



FACULTEIT ECONOMIE  
EN BEDRIJFSKUNDE

TWEEKERKENSTRAAT 2  
B-9000 GENT  
Tel. : 32 - (0)9 - 264.34.61  
Fax. : 32 - (0)9 - 264.35.92

## WORKING PAPER

# Wage Inequality and Immigration: Western-Europe in the Sixties

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# Wage Inequality and Immigration: Western-Europe in the Sixties

Nathalie Chusseau<sup>\*</sup>, Michel Dumont<sup>#</sup>, Joël Hellier<sup>\*</sup>, Glenn Rayp<sup>‡</sup> and Peter Willemé<sup>†</sup>

## Abstract

*We analyse the immigration flows to Western Europe in the sixties. We develop a theoretical model tailored to account for some of the key features of this period, i.e., trade in manufacturing that essentially involved advanced countries, the growing administration of labour markets in Western Europe and the huge inflow of low skilled immigrants from the South (less advanced countries) into Western Europe. Two propositions are subsequently derived from this model. First, the immigration flow increases with the skill premium in the country of destination. Second, for a given skill premium, immigration is an increasing function of both the host country's working population and its relative endowment in skilled labour. The first proposition reflects a demand side effect that diverges from the result of the traditional self-selecting approach to migration, i.e., that a higher skill premium in the country of destination tends to discourage potential low-skilled migrants. Estimations implemented for a panel of four European countries (Belgium, France, Sweden and West Germany) over the period 1960-1975 corroborate to a large extent our propositions. We also find that none of the supply determinants are individually significant at equilibrium. These results confirm the hypothesis that immigration to Western Europe in the sixties was primarily demand driven.*

**JEL classification:** F22, J31

**Keywords:** Immigration, International Division of Labour, Wage Inequality.

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<sup>\*</sup> EQUIPPE, Universities of Lille, and IFRESI-CNRS, France.

<sup>#</sup> Delft University of Technology, The Netherlands and University of Antwerp, Belgium.

<sup>†</sup> Faculty of Applied Economics, University of Antwerp, and Federal Planning Bureau, Belgium.

<sup>‡</sup> Faculty of Economics and Business Administration and SHERPPA, Ghent University, Belgium.

# 1. Introduction

From the mid-1950s to the mid-1970s, trade in manufacturing primarily took place among industrialised countries ('the North'). The less advanced countries ('the South') were specialised in the exports of raw materials and only accounted for a minor share of the Northern countries' trade (Krugman 1995; United Nations 1997). However, this picture of a minor contribution of the South at the early stage of the post war international division of labour (IDL) fails to include the substantial immigration flows from the South that occurred over this period, at least in Western Europe. In the majority of West European countries, immigration accounted for between 1/4 and 1/3 of the increase in total population between 1950 and 1972<sup>1</sup>.

In this paper, we set out to establish the determinants of this vast labour immigration that constituted a key component in North-South relations in the early stages of IDL.

In both theoretical and empirical approaches, migration flows have essentially been analysed within a general push-pull framework<sup>2</sup>. In the theoretical literature since Sjaastad (1962), the decision to migrate is taken by an individual considering the cost of migration, the difference in earnings between the home and the host country or region, and the probability of finding a job (Harris and Todaro 1970). Several factors that impact on these three determinants have been introduced in the subsequent analyses: cultural and geographical proximity<sup>3</sup>, presence in the host country of an established network of home country immigrants<sup>4</sup>, population size, etc. Stark (1991) extended the Harris and Todaro model by considering emigration as a collective decision by the family under uncertainty. The theory has also explored the skill structure of immigration. Borjas (1987) established that the skill composition of immigration depends on wage inequality in the host country because of self-selecting immigration. The higher the wage inequality, the higher the skill level of immigrants. As a matter of fact, a high skill premium (wage inequality) normally results from low pay of low-skilled workers and high pay for high-skilled workers, which tends to discourage the former and lead the latter to migrate.

Within these push-pull approaches, the supply side of migration is typically emphasized, whereas the demand side is somewhat overlooked (Borjas, 1999b; Mayda, 2005; and Bianchi 2006). However, Mayda (2005) finds convincing indications of the importance of demand side determinants of immigration for fourteen OECD countries between 1980 and 1995. In a number of recent works (Scheve and Slaughter, 2001; O'Rourke and Sinnott, 2004; Hanson et al., 2005a and 2005b), the demand for migrants is derived from a factor endowment framework in which host country individuals (voters) support the immigration policy fostering the skill structure that enhances their relative position (e.g., high-skilled natives support the immigration of low-skilled workers). This link between

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<sup>1</sup> McCombie and Thirlwall (1994), Table 2.3 p.162. See also Zimmerman (1996) for the case of West Germany.

<sup>2</sup> See the survey articles of Ghatak et al (1996), Bauer and Zimmerman (1998, 1999) and Borjas (1999a).

<sup>3</sup> See, e.g., Mayda (2005) and Pedersen, Pytlikova and Smith (2004).

immigration policy and the natives' preferences may crucially hinge on political and institutional factors (Bianchi 2006). Finally, the key role of the demand for low skilled labour in the migration flows to Western Europe in the sixties has been emphasized by Zimmermann (1996).

In the sixties, the labour markets became increasingly administered in West European countries. Wages and labour conditions were subject to bargaining and state interventions, and were thereby institutionally determined to a large extent. In addition, a number of European countries pursued active immigration strategies to obtain the low-skilled workers required for growth. These were implemented by both the firms and the states. The firms directly prospected in less developed countries with a view to importing the low-skilled workers they needed. The public authorities chose to welcome the immigrants selected by the firms, and set bilateral agreements with countries from the South for the provision of immigrants. Hence, our main hypothesis is that in the 1960s immigration and institutional wage setting determined the adjustment process within the European countries' labour markets.

We develop an extended Heckscher-Ohlin-Samuelson (HOS) model tailored to account for the main characteristics of the countries' specialisation in trade and for the adjustment process within the labour markets at the early stage of the post-war division of labour. Within this framework, the real wage of low-skilled labour is institutionally determined, so that migration inflow of low-skilled workers is the adjustment variable on the labour market. In fact, when firms are allowed to import low-skilled workers from abroad, the institutionally determined minimum wage drives their demand for low-skilled labour. The lower the minimum wage, the higher the demand for, and the immigration of, low-skilled workers. We thus show that the immigration of low-skilled labour increases with the skill premium, and thus with wage inequality. This is due (i) to the substitution of low-skilled for high-skilled labour, and (ii) to the host country's international specialisation that is distorted towards low-skilled intensive goods when the skill premium rises. This result critically differs from what would be expected in a self-selection migration framework where migration of low-skilled workers is negatively linked to inequality in the host country (Borjas 1987). We also show that migration inflows of low-skilled workers positively depend on the size of the working population and the initial relative endowment of high-skilled labour inside the host country. Subsequently, these predictions are empirically tested for four European countries (Belgium, France, Sweden and West-Germany). The estimations corroborate the theoretical findings, suggesting that migration to these countries in the sixties was mainly demand-sided.

Our contribution to the literature is the following. Firstly, we find additional evidence in support of the relevance of the demand side to understanding international migration. Secondly, we point to the importance of considering the institutional characteristics of the labour market when modelling immigration demand. Thirdly, we integrate recent methodological progress into the estimation of static and dynamic panel data models in order to obtain more reliable estimations.

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<sup>4</sup> Massey et al. (1993), Carrington et al. (1996), Bauer and Zimmerman (1999), Pedersen, Pytlikova and Smith (2004).

The paper is organised as follows. In Section 2, we build a theoretical model and we derive the two propositions that will be tested. In Section 3, we discuss the empirical specification of the model and define the tests of the two propositions. In Section 4, we report the estimation of the immigration model for four Western-European countries and discuss the main results. Finally, we formulate our conclusions in Section 5.

## 2. The model

### 2.1. General framework

The theoretical model aims at representing the main characteristics of the international division of labour among the advanced countries (the North) in the sixties, considering the following stylized facts:

- Over this period, the North accounted for 90% of manufactured exports and 80% of manufactured imports.
- The wages of low-skilled workers were mainly determined by institutional rules (minimum wages, bargaining).
- North-Western Europe received a large number of low-skilled immigrants from the South.

Like Davis (1998a and b), we use a modified HOS framework. High-skilled ( $H$ ) and low-skilled ( $L$ ) labour are the two factors of production. Minimum wages and wage bargaining determine the skill premium,  $\bar{w}_i \equiv w_{Hi} / w_{Li}$  for country  $i$ . However, our model differs from Davis' approach on three major points:

- (i) there are  $n$  countries;
- (ii) all countries are characterised by a rigid skill premium and no factor price equalisation occurs;
- (iii) equilibrium is achieved through immigration that adjusts supply to the demand for low-skilled workers, given the institutionally determined skill premium.

The  $n$  countries located in the North possess different initial endowments of both factors  $L$  and  $H$  that are used to produce two goods, respectively labelled  $l$  ( $L$ -intensive) and  $h$  ( $H$ -intensive). Given that we consider the early post-war IDL period, it is assumed (i) that high-skilled labour is internationally immobile, in contrast with low-skilled labour, (ii) that the South does not participate in the trading of manufactured goods, but (iii) that it provides the low-skilled labour needed in the North.

In each country (of the North), the skill premium is institutionally determined. For the sake of simplicity, we assume that there are no two countries with the same skill premium. Hence, the demand for low-skilled labour is endogenous and met by migration inflows if it exceeds the national endowment of low-skilled labour. We show that each of the  $n$  countries belong to one of the following three groups:

- egalitarian countries (labelled  $E$ ) where the skill premium is low and which produce only good  $h$ ;
- inequality-oriented countries ( $I$ ) where the skill premium is high and which are fully specialised in good  $l$ ,
- one intermediary country  $M$  (for Medium) that produces both goods.

### *The markets for goods $l$ and $h$*

We assume that the markets for goods are in perfect competition. In all countries, households maximise the same utility function  $U = (X_l)^\beta (X_h)^{1-\beta}$  that depends on the consumption of goods  $l(X_l)$  and  $h(X_h)$ , subject to the income constraint. Consequently, the related demand functions in each country and at the World level are such that:

$$\frac{p_l X_l}{p_h X_h} = b \quad (1)$$

with  $p_j$  being the price of good  $j = l, h$ , and  $b \equiv \beta/(1-\beta)$ .

The technologies, identical in all countries  $i$  ( $i = 1 \dots n$ ), are Cobb-Douglas in both industries  $l$  and  $h$ :

$$Y_{i,l} = A_l L_{i,l}^{\alpha_l} H_{i,l}^{1-\alpha_l} \quad Y_{i,h} = A_h L_{i,h}^{\alpha_h} H_{i,h}^{1-\alpha_h}$$

with  $\alpha_l > \alpha_h$  since  $l$  is  $L$ -intensive and  $h$  is  $H$ -intensive.

In each country  $i$  and each industry  $j$  ( $j = l, h$ ), the firm's relative factor demand stems from the equality of marginal productivity and the factor reward. This determines the skill intensity as a function of the exogenous skill premium  $\bar{w}_i$ :

$$\frac{L_{i,j}}{H_{i,j}} = \frac{\alpha_j}{1-\alpha_j} \bar{w}_i \quad (2)$$

From (2), the production function may be written in terms of the skill premium and the input of high-skilled labour:

$$Y_{i,j} = A_j \left( \frac{\alpha_j}{1-\alpha_j} \bar{w}_i \right)^{\alpha_j} H_{i,j} \quad (3)$$

### *Labour markets and migration*

The two labour markets behave differently. In the low-skilled labour market, the wage is determined, either by a minimum wage policy (Davis, 1998a and b), or through bargaining between employers and employees. In contrast, the high-skilled labour market is assumed to be competitive. As a result, we assume that an institutionally given skill premium ( $w_i = \bar{w}_i$  for country  $i$ ) combines with full employment on the high-skilled labour market ( $H_i = \bar{H}_i$  in country  $i$ ) in all countries.

In each country  $i$ , the exogenous skill premium and skilled labour endowment determine the country's specialisation, and thereby the demand for low-skilled labour ( $L_i$ ). This link between wage policy and specialisation is similar to that in Agell and Lommerud (1993) who show how egalitarian pay compression (part of the 'Scandinavian Model') fostered the transition from traditional industrial sectors to modern sectors.

According to these assumptions, the different countries are defined (i) by their preference towards inequality measured by their skill premium  $\bar{w}_i$ , and (ii) by their relative skill endowment, represented by their endowment ratio ex ante migration  $\bar{H}_i / \bar{L}_i$ . Inequality-oriented countries demonstrate a high skill premium, because their governments do not set generous minimum wages and because their trade unions are not powerful enough to impose high wages for low-skilled workers. Education-oriented countries display a high relative skill endowment. If the relative skill endowment  $\bar{H}_i / \bar{L}_i$  is not equal to the relative demand for skill derived from the skill premium, then the market for less skilled labour is not balanced. Our hypothesis is that, in this very likely case, equilibrium is attained either through immigration or through unemployment.

When the demand for low-skilled labour  $L_i$  is higher than the initial domestic endowment  $\bar{L}_i$ , there is a net demand for immigration of low-skilled labour  $M_i$  to adjust supply to demand:

$$L_i > \bar{L}_i \Rightarrow M_i = L_i - \bar{L}_i$$

When the demand for low-skilled labour is lower than its initial domestic endowment, some low-skilled workers will be unemployed and some of them may migrate to the Northern countries where demand for low-skilled labour outstrips domestic supply. In this case, unemployment  $U_i$  may be expressed as follows:

$$L_i < \bar{L}_i \Rightarrow U_i = \bar{L}_i - L_i - E_i$$

with  $E_i$  being emigration of low-skilled workers from country  $i$ .

### *The three types of countries*

In the most general case, the model determines one medium country  $M$ , with skill premium  $\bar{w}_M$ , that divides the  $n$  countries between the set of egalitarian countries ( $E$ ) and the set of non-egalitarian countries ( $I$ ), with skill premiums respectively lower and higher than  $\bar{w}_M$ .

This division of countries into three groups ( $E$ ,  $M$  and  $I$ ) stems directly from the assumption of different skill premiums. If two countries produce both goods  $l$  and  $h$ , they must have equal skill premiums (Davis, 1998a and b)<sup>5</sup>. As countries have different skill premiums, the model defines a general equilibrium with only one country ( $M$ ) producing both goods. The non-egalitarian countries (belonging to set  $I$ ) with a higher skill premium than  $M$  fully specialise in good  $l$  ( $L$ -intensive). The egalitarian countries (set  $E$ ) where the skill premium is lower than in  $M$  fully specialise in good  $h$ . In the traditional HOS model, the Stolper-Samuelson theorem stipulates that an increase in the relative price of a good causes an increase in the relative price of the factor that is used intensively (relative to other goods) to produce this good. However, given that in our model the relative factor prices (the skill premiums) of the different countries are exogenous and the markets for goods are perfectly competitive, an increase (decrease) in the skill premium above (below) that of the medium country causes an increase (decrease) in the relative price of good  $h$ , and thus a total specialisation of the country in good  $l$  (good  $h$ ), the law of one price being achieved through exchange rates adjustments.

Note that the model can exhibit three other configurations that are special cases in this general framework. When the country with the highest skill premium (the least egalitarian) is very large (i.e., it has a very high share of the total endowment in  $H$  of the North), it may produce both goods, all other countries producing good  $h$ . In this case, there is no country in group  $I$  (i.e.  $\sum_{i \in I} \bar{H}_i = 0$ ). The opposite case (i.e.,  $\sum_{i \in E} \bar{H}_i = 0$ ) corresponds to the most egalitarian country being very large. Finally, what may happen is that no country produces both goods, the  $n$  countries belonging to one of two groups; countries of type  $I$  then specialise in  $l$  and countries of type  $E$  in  $h$ .

### *2.2. General equilibrium and the demand for immigrants*

Table 1 summarizes the general equilibrium of the model defined above by assuming that the demand for immigrants is not constrained. Equations (4), (5) and (6) determine the employment of low-skilled labour for a country of group  $E$ ,  $I$ , and  $M$  respectively. Equations (4) and (5) follow directly from (2), and (6) is obtained by equalising supply of and demand for goods  $l$  and  $h$  at the World (North) level<sup>6</sup>.

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<sup>5</sup> This may also be easily established from the model developed here (see equation 11 in Table 1)

<sup>6</sup> The mathematical determination of these results is available from the authors upon request.



Table 1

The general equilibrium of the model

*Low-skilled labour*

$$i \in E \Rightarrow L_i = \frac{\alpha_h}{1 - \alpha_h} \bar{w}_i \bar{H}_i \quad (4)$$

$$i \in I \Rightarrow L_i = \frac{\alpha_l}{1 - \alpha_l} \bar{w}_i \bar{H}_i \quad (5)$$

$$L_M = \frac{(\alpha_l - \alpha_h) \bar{w}_M}{b(1 - \alpha_l) + 1 - \alpha_h} \left( \frac{b\alpha_l + \alpha_h}{\alpha_l - \alpha_h} \bar{H}_M + \frac{b \sum_{i \in E} (\bar{w}_i)^{\alpha_h} \bar{H}_i}{(1 - \alpha_h) \bar{w}_M^{\alpha_h}} - \frac{\sum_{i \in I} (\bar{w}_i)^{\alpha_l} \bar{H}_i}{(1 - \alpha_l) \bar{w}_M^{\alpha_l}} \right) \quad (6)$$

*Immigration ( $L_i > \bar{L}_i$ )*

$$i \in E \Rightarrow M_i = \frac{\alpha_h}{1 - \alpha_h} \bar{w}_i \bar{H}_i - \bar{L}_i \quad (7)$$

$$i \in I \Rightarrow M_i = \frac{\alpha_l}{1 - \alpha_l} \bar{w}_i \bar{H}_i - \bar{L}_i \quad (8)$$

$$M_M = \frac{(\alpha_l - \alpha_h) \bar{w}_M}{b(1 - \alpha_l) + 1 - \alpha_h} \left( \frac{b\alpha_l + \alpha_h}{\alpha_l - \alpha_h} \bar{H}_M + \frac{b \sum_{i \in E} (\bar{w}_i)^{\alpha_h} \bar{H}_i}{(1 - \alpha_h) \bar{w}_M^{\alpha_h}} - \frac{\sum_{i \in I} (\bar{w}_i)^{\alpha_l} \bar{H}_i}{(1 - \alpha_l) \bar{w}_M^{\alpha_l}} \right) - \bar{L}_M \quad (9)$$

*Unemployment ( $L_i < \bar{L}_i$ )*

$$U_i = \bar{L}_i - L_i - E_i \geq 0 \quad (10)$$

*Terms of trade*

$$\tau \equiv p_h / p_l = \frac{A_l (\alpha_l)^{\alpha_l} (1 - \alpha_l)^{1 - \alpha_l}}{A_h (\alpha_h)^{\alpha_h} (1 - \alpha_h)^{1 - \alpha_h}} \bar{w}_M^{\alpha_l - \alpha_h} \quad (11)$$

*Production*

$$i \in E \Rightarrow Y_{i,h} = A_h \left( \frac{\alpha_h}{1 - \alpha_h} \bar{w}_i \right)^{\alpha_h} \bar{H}_i \quad (12)$$

$$i \in I \Rightarrow Y_{i,l} = A_l \left( \frac{\alpha_l}{1 - \alpha_l} \bar{w}_i \right)^{\alpha_l} \bar{H}_i \quad (13)$$

$$Y_{M,l} = A_l \alpha_l^{\alpha_l} (1 - \alpha_l)^{1 - \alpha_l} \frac{(1 - \alpha_h) L_M - \alpha_h \bar{w}_M \bar{H}_M}{\alpha_l - \alpha_h} \bar{w}_M^{\alpha_l - 1} \quad (14)$$

$$Y_{M,h} = A_h \alpha_h^{\alpha_h} (1 - \alpha_h)^{1 - \alpha_h} \frac{\alpha_l \bar{w}_M \bar{H}_M - (1 - \alpha_l) L_M}{\alpha_l - \alpha_h} \bar{w}_M^{\alpha_h - 1} \quad (15)$$

*Note:* subscript  $i$  denotes country  $i$ .

The following two propositions can be derived from the general equilibrium of the model.

**Proposition 1:** *Whatever the group to which a country belongs ( $E$ ,  $I$  or  $M$ ), the demand for immigrants is an increasing function of its skill premium.*

*Proof:* deriving (7), (8) and (9) with respect to the country's skill premium  $\bar{w}_i$ .

When comparing several countries, the countries with a high skill premium experience *ceteris paribus* a higher inflow of migrants than the countries with a low skill premium. This result emphasises the fact that, the higher the skill premium, the higher the demand for low-skilled labour, and thereby immigration.

Proposition 1 reflects a demand side effect that diverges from the effect put forward by the traditional supply side approach to migration, i.e., that a higher skill premium in the destination country tends to discourage potential low-skilled migrants because it lowers the wage return to migration (e.g. Borjas, 1987).

**Proposition 2:** *In egalitarian and non egalitarian countries<sup>7</sup>, the demand for immigrants is an increasing function of both the working population  $\bar{H}_i + \bar{L}_i$  and the relative initial (domestic) endowment of high-skilled workers  $\bar{H}_i / \bar{L}_i$ .*

*Proof:* Let us consider country  $i$  that has migration inflows  $M_i > 0$  and is completely specialised in one of the two industries,  $l$  or  $h$ . Relations (7) and (8) become after rearranging:

$$M_i = \frac{\alpha}{1 - \alpha} \left( (\bar{w}_i + 1) \frac{\bar{h}_i}{\bar{h}_i + 1} - 1 \right) \bar{N}_i, \text{ with } \bar{h}_i = \bar{H}_i / \bar{L}_i, \bar{N}_i = \bar{H}_i + \bar{L}_i, \text{ and } \alpha = \alpha_h, \alpha_l \text{ for } i \in E, I.$$

$M_i$  is thus an increasing function of both  $\bar{h}_i = \bar{H}_i / \bar{L}_i$  and  $\bar{N}_i = \bar{H}_i + \bar{L}_i$ .

Note that if the rise in  $\bar{H}_i / \bar{L}_i$  combines an increase (or no change) in  $\bar{H}_i$  and a decrease (or no change) in  $\bar{L}_i$ , Proposition 2 is equally valid for the medium country  $M$  (because of Equation 9).

Finally, Propositions 1 and 2 are established *ceteris paribus*. Consequently, when testing for the first, one must control for the second and vice versa.

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<sup>7</sup> i.e., the countries in sets  $E$  and  $I$ .

### 3. The empirical model specification

Most of the existing theories of migration can be integrated into a general push-pull model. Push factors affect the supply side of migration. Pull factors reflect migration in response to changes in the demand side, i.e., in the region of destination. Economic variables such as unemployment and wages, and demographic variables such as the age distribution of the working population can be considered as determining the supply side, in that it influences the probability that workers from a given region of origin migrate to a given region of destination. Changes in immigration policy, e.g., restrictions, can be considered as pull factors.

Karemera et al. (2000) indicate that a system of demand and supply relations can be modelled in reduced form by a gravity model of migration between two countries. We follow their approach in the specification of the empirical model of emigration that we use to test the two propositions stated in the previous section. Thus, the *equilibrium* migration flow can be expressed as:

$$M_{o,d,t}^* = S_{o,d,t}^{\nu} D_{d,t}^{\theta} R_{o,d,t}^{\gamma} \quad (16)$$

where  $M_{o,d,t}^*$  is the number of migrants from the country of origin  $o$  to the country of destination  $d$  at time  $t$ ,  $S_{o,d,t}$  represents the supply-side determinants of migration from country  $o$  to country  $d$  at time  $t$ ,  $D_{d,t}$  the demand side determinants of migration to country  $d$  and  $R_{o,d,t}$  the factors that determine the distance and migration costs between countries  $o$  and  $d$ .

We assume that  $S_{o,d,t}$  can be written:

$$S_{o,d,t} = \eta_o e_{o,t}^{\eta_1} e_{d,t}^{\eta_2} w_{o,t}^{\eta_3} w_{d,t}^{\eta_4} \bar{N}_{o,t}^{\eta_5} \quad (17)$$

with  $e_{o,t}$  ( $e_{d,t}$ ) the employment rate in the country of origin (destination),  $w_{o,t}$  ( $w_{d,t}$ ) the per capita income in the country of origin (destination) and  $\bar{N}_{o,t}$  the working population in country  $o$  prior to migration. Bauer and Zimmermann (1999) point out that a statistically significant positive effect of income in the region of destination and a negative effect of the wage or income level in the home region can be found in almost all studies. There are seemingly more ambiguous findings as regards employment rates. Certain studies even suggest a negative correlation between the employment rate in the region of destination and the migration flow (Fields 1979; Pissarides and McMaster, 1990; and Puhani, 2001).

From the determinants of the demand for immigration identified in Section 2, we assume that  $D_{d,t}$  can be expressed in simplified form as:

$$D_{d,t} = \mu_d \left( \frac{w_{H,d,t}}{w_{L,d,t}} \right)^{\mu_1} \left( \frac{\bar{H}_{d,t}}{\bar{L}_{d,t}} \right)^{\mu_2} (\bar{N}_{d,t})^{\mu_3} \quad (18)$$

with  $\frac{w_{H,d,t}}{w_{L,d,t}}$ ,  $\frac{\bar{H}_{d,t}}{\bar{L}_{d,t}}$  and  $\bar{N}_{d,t}$  being respectively the skill premium, the (prior to migration) relative endowment of high skilled labour and the (prior to migration) working population in the country of destination.

In addition, persistence of the migrations flows is assumed and these are supposed not to adjust immediately to the equilibrium level determined by (16). Consequently, we assume that migration  $M_{o,d,t}$  between the country of origin  $o$  and the country of destination  $d$  at time  $t$  can be represented by a first-order autoregressive-distributed lag model:

$$\ln M_{o,d,t} = \alpha_0 + \alpha_1 \ln M_{o,d,t-1} + \beta_1 \ln M_{o,d,t}^* + \beta_2 \ln M_{o,d,t-1}^* \quad (19)$$

where  $M_{o,d,t}^*$  denotes the equilibrium migration between  $o$  and  $d$  at time  $t$ .

Successively adding to and subtracting from the right hand side of (19)  $\beta_1 \ln M_{o,d,t-1}^*$ , we obtain:

$$\ln M_{o,d,t} = \alpha_0 + \alpha_1 \ln M_{o,d,t-1} + \beta_1 \Delta \ln M_{o,d,t}^* + (\beta_1 + \beta_2) \ln M_{o,d,t-1}^* \quad (20)$$

Inserting  $S_{o,d,t}$  and  $D_{d,t}$  as defined by (16) and (17) into equation (20), we obtain after rearranging:

$$\begin{aligned} \ln M_{o,d,t} = & \alpha_0 + \alpha_1 \ln M_{o,d,t-1} \\ & + \nu \beta_1 \left( \eta_1 \Delta \ln e_{o,t} + \eta_2 \Delta \ln e_{d,t} + \eta_3 \Delta \ln w_{o,t} + \eta_4 \Delta \ln w_{d,t} + \eta_5 \Delta \ln \bar{N}_{o,t} \right) \\ & + \theta \beta_1 \left( \mu_1 \Delta \ln \frac{w_{H,d,t}}{w_{L,d,t}} + \mu_2 \Delta \ln \frac{\bar{H}_{d,t}}{\bar{L}_{d,t}} + \mu_3 \Delta \ln \bar{N}_{d,t} \right) \\ & + \nu (\beta_1 + \beta_2) \left( \ln \eta_o + \eta_1 \ln e_{o,t-1} + \eta_2 \ln e_{d,t-1} + \eta_3 \ln w_{o,t-1} + \eta_4 \ln w_{d,t-1} + \eta_5 \ln \bar{N}_{o,t-1} \right) \\ & + \theta (\beta_1 + \beta_2) \left( \ln \mu_d + \mu_1 \ln \frac{w_{H,d,t-1}}{w_{L,d,t-1}} + \mu_2 \ln \frac{\bar{H}_{d,t-1}}{\bar{L}_{d,t-1}} + \mu_3 \ln \bar{N}_{d,t-1} \right) \\ & + \gamma \beta_1 \ln R_{o,d,t} + \gamma \beta_2 \ln R_{o,d,t-1} \end{aligned} \quad (21)$$

Equation (21) is a three way panel model with a country of origin, a country of destination and a time dimension, that can be estimated by adding an error term.

Regarding the econometric specification of a three-way panel model, Mátyás (1997), Egger (2002), Egger and Pfaffermayer (2003), Baltagi, Egger and Pfaffermayer (2003), and Cheng and Wall (2005) point to the risk of an omitted variable inconsistency if heterogeneity is not as much as possible controlled for. Our model does not explicitly include two dimensions, i.e., the time independent country of origin (destination) effect and the time independent country of origin- country of destination bilateral effects. The bilateral fixed effects can control, *inter alia*, for cultural, linguistic and political links that may influence the probability to migrate. Hence, concerning the error term  $v_{o,d,t}$  that is added to (21), we assume:

$$v_{o,d,t} = \alpha_t + \alpha_{o,d} + \varepsilon_{o,d,t} \quad t = 1, \dots, T; \quad o = 1, \dots, O; \quad d = 1, \dots, D$$

with  $\varepsilon_{o,d,t}$  i.i.d. distributed, and  $O$ ,  $D$  and  $T$  being respectively the number of countries of origin, the number of countries of destination, and the number of time periods.

Egger and Pfaffermayer (2003) indicate that a generalised three-way panel model (including the main effects of time, countries of origin and countries of destination, and the bilateral country of origin- country of destination fixed effects) is identical to a two-way model with time and bilateral effects only. Our final specification then becomes:

$$\begin{aligned} \ln M_{o,d,t} = & a_0 + a_1 \ln M_{o,d,t-1} + s_1 \Delta \ln e_{o,t} + s_2 \Delta \ln e_{d,t} + s_3 \Delta \ln w_{o,t} + s_4 \Delta \ln w_{d,t} + s_5 \Delta \ln \bar{N}_{o,t} \\ & + d_1 \Delta \ln \frac{w_{H,d,t}}{w_{L,d,t}} + d_2 \Delta \ln \frac{\bar{H}_{d,t}}{\bar{L}_{d,t}} + d_3 \Delta \ln \bar{N}_{d,t} \\ & + s_6 \ln e_{o,t-1} + s_7 \ln e_{d,t-1} + s_8 \ln w_{o,t-1} + s_9 \ln w_{d,t-1} + s_{10} \ln \bar{N}_{o,t} + d_4 \ln \frac{w_{H,d,t-1}}{w_{L,d,t-1}} \\ & + d_5 \ln \frac{\bar{H}_{d,t-1}}{\bar{L}_{d,t-1}} + d_6 \ln \bar{N}_{d,t} + m_1 \ln R_{o,d,t} + m_2 \ln R_{o,d,t-1} + \alpha_t + \alpha_{o,d} + \varepsilon_{o,d,t} \end{aligned} \quad (22)$$

Proposition 1 states that, *ceteris paribus*, immigration increases with the skill premium in the country of destination and Proposition 2 that, *ceteris paribus*, immigration increases with the size of the working population and with the relative endowment of high-skilled labour. Since Proposition 1 and 2 describe an equilibrium property of immigration, these propositions can be tested by estimating (22) and verifying:  $\hat{d}_4 > 0$ ,  $\hat{d}_5 > 0$ ,  $\hat{d}_6 > 0$ .

## 4. Data and model estimation

### 4.1. The data

We gathered data on immigration in West-European and Scandinavian countries for the period 1960-1975. We obtained the highest common denominator of countries of origin for four EU countries: Belgium, France, West-Germany and Sweden. These four countries have actually experienced a high flow of immigration over the period considered, as shown in Table 2. In addition, these countries were characterised by negligible unemployment over the relevant period (between 1.5 and 2.5%).

Table 2  
Net Immigration as a percentage of the increase in total population and as a share of total labour force

	Immigration in percentage of population increase 1950-72	Share of total labour force in 1973 (%)
Belgium	25	7
France	33	11
Germany	47	11
Sweden	30	n.a.

Source: McCombie and Thirlwall (1994), Table 2.3 p.162.

The seven countries of origin are Greece, Italy, Poland, Portugal, Spain, Turkey and Yugoslavia. We obtained immigration data for Belgium and Sweden from the national statistical offices (NIS and Statistics Sweden respectively). The data for France was kindly provided by the French *Office des Migrations Internationales* and for West Germany by Michael Fertig and Georgios Tassoukis. In all, immigration data was obtained for 28 country pairs spanning a maximum of 15 years. The dependent variable is the inflow of immigrants. Given the problems of net migration data (e.g. Rogers, 1990), gross migration is used to determine the dependent variable.

GDP per capita at 1996 constant prices is taken from the Penn World Table Version 6.1 (Heston et al., 2002) and used for the income in the country of destination and the country of origin in year  $t$ ,  $w_{d,t}$  and  $w_{o,t}$  respectively. In the period being considered, Italy was rather similar to the destination countries in GDP per capita terms. However, Italy was (and still is) characterised by substantial regional imbalances between rich northern regions and a poor southern part, from which most of the immigrants in North-West Europe originated<sup>8</sup>.

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<sup>8</sup> As Italy was a member-state of the EEC, Italian citizens benefited in principle from the free mobility of labour within the EEC. However, formally this was only achieved towards the end of our sample period, and the practical obstacles to the free mobility of labour remained considerable.

We use unemployment rates  $u$  rather than employment rates  $e$ , for which no sufficient data was available<sup>9</sup>.

The skill premium in the countries of destination was proxied by the ratio of the wage of white collar workers to the wage of blue collar workers, taken from the Industrial Statistics Database (UNIDO, 1994) for Belgium, West-Germany and Sweden and from the *Series Longues sur les Salaires* (INSEE, 2000) for France. Relative labour endowment was proxied by the ratio of white collar to blue collar workers, taken from the same sources and lagged one year in order to ensure that it precedes the migration inflow variable. As regards the labour force in the countries of origin and destination, we used data on the total labour force from the World Development Indicators.

Migration costs  $R_{o,d,t}$  consist of many determinants and are difficult to specify exhaustively. In so far as it refers to pair wise time invariant destination-origin country determinants (e.g., distance, common language, common colonial past, etc.), it will be captured by the bilateral fixed effect component of the error term. In accordance with the network approach to immigration, we approximate the time varying determinants of migration costs by the stock of immigrants in the previous period ( $t-1$ ),

$MST_{o,d,t-1}$ , divided by the population of the destination country  $d$ ,  $pop_{d,t-1}$ , i.e.  $\frac{MST_{o,d,t-1}}{pop_{d,t-1}}$ . This

approach considers existing network ties, due to previous migration between a country of origin and a country of destination, as a factor that can lower the costs of migration and thus boost the probability of migration from the first to the second region (Bauer and Zimmermann, 1999). The stock of immigrants in the country of destination  $d$  from country  $o$  can also be considered as a proxy for the revealed cost of immigration from  $o$  to  $d$ . The stock of immigrants at time  $t$  has been computed as in Hatton (1995):

$$MST_{o,d,t} = \delta_{o,d,t} MST_{o,d,t-1} + M_{o,d,t-1} \quad (23)$$

where  $1 - \delta_{o,d,t}$  is the rate at which the stock diminishes due to mortality and remigration.  $1 - \delta_{o,d,t}$  is calculated using the number of migrants of origin country  $o$  leaving country of destination  $d$ <sup>10</sup>.

Finally, in certain studies, the demographic characteristics of the countries of origin are considered to account for possible heterogeneity among individuals in the different countries. We have therefore estimated two specifications of equation (22), namely a restricted model and an extended model, the

<sup>9</sup> The data on unemployment rates was kindly provided by Michael Fertig as used in Fertig (2001).

<sup>10</sup> For France we have no data on emigrants but we used the average  $\delta$  of the other three countries to compute the stock of migrants.

second including three demographic variables taken from the World Development Indicators in levels and in first differences:

- (i) The share of the population younger than 14 years of age as a proxy of the share of young people in the population of the countries of origin ( $pop14_{o,t}$ ), because young individuals are more likely to migrate than older people (Bauer and Zimmermann, 1999; Fertig and Schmidt, 2000).
- (ii) The growth of the population in the countries of origin ( $gpop_{o,t}$ ). Rotte and Vogler (2000) argue that higher population growth in the countries of origin implies more potential emigrants. Apart from a direct effect of population growth they perceive an indirect effect through the labour market. An increase in labour supply can lower wages or raise unemployment and thereby increase the incentive to emigrate.
- (iii) The share of total population living in urban areas ( $purb_{o,t}$ ). Rotte and Vogler (2000) consider that urban population is more internationally mobile than rural population and therefore assume a positive correlation between the share of urban population and emigration.

Table 3 summarises the definition and the sources of the different variables used in the estimations.

Table 3  
The variables used for the estimations

*Estimated equation:*

$$\begin{aligned} \ln M_{o,d,t} = & a_0 + a_1 \ln M_{o,d,t-1} \\ & + s_1 \Delta \ln u_{o,t} + s_2 \Delta \ln u_{d,t} + s_3 \Delta \ln w_{o,t} + s_4 \Delta \ln w_{d,t} + s_5 \Delta \ln \bar{N}_{o,t} + s_6 \ln u_{o,t-1} + s_7 \ln u_{d,t-1} + s_8 \ln w_{o,t-1} + s_9 \ln w_{d,t-1} + s_{10} \ln \bar{N}_{o,t} \\ & + d_1 \Delta \ln \frac{w_{H,d,t}}{w_{L,d,t}} + d_2 \Delta \ln \frac{\bar{H}_{d,t}}{\bar{L}_{d,t}} + d_3 \Delta \ln \bar{N}_{d,t} + d_4 \ln \frac{w_{H,d,t-1}}{w_{L,d,t-1}} + d_5 \ln \frac{\bar{H}_{d,t-1}}{\bar{L}_{d,t-1}} + d_6 \ln \bar{N}_{d,t} \\ & + p_1 \Delta \ln pop14_{o,t} + p_2 \Delta \ln purb_{o,t} + p_3 \Delta \ln gpop_{o,t} + p_4 \ln pop14_{o,t} + p_5 \ln purb_{o,t} + p_6 \ln gpop_{o,t} \\ & + m_1 \ln \frac{MST_{o,d,t-1}}{pop_{d,t-1}} + m_2 \ln \frac{MST_{o,d,t-2}}{pop_{d,t-2}} + \alpha_t + \alpha_{o,d} + \varepsilon_{o,d,t} \end{aligned}$$

<i>Variables</i>	<i>Definitions</i>	<i>Sources</i>
$M_{o,d,t}$	Immigration flows	NIS for Belgium; Statistics Sweden for Sweden; <i>Office des Migrations Internationales</i> for France; data from M. Fertig and G. Tassoukis for West Germany.
$u_{d,t}$ , $u_{o,t}$	Unemployment rates	Provided by Fertig as used in Fertig (2001)
$w_{d,t}$ , $w_{o,t}$	GDP per capita at 1996 constant prices	Penn World Table Version 6.1
$\frac{w_{H,d,t}}{w_{L,d,t}}$	The skill premium in the countries of destination, proxied by the ratio of the wage of white collar workers to the wage of blue collar workers.	- Industrial Statistics Database (UNIDO, 1994) for Belgium, West-Germany and Sweden - <i>Séries Longues sur les Salaires</i> (INSEE, 2000) for France.



$\frac{\bar{H}_{d,t}}{\bar{L}_{d,t}}$	Ratio of the skilled working population on the unskilled working population.	- Industrial Statistics Database (UNIDO, 1994) for Belgium, West-Germany and Sweden - <i>Séries Longues sur les Salaires</i> (INSEE, 2000) for France.
$\bar{N}_{d,t}, \bar{N}_{o,t}$	Working population	World Development Indicators (World Bank)
$pop14_{o,t}$	Share of the population younger than 14	World Development Indicators (World Bank)
$purb_{o,t}$	Share of total population living in urban areas.	World Development Indicators (World Bank)
$gpop_{o,t}$	Growth of the population	World Development Indicators (World Bank)
$MST_{o,d,t}$	Stock of immigrants from $o$ in $d$	NIS for Belgium; Statistics Sweden for Sweden; <i>Office des Migrations Internationales</i> for France; data from M. Fertig and G. Tassoukis for West Germany
$pop_{d,t}$	Total population of country $d$	Penn World Tables.

*Note* : subscripts  $o$ ,  $d$  and  $t$  respectively refer to the country of origin, the country of destination and the time period.

## 4.2. Estimation Method and Results

The model (22) is a dynamic panel model that is known to suffer from a bias when estimated using the least squares dummy variable (LSDV) method, due to the correlation between the lagged dependent variable and the residuals (e.g. Hsiao, 1986). At the outset, this problem has been tackled by instrumental variables estimation, generalized method of moments (GMM) in particular. However, a number of simulation studies (e.g. Kiviet, 1995; Judson and Owen, 1999; and Bun and Kiviet, 2001) have shown that a bias-corrected LSDV estimator, as well as the Anderson-Hsiao instrumental variable estimator (Anderson and Hsiao 1982), are more efficient than the asymptotically efficient GMM estimators when the dimensions of the panel are fairly small as in our sample.

Taking this into account, we use the LSDV-bias corrected estimator proposed by Bun and Carree (2005). Their correction procedure consists in (i) obtaining an estimation of the model from LSDV, and (ii) subsequently computing the bias of the estimated coefficients and the variance of the error terms. This can be achieved by an iterative procedure, taking the LSDV estimated parameters as starting values, or by solving the system of equations with the unbiased parameters as unknowns. We have used both approaches and obtained comparable results<sup>11</sup>.

Bun and Carree (2006) show that the inconsistency of the LSDV-estimator is asymptotically identical for homoscedastic disturbances and cross-sectionally heteroscedastic disturbances. In these cases the bias correction of Bun and Carree (2005) is valid. The bias correction must be modified though for time series heteroscedasticity of the disturbances. We may assume that the main source of

<sup>11</sup> We only report the results of the iterative procedure. The results of solving the system of equations in the parameters and the residual variance are available from the authors upon request.

heteroscedasticity in our sample is cross-sectional, rather than time-series heteroscedasticity. Consequently, we can compute the bias as in Bun and Carree (2005).

Bun and Carree (2005) also provide an expression for the variance-covariance matrix of the limiting distribution of the bias-corrected estimators. However, given the small dimensions of our model, we prefer to bootstrap the standard errors, of which Bun and Kiviet (2001) report that it achieves higher accuracy in small samples. Running 1000 replications of the Bun and Carree (2005) correction procedure, we derive the sample distribution of the parameters and compute the standard errors.

In Table 4, we report the results of the estimations (restricted and extended models) of (22) following this approach.

Table 4  
Estimation of the determinants of immigration in the panel of four EU countries (1960-1975)

Explanatory variables	Dependent variable: $\ln M_{o,d,t}$	
	Restricted model	Extended model
$\Delta \ln \frac{w_{H,d,t}}{w_{L,d,t}}$	0.13 (4.04)	0.22 (5.36)
$\Delta \ln w_{d,t}$	<b>17.77 (8.28)**</b>	<b>19.77 (8.42)**</b>
$\Delta \ln w_{o,t}$	-2.03 (5.27)	-3.76 (5.35)
$\Delta \ln u_{d,t}$	-0.14 (0.57)	0.02 (1.02)
$\Delta \ln u_{o,t}$	-0.28 (0.33)	-0.70 (0.46)
$\Delta \ln N_{d,t}$	43.53 (33.12)	31.34 (31.75)
$\Delta \ln N_{o,t}$	5.72 (7.48)	<b>47.82 (23.80)**</b>
$\Delta \ln pop14_{o,t}$		0.85 (21.28)
$\Delta \ln purb_{o,t}$		47.34 (58.76)
$\Delta \ln gpop_{o,t}$		-0.19 (15.79)
$\Delta \ln \frac{\bar{H}_{d,t}}{\bar{L}_{d,t}}$		5.78 (3.34)
$\ln \frac{w_{H,d,t-1}}{w_{L,d,t-1}}$	<b>6.35 (2.90)***</b>	<b>6.83 (2.91)**</b>
$\ln w_{d,t-1}$	-0.81 (5.11)	3.79 (5.30)
$\ln w_{o,t-1}$	-2.02 (1.86)	-4.75 (3.55)
$\ln u_{d,t-1}$	-0.04 (0.77)	0.08 (1.61)
$\ln u_{o,t-1}$	-0.24 (0.21)	-0.31 (0.33)
$\ln N_{d,t}$	5.19 (4.11)	<b>10.29 (5.64)*</b>

$\ln N_{o,t}$	0.74 (2.94)	-6.47 (6.66)
$\ln pop14_{o,t}$		-4.94 (5.45)
$\ln purb_{o,t}$		13.25 (8.94)
$\ln gpop_{o,t}$		-0.23 (4.54)
$\ln \frac{\bar{H}_{d,t-1}}{\bar{L}_{d,t-1}}$	5.52 (3.62)	5.62 (3.55)
$\ln \frac{MST_{o,d,t-1}}{pop_{d,t-1}}$	-0.64 (0.97)	-0.56 (0.93)
$\ln \frac{MST_{o,d,t-2}}{pop_{d,t-2}}$	0.42 (0.29)	0.03 (0.33)
$\ln M_{o,d,t-1}$	<b>0.80 (0.13)***</b>	<b>0.67 (0.19)***</b>
Adjusted R <sup>2</sup>	0.97	0.97

*Note:* Least Squares Dummy Variables (LSDV) estimation of both models following the bias-correction procedure proposed by Bun and Carree (2005) using an iteration approach. Time and bilateral country dummies are included but not reported. \*, \*\*, \*\*\* denotes significance at respectively 10%, 5% and 1%. Standard errors are in brackets.

In both specifications (restricted and extended) the signs of almost all the coefficients are in line with expectations and with other estimation results, except for the per capita income in the destination country ( $\ln w_{d,t-1}$ ) in the restricted model, which is however not significant. In addition, the signs of the coefficients of the variables in first differences and in levels are as expected (the exception again being per capita income in the destination country in the restricted model).

The signs of supply-side determinants are in general in accordance with expectations. The sign of the impact of the unemployment rates in the destination countries differs according to the estimation, being positive in the extended model and negative in the restrictive specification. The unemployment rates in the countries of origin also have a negative coefficient. This finding is consistent with the ambiguous results of previous research with respect to employment rates reported by Bauer and Zimmermann (1999). However, none of the supply-side variables in level, i.e. measuring their impact on migration at equilibrium, have a statistically significant effect. The per capita income in the destination country and the working population in the country of origin are significant in first differences, i.e. during the transition to equilibrium, and only in the extended model for the latter. These results differ from those of Jennissen (2003) who finds that GDP per capita and unemployment respectively have a positive significant effect and a negative significant effect on Western Europe countries' net migration rate. However, Jennissen's calculations (i) concern the whole of the 1960-

1998 period, (ii) include Western European countries of immigration and emigration, and (iii) do not consider the skill premium as an explanatory variable<sup>12</sup>.

On the demand side, we can find in both estimations a positive correlation between immigration and the skill premium, the relative endowment of high-skilled workers and the labour force in the country of destination, in levels and in first differences. The coefficient of the skill premium in levels (i.e. the equilibrium relationship) significantly differs from zero in both specifications, as well as the size of the population in the extended model.

These results corroborate Proposition 1 that was derived from the theoretical model. Our estimations also confirm Zimmermann's (1996) hypothesis that, in the period considered, migration flows were essentially determined by labour demand and not by labour supply factors. In fact, we do find that none of the supply determinants in our model are individually significant for the determination of the equilibrium migration flow.

The results concerning Proposition 2 are more ambiguous since the correlation between immigration and the relative endowment of skilled labour is fragile in both specifications even if its coefficients show the expected sign, and the correlation between immigration and the size of the working population is only significant in the extended model.

Finally, the extended model provides very similar, if not somewhat better results than the restricted specification. Income per capita in the country of destination (in levels and in first differences) has now the expected positive sign and the impact of the size of the destination country is now statistically significant. The demand side determinants again display the expected sign.

## 5. Conclusion

We propose a modified Heckscher-Ohlin-Samuelson model in order to provide an explanation for the substantial immigration flows to North-West Europe in the 1960s. Assuming that the skill premium and endowments of high-skilled labour are exogenously determined, the markets for low-skilled labour clear because immigration adjusts supply to demand. The model implies that immigration of low-skilled workers is an *increasing* function of the skill premium, of the size of the working population and of the relative endowment of high-skilled labour.

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<sup>12</sup> The estimated elasticities are sometimes quite high in our model. This reflects the substantial fluctuations of the immigration flows over the considered period. In addition, if the model is relevant to explain immigration in Western Europe in the sixties and early seventies (the first stage of IDL), it could be inappropriate to represent immigration in other periods. Because of institutional changes for instance, the long term equilibrium model of immigration after the 1970s may behave in a completely different manner to the previous period.

We use two specifications of a dynamic model of the supply and demand relationships in reduced form in order to test these theoretical implications in four European countries over the period 1960-1975. The empirical estimations provide two major results.

Firstly, both specifications suggest that the skill premium had a statistically significant and positive effect upon migration. This corroborates the first of the two propositions that can be derived from the theoretical model developed in this paper. The correlation between the relative endowment of skilled labour and immigration is rather fragile, but the correlation between the size of the working population and immigration is significant in the extended form of the model.

Secondly, almost none of the traditional supply-side variables that are included in the empirical models are individually significant at conventional error levels. This might confirm Zimmermann's (1996) hypothesis regarding the predominance of the demand-side determinants and the relative insignificance of supply-side determinants of immigration into Western Europe in the considered period.

Apparently, immigration flows to Western Europe were primarily driven by the demand for low-skilled workers in the host countries, this demand depending on the institutionally determined wages. Despite focusing on a different period of time than most of the studies, our results bear out the recent stress on the demand side of immigration by, e.g., Mayda (2005) and Bianchi (2006). The evidence we find in support of Propositions 1 and 2 suggests that, at least for the period considered, traditional estimations could suffer from a bias due to the omission of variables reflecting a demand-driven quest for low-skilled immigrants.

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