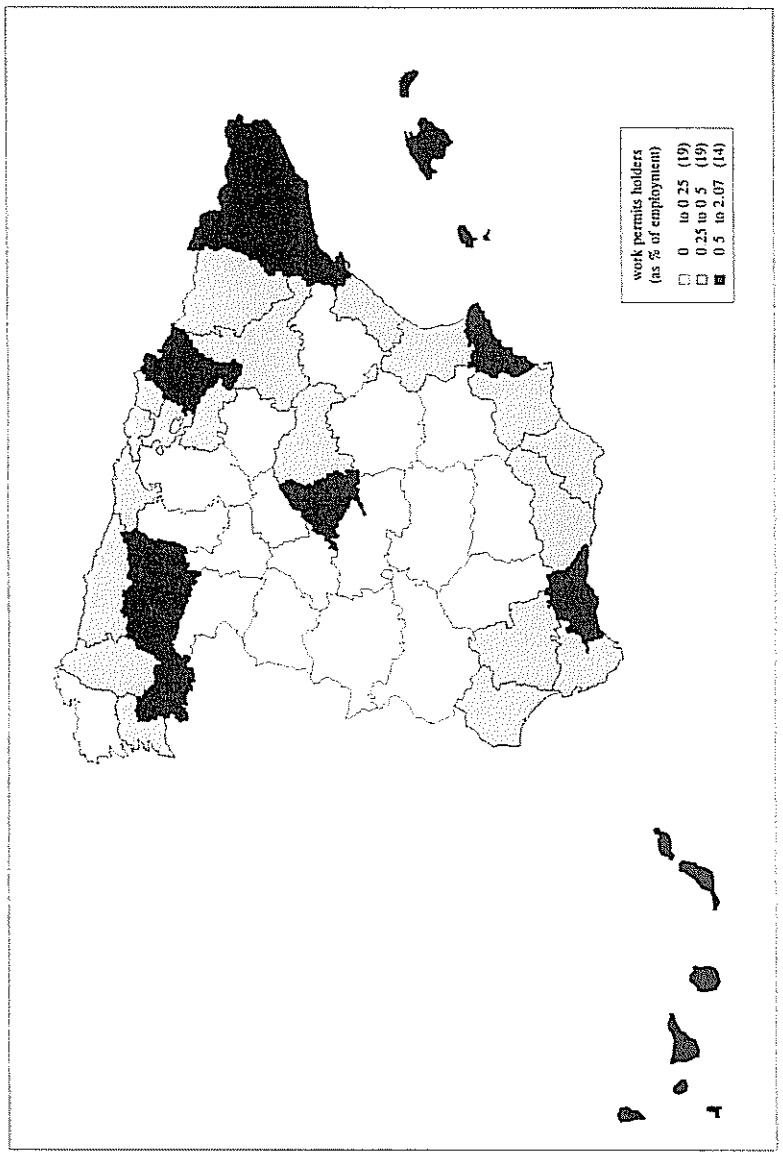
where m_c^* is an immigration threshold above which the previous effects hold. Moreover, as shown in the Appendix, if $m > m_c^*$, the wage bill of the unskilled

Graph 4 b Geographical distribution of work permits
1992



Source: Labour Force Survey

Graph 4 a Geographical distribution of work permits
1990



Source: Labour Force Survey

workers ($w_u N_u$) also increases when m raises, namely, the decrease in w_u is offset by a larger increase in N_u. Since the wage bill of the skilled workers ($w_s N_s$) also raises ($N_s = S$ given, and w_s increases), condition (11) proves to be a key condition in ascertaining the effects of m on the labour market outcomes of natives. Notice that if $m < m_c^*$, the previous effects could be reversed although not necessarily since condition (11) only represents a sufficient condition. Note also that for given m, the larger are the elasticity of substitution, σ, the degree of competition, κ, and the labour share, α, the lower will be m_c^*, and, hence, the more likely is that condition (11) will be satisfied. In order to get a feeling on the values of m_c^*, let us assume that σ is equal to 3.0, α and κ are both equal to 0.6, and δ equal to 1.2.[3] Then, according to condition (11), m_c^* will be equal to 1.1%. Had we chosen σ equal to 2.0, the corresponding value for m_c^* would be 13.3%. Of course, these values depend upon the chosen functional form for the relative productivity coefficient in the production function. Nonetheless, the choice of a functional form $f(m)$, with $f(0) = \delta$, would imply an analysis very much along the same lines.

2.2 Wage determination: Model II

In the previous section, we derived skilled and unskilled workers' wages under the assumption that skilled workers are in full employment. This assumption may seem controversial when applied to the analysis of the Spanish labour market (where the average unemployment rate is close to 23% and 30% of the unemployed are classified as skilled workers). Thus, previous results are only presented for reference purposes.

We now derive wages and employment of skilled and unskilled workers without assuming full employment of skilled workers. Instead, we take the wage gap between skilled and unskilled labour ($z = \frac{w_s}{w_u} > 1$) as given. This wage gap may be the result of deliberate attempts by the part of the unions to control the wage distribution.[4] In this case, substituting equation (2.1)

[3] In our sample, $\frac{N_u}{N_s} = 1.67$, $\frac{w_s}{w_u} = 1.6$, and $m = .007$, on average, in 1990. Given these values and assuming $\sigma = 3$, the marginal rate of substitution in equation (1) implies $\delta \approx 1.2$.

[4] See Dolado, Felgueroso and Jimeno (1996) for a discussion of the attempts by Spanish unions to affect the wage distribution through the bargaining of minimum wage rates.

into equations (3) and (9), we get

$$N_s = (\alpha\kappa)^{\frac{1}{1-\alpha\kappa}} w^{-\sigma^*} (\delta+m)^{\sigma} \left|(\delta+m)^{\sigma} + z^{\sigma-1}\right|^{\frac{\sigma}{1-\sigma}}$$

$$N_u = (\alpha\kappa)^{\frac{1}{1-\alpha\kappa}} w^{-\sigma^*} \left|1 + (\delta+m)^{\sigma} z^{1-\sigma}\right|^{\frac{\sigma}{1-\sigma}}$$

and, therefore, total employment defined as $L = N_s + N_u$ is given by

$$L = N_s + N_u = \chi \left|1 + (\delta+m)^{\sigma}\right|^{\frac{\sigma^*}{\sigma^*-1}} \left|1 + (\delta+m)^{\sigma} z^{1-\sigma}\right|^{\frac{\sigma}{1-\sigma}} \left|1 + (\delta+m)^{\sigma} z^{-\sigma}\right| \tag{12}$$

where $\chi = (\alpha\kappa)^{\frac{1}{1-\alpha\kappa}} \left(\frac{\beta+\alpha\kappa}{1+\beta}\right)^{-\sigma^*} \bar{w}_A^{-\sigma^*}$. It can be proved that, for $z > 1$, total employment is increasing in the wage gap, z. Also, either for z close to 1 or for z very large, total employment is increasing in m (see Appendix). Otherwise, assuming $\lambda > 0$, a sufficient condition for immigration to raise total employment is (see Appendix)

$$m \leq \left(\frac{\sigma^*(z^{\sigma-1}-1)}{\lambda} - 1\right)^{\frac{1}{\sigma}} - \delta \equiv m_z^* \tag{13}$$

where m_z^* is another threshold which depends on σ, σ^* and δ, as m_c^*, and the value of the wage gap, z. The larger is z, the more likely is that condition (13) will be verified. For example, using z equal to 1.6 and the remaining parameter values chosen in the evaluation of m_c^* (with $\sigma = 3$), we get m_z^* equal to -3.1%. Thus, no positive value of m would verify condition (13). However, had we chosen z equal to 2, m_z^* would be equal to 11.2%.

2.3 Bounds on the employment effect of immigration

Combining results from models I and II above, we can establish a sufficient condition for immigration to raise total employment, irrespectively of the degree of competition in the market for skilled labour. If we assume $\lambda > 0$, i.e., the substitution effect dominates the output effect then, combining conditions (11) and (13), total employment is always increasing in the immigration rate if $m_c^* < m < m_z^*$

Note that $m_c^* < m < m_z^*$ if and only if $\frac{\sigma-1}{\sigma^*-1} < z^{\sigma-1}$ Thus, for the values of σ and σ^* that we discussed above, condition (??) is verified for values of z larger than 1.88. Alternatively, for z equal to 1.6 and α and κ equal to .36, condition (??) can be verified when σ is larger than 5.5.

Finally, Figures 4a and 4b plot the geographical distribution of work permits across Spanish provinces, both before and after the legalization procedure in 1991. In 1990, before the special legalization procedure of June 1991, legal immigrants were mainly concentrated in Madrid, Catalonia, and Baleares, Canarias, and two Mediterranean provinces (where tourism represent a relatively high proportion of employment). In turn, the number of Spanish provinces were legal immigrants represented more that 0.5% of employment went from 14 in 1990 to 23 in 1992.

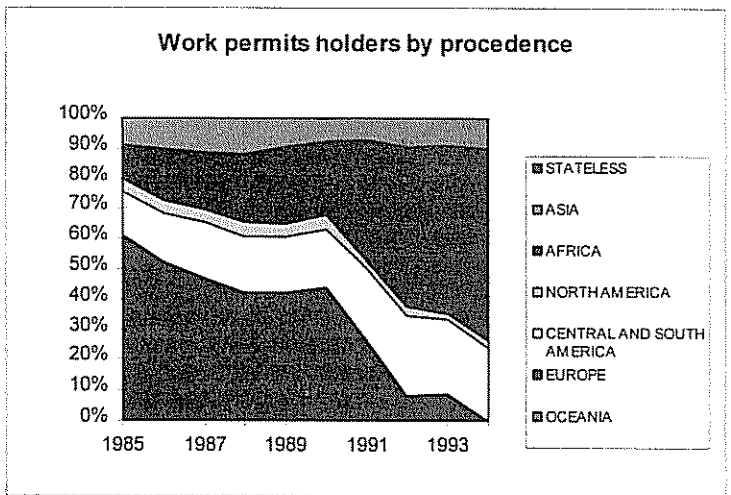


Figure 3

3 Data on legal immigration to Spain

We now turn to the empirical part of the paper. Our data comes from the administrative register of work permits kept at the Spanish Ministry of Employment. Either immigrants wishing to live and work in Spain or the firm hiring them must apply for a work and residence permit. The application forms are coded and registered in a database offering information on some immigrants characteristics (sex, age, level of education, country of origin, province of residence) and some of the characteristics of the job to be performed (self-employment, sector of activity, occupation). Most of the permits are conceded for a period of one year but can be renewed. As mentioned above, in June 1991 a special procedure was implemented to concede work permits to illegal immigrants already living and/or working in Spain under certain conditions.[5] As for January 1992, immigrants from European Union (EU) member countries are not required to hold a permit.

Figures 1 to 4 report on the main characteristics of our database. Figure 1 shows that the number of work permits in Spain was around 50,000 prior to 1991 (which represented less than 0.5% of total employment at the time). In 1991 this number more than doubles, to reach around 1% of total employment. In 1992, the number of work permits decreases again, as the immigrants form EU member countries are no longer required to hold one. In more recent years, the number of work permits more or less has stayed constant at around .7% of total employment.

Figure 2 offers information on the sectoral distribution of work permits. As seen in this graph, most permits are conceded to work in the construction and service sectors, while the proportions of work permits in agriculture and manufacturing have followed opposite trends, decreasing in the latter and increasing in the former.

Regarding the origin of the migrants, we observe in Figure 3 that immi-

[5]These conditions were either one of the following:

1. To prove residence in Spain previous to July 1985, or
2. To prove residence in Spain previous to May 1991 and to satisfy either:
   - To have been a holder of a work permit in the past, or
   - To be working or having worked in Spain, or
   - To have a job offer or to prove to be able to become self-employed.

grants from Africa now represent more than 50% of the immigrants, up from around 10% in 1985. According to this information, it can be concluded that the special legalization process affected mostly to Africans and Latin Americans.

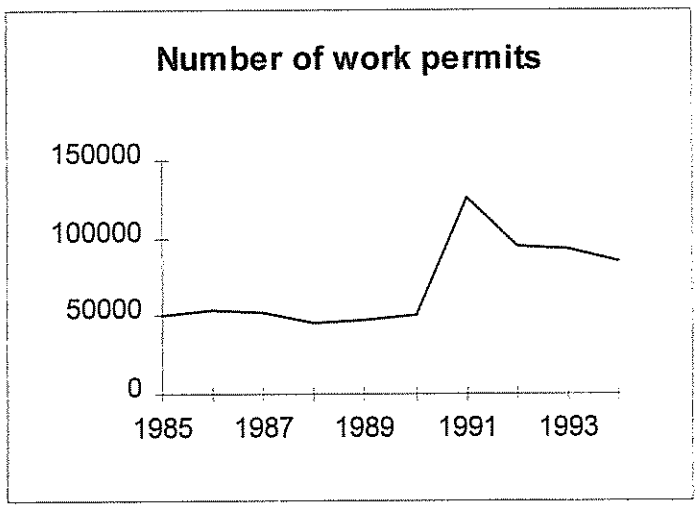


Figure 1

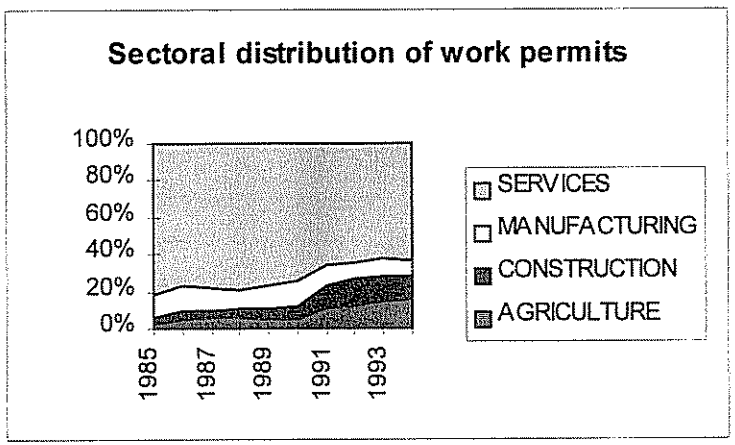


Figure 2