

research paper series

Globalisation and Labour Markets



Research Paper 2006/06

**Welfare Magnets, Border Effects or Policy Regulations:
What Determinants Drive Migration Flows into the EU?**

by

Nicolas Péridy

The Authors

Nicolas Péridy is Assistant Professor at the University of Nantes (France), Department of Economics.

Acknowledgements

I would like to thank GEP, and especially David Greenaway, for inviting me to visit GEP and giving a seminar (16 January 2006). I am further grateful to Robert Shelburne (UNECE) and GEP seminar participants for helpful comments and suggestions.

Welfare Magnets, Border Effects or Policy Regulations: What Determinants Drive Migration Flows into the EU?

by

Nicolas Péridy

Abstract

This paper aims at explaining recent migration trends into the EU. A first contribution is to provide an original eclectic theoretical model from the new developments in migration theories. Second, an empirical panel data model is provided in order to explain the emigration rate into 18 EU countries, from 67 source countries, over the past 10 years. Finally, this model simultaneously tests the impact of the traditional and the new variables on migration flows into the EU. From both static and dynamic panel data estimators, the results show that the new variables are of particular significance, compared to traditional ones.

JEL classification: F22

Keywords: International migrations, European Union, welfare magnets, border effects, migration policy, panel data.

Outline

- 1. Introduction*
- 2. Theoretical framework*
- 3. Empirical Evidence*
- 4. Conclusions*

Non-Technical Summary

In the past few years, international migration has become an increasing concern for EU citizens and policy makers. This is due to important changes in migration policies and patterns, such as the fall of the Berlin wall and the prospect of the EU enlargement to Central and Eastern European countries. More recent changes include the ongoing enlargement to Romania, Bulgaria and Turkey, the rise in the number of asylum applications to the EU as well as the increase in the proportion of unskilled migrants from low and middle income countries.

However, there has been a lack of empirical work devoted to the explanation of migration patterns into the European Union. At the same time, migration theories have undertaken a considerable renewal, which has led to the development of new variables for explaining migration decisions. One major variable is welfare magnets. It relies on the idea that once migrants are self-selected, they can choose the destination country where public assistance is the highest. A second variable concerns migration costs, especially border effects or networks. In this regard, it is striking to observe that these costs are also found in the new international trade theory. Finally, policy regulations, such as residence permits or quotas can also be considered as major new variables.

This paper aims at explaining the recent migration patterns into the EU. It first develops an original theoretical model which simultaneously takes into account the traditional and the new migration determinants, i.e. differences in living standards, poverty, welfare magnets, policy regulations, geographical distance, border effects, networks as well as other migration costs. One original assumption is to make possible that social transfers differ across individuals in a same country. As a result, migration not only depends on the average transfers granted in the source and destination countries (as in the standard welfare magnet theory), but also on transfer inequalities across countries.

This model is subsequently estimated in order to explain the emigration rate into 18 EU countries, from 67 source countries, over the past 10 years. The empirical model is carried out by using both static and dynamic panel data estimators, especially the Hausman and Taylor as well as the Arellano, Bond and Bover's estimators.

Results unambiguously show that the new variables play a major role for explaining recent migration patterns. In particular, public spending in the EU is a significant variable in accordance with the welfare magnet theory. This result is also complemented by the significance of the dispersion in public spending: as expected from our theoretical model, migration is an inverse U-shape function of this variable. New migration costs also matter: in particular, border effects prove to be a major barrier to migration. In addition, source and destination countries' policy regulations are both of particular importance. Finally, the model shows that migration flows into the EU are inversely related to the education level in foreign countries. This result is in contradiction with the current need of the EU labour markets, which require an increasing number of skilled migrants. This inevitably raises the question of the opportunity of creating a skill-selective EU migration policy, as it is already the case in Canada.

1 Introduction

In the past few years, international migration has become an increasing concern for EU citizens and policy makers. This is due to significant changes in migration policies and patterns. As a first example, the fall of the Berlin wall and the prospect of the EU enlargement to the Central and Eastern European Countries (CEECs) have led to a sharp increase in migration flows into the EU from 1990 onwards. In the early 2000s, the number of residents from the CEECs in the EU-15 was estimated to exceed one million (Alvarez-Plata and al., 2003). The ongoing 2007 enlargement to Romania and Bulgaria, and subsequently to Turkey, may also have a significant migration impact, given the differences in the living standards between these candidate countries and the EU.

In addition to these inter-European migration flows, several other striking features emerge from migration statistics. First, the number of asylum applications to the EU have almost doubled over the last decade (excluding applications from CEECs): it amounted to 160,000 in the late 80s and reached 300,000 in the early 2000s on a yearly average (UNHCR, 2004). These applications mainly come from African and Asian countries. At the same time, EU policy makers implemented tougher policy regulations in order to deter them (Hatton, 2005).

Secondly, the EU (like the USA) has been facing a change in the structure of the immigrant population: the proportion of migrants from low and middle income countries has dramatically risen, as well as the proportion of unskilled migrants (OECD, 2005; Pedersen et al., 2004). The expectations of higher living standards, a more secure employment and significant welfare transfers are often put forward in order to explain these new migration trends into the EU.

Surprisingly however, there has been little work which focuses on the migra-

tion determinants into the EU. In fact, the great bulk of the work has concerned the USA and Canada¹. With regards to Europe, most empirical studies concentrate on one particular European country, essentially the UK or Germany (Brucker and Schroder, 2005; Brucker and Siliverstovs, 2005; Fertig, 2001; Hatton, 1995; Hatton and Williamson 2005a,), and less frequently other EU countries (Zimmerman, 1994, 2005). Some other studies take an historical perspective (Hatton and Williamson, 2005; Dustman and Glitz, 2005) whereas the remainder focus on particular migrants to the EU, such as asylum seekers (Hatton and Williamson, 2005b; Hatton, 2005) or high-skilled workers (Bauer and Kunze, 2004).

In fact, only three unpublished studies develop an empirical migration model with a large selection of EU countries in the recent period. These are Alvarez-Plata and al. (2003), Mayda (2005) as well as Pederson and al. (2004). However, these studies do not take into account some crucial new developments in migration theory. Indeed, these developments make it possible to take into account three additional factors which are of particular interest in the case of the EU. The first is welfare magnets (Borjas, 1999). It relies on the idea that once migrants are self selected, they can choose the destination country where public assistance is the highest. Secondly, some authors have investigated the impact of migration costs on the migration decision. In particular, Helliwell (1997) as well as Hunt and Mueller (2004) point out the importance of border effects for this decision. These investigations complement some new results found in the international trade theory (Anderson and van Wincoop, 2004). Finally, policy regulations, such as residence permits or quotas, are also expected to play a major role in migration flows (Bauer et al., 2000, Hatton and Williamson, 2004a).

¹For example, refer to Borjas et al. (1992) ; Clarck et al. (2002), Hunt and Mueller (2004) Kamerama et al. (2000), etc...

The present paper's main contribution is threefold. It first develops an original eclectic theoretical model which simultaneously takes into account the three factors referred to above, i.e. welfare magnets, border effects and policy regulations. In particular, one original assumption of this model is to make possible that social transfers differ across individuals in a same country. As a result, migration not only depends on the average transfers granted in the source and destination countries (as in the standard welfare magnet theory), but also on transfer inequalities across countries. As a second contribution, this paper provides an empirical model in order to explain the determinants for the emigration rate into 18 EU countries, from 67 source countries, over the past 10 years. Finally, it simultaneously tests the impact of the traditional and the new migration variables in a panel data framework. Results unambiguously show that the new variables play a major role for explaining recent migration patterns into the EU.

The remainder of the paper is organized as follows: the second section presents a short survey of the new developments in migration theories. It also develops a simple eclectic model from these new developments, including welfare magnets, migration costs, policy regulation as well as the relationship between trade and migration. From this theoretical background, the empirical model is derived in the third section. It provides a large set of proxies which are chosen to account for the theoretical variables. The model is subsequently estimated by using both static and dynamic panel data estimators. The econometric tests and the sensitivity analysis lead to the selection of both the Hausman and Taylor as well as the GMM estimators.

2 Theoretical framework

2.1 New developments in migration theories

The migration theory traditionally deals with three major topics: the determinants of migration, the assimilation of migrants and the effects of migrants on natives (for a complete review of the literature, refer to Zimmermann and Bauer, 2002). However, no single theory simultaneously addresses these three issues. Instead of this, they can be partly tackled by several theories, like human capital models, the "brain drain" approach or even the Heckscher-Ohlin-Samuelson theory (Borjas, 1989, Greenwood, 1985).

Focusing on the migration determinants, traditional theories generally predict that the emigration rate is negatively correlated with the mean earnings in the source country² as well as with migration costs, and positively correlated with the mean earnings in the host country. It is also expected that migration pressure decreases with trade liberalization, following the standard HOS approach. In this framework, trade and migration are considered as substitutes.

However, the theory of migration decision has been considerably renewed in the past two decades. One major contribution concerns self-selection (Borjas, 1987, 1994 and Borjas et al.,1992). Guided by the income-maximizing Hicks-Sjaastad approach within the Roy's model, several important new insights have been generated. In particular, it has been shown that migration decisions not only depend on differences in the mean income between the source and destination countries, but also on the return to skill in each country: countries which pay the higher returns to skills attract more skilled workers than others. As a

²Except in case of poverty traps: the decline in income in the source country may not lead to an increasing migration pressure if people are too poor and cannot manage monetary migration costs.

result, these skill-price differentials determine the skill composition of migration flows.

This framework has been subsequently extended in different ways. For example, Borjas and Bratsberg (1996) propose a generalization of the model which makes possible return migration. The latter may be motivated either by an optimal location plan over the life cycle, or by worse than expected outcomes in the host country. Whatever the motivation, this extension of the Roy model does not modify the results related to the migrants' selection process. In fact, these authors show that return migration accentuates the selection regarding the initial migration flows. Dustmann (2003) as well as Brucker and Schroder (2005) also take return migration into account in a human capital model. Again, this does not significantly change the basic migration determinants, i.e. income differential across countries and employment.

A second extension of this model relates to the family migration decision instead of the individual decision (Borjas and Bronars, 1991). It is assumed that the family objective is to maximize the household income. This gives rise to situations in which some persons within the household may migrate even if their private optimal choice would have been to stay (tied movers). Conversely, some other persons may decide to stay, even if their optimal choice would have been to migrate (tied stayers). Here again, the basic results of the standard model are not significantly altered, except that the presence of tied-movers in the immigrant flows tend to attenuate the selection process.

A related extension takes into account other people whose migration decision is not primarily determined by economic motivations, such as refugees and ideological (including religious) migrants (Chiswick, 1999, Hatton and Williamson, 2004a). For the same reasons as tied movers, these particular migrants tend to

attenuate the favorable selectivity in the migration decision process.

Another important extension corresponds to the host country's migration policies. Indeed, the Roy model generally considers self-selection from the supply side of migration, i.e. migration decisions from the source country's point of view. However, it is crucial to consider that these decisions also depend on the migration demand (from the host country standpoint). For example, it is expected that the host country develops a migration policy which depends on several factors, such as the needs of the local labour market, the quality of the migrants, the expected welfare effect of migration on this country, and possibly the attitude of natives toward immigration. Although there is no precise theory of migration demand, several authors have attempted to introduce policy regulation into both theoretical and empirical models, mostly within the framework of the political economy of migration (Bauer et al., 2000, Benhabib, 1996, Karemera et al., 2000, Hatton and Williamson, 2004a).

In addition to the above extensions connected to the Roy model and self-selection, the recent theoretical literature also provides interesting contributions with regards to three major additional issues, namely the specification of migration costs, welfare magnets and the relationship between trade and migration.

Firstly, in regard to migration costs, several authors have recently attempted to further specify them compared to the traditional theory. In particular, Helliwell (1997) as well as Hunt and Mueller (2004) both focus on border effects as a specific mobility cost for migrants. This additional cost may be introduced in the Roy model or in any other migration model which includes mobility costs. Both authors conclude there is a significant impact of border effects on migration, though this impact may have some large non linear effects. This result complements the recent literature which has considered border effects within

the international trade theory (since McCallum's (1995) pioneer work)³. It also makes it possible to compare the magnitude of these effects on both migration and trade.

In addition to border effects, the recent literature on migration costs has also introduced "family ties" or "network effects" as factors which influence migration costs. For example, the presence of relatives abroad, business ties or any other human network (ethnic, religious, friends) lowers migration cost and therefore increases the emigration rate all things being equal (Lalonde and Topel, 1997; Pederson et al., 2004).

Welfare magnets are another recent extension developed by Borjas (1999). It relies on the idea that once migrants are self-selected, they can choose the destination country (or state) where public assistance is the highest. This is due to the fact that they have initially chosen to bear the fixed costs of migration whatever the State of destination. Consequently, they cluster in generous states or countries. Conversely, natives do not easily migrate to states where welfare benefits are high, because they are not self-selected, and thus may find fixed mobility costs too high compared to the expected welfare benefits of moving. As a result, natives tend to be stuck in the state where they were born. These results are demonstrated by introducing welfare programs in wage equations, assuming that each State guarantees a minimum income level to all its residents, and that this level differs for each State. Borjas (1999) also tests this theoretical model empirically and finds some support for the relationship between migrant clusters in specific US states and the level of public assistance.

Finally, more attention has also been paid to the relationship between trade and migration⁴. According the HOS theoretical framework, if the only difference

³In particular, refer to Anderson and van Wincoop (2004).

⁴For a complete survey, see Razin and Sadka (1997).

between two countries is their relative labour abundance, then commodity trade and factor mobility are perfect substitutes. However, it may also be shown that if countries only differ in their technology for at least one commodity, then trade cannot alone equalize factor prices. As a consequence, factor mobility is needed for a complete equalization. Trade and migration are thus complementary. Foreign Direct Investment (FDI) may be an alternative to migration. However, when the investment in human capital generates external trade economies which are locked within national borders, this alternative fades away and capital flows and skilled labour flows remain complementary (Razin and Sadka, 1997). This complementarity between migration on the one hand and trade and FDI on the other may also be explained by considering that trade and FDI reflect business ties between the source and destination countries and that these ties reduce indirect migration mobility costs (Pederson et al., 2004).

The theoretical model presented below is inspired by the recent developments described previously. The presentation follows Borjas' spirit and extends the related models developed by Hatton and Williamson (2005a) or Clark and al. (2002), in two ways. It first includes welfare transfers and makes it possible that these transfers differ across individuals in the same country. As a result, migration not only depends on the average transfers granted in the source and destination countries (as in the standard welfare magnet theories) but also on transfer inequalities across countries. Secondly, it provides a large set of migration costs and includes specifically border effects, in line with Hunt and Mueller's (2004) new developments. This eclectic model will subsequently be used for the empirical analysis, applied to immigration into the EU.

2.2 An eclectic model of aggregate international migration

Basically, the decision of individual i in source country h to migrate to destination f (m_{ihf}) depends on the earnings difference between the destination and the source country, net of the migration costs. The earnings have an economic component (wages) as well as a social component (welfare transfers):

$$m_{ihf} = (W_{if} + T_{if}) - (W_{ih} + T_{ih}) - C_{ihf} \quad (1)$$

Specifically, W_{if} and W_{ih} denote the wages of individual i in the foreign and source country respectively. It is assumed that these wages depend on an average base revenue for workers (α_f and α_h) as well as on the skill level (S_i) of each person:

$$\begin{aligned} W_{if} &= \alpha_f + \beta_f S_i \\ W_{ih} &= \alpha_h + \beta_h S_i \end{aligned} \quad (2)$$

with β_f and β_h reflecting the return to skill of individuals in each country. It is also assumed that wage means and variances equal to $\mu_{wf}, \mu_{wh}, \sigma_{wf}, \sigma_{wh}$ respectively.

T_{if} and T_{ih} denote the welfare benefits (transfers) granted by each country to individuals, regardless of whether the person was born in the country. Unlike Hatton and Williamson (2005a) or Clark and al. (2002), we make it possible that these transfers differ across individuals in a same country. This assumption seems to be more realistic, as international statistics show significant transfer dispersion in most countries (LIS, 2005). As a consequence, we

introduce transfer means and variances equal to $\mu_{tf}, \mu_{th}, \sigma_{tf}, \sigma_{th}$, respectively.

We also assume that $Cov(W_{if}, W_{ih}) > 0$; $Cov(T_{if}, W_{if}) < 0$; $Cov(T_{ih}, W_{ih}) < 0$ and the other covariances are equal to zero.

Migration costs C_{ihf} can be divided into several elements:

$$C_{ihf} = C_{hf}(D_{hf}, B_{hf}, L_{hf}, H_{hf}, X_{hf}, U_{hf}) + P(P_f, P_h) + C_i \quad (3)$$

C_{hf} reflects direct and indirect location costs, i.e. the costs which are the same for all individuals i in country h for a given destination f . Direct costs includes the geographical distance between h and f (D_{hf}), the border effect (B_{hf}), i.e. the cost of crossing the national border⁵, as well as differences in languages between the source and destination country (L_{hf}) and differences in the cost of living between the source and destination countries (H_{hf}). Indirect costs involve the difference between unemployment rates abroad and at home (U_{hf}) or the absence of business ties. The latter may be inversely reflected by the magnitude of trade (X_{hf}).

P denotes policy regulations which have a direct or indirect impact on migration flows. They first include the destination country's policy instruments which restricts migration (P_f). For simplicity and for empirical reasons, we assume that this policy is made of quotas or simply the possibility to deliver or not residence permits, as in the EU. The higher the number of delivered permits or the higher the quota level, the lower migration costs. This analysis may be easily extended to other policy instruments, such as skill selective instruments which are in place in other countries (Clark and al., 2002). Another set of policy

⁵This concept was first introduced in trade theory (McCallum, 1995) before an extension to migration theory (Helliwell, 1997).

regulations or political factors concern the source country (P_h). It may include wars or the deprivation of freedom, such as civil or political rights. These political deprivations are expected to reduce relative migration costs. They are supposed to have a direct or indirect impact on migration by inciting people to leave their country.

Finally, C_i represents the costs which depend on the individual i only (psychic costs). It includes non monetary benefits which are lost when migrating, like the absence of the family or other human networks. It is also referred to as the compensating differential in favour of the home country. However, this cost may be reduced when the migrant meets part of his family or friends abroad.

We must also stress that the compensating differential may not be independent from policy regulation: for instance, the presence of a family network abroad will not only increase migration because the psychic cost for the individuals is reduced, but also because the host country can encourage family reunification through a specific policy. This relationship must be kept in mind when interpreting empirical results.

Substituting equations (2) and (3) into (1) provides:

$$m_{ihf} = (\alpha_f - \alpha_h) + (\beta_f - \beta_h)S_i + (T_{if} - T_{ih}) - C_{hf}(D_{hf}, B_{hf}, L_{hf}, H_{hf}, X_{hf}, U_{hf}) - P(P_f, P_h) - C_i \quad (4)$$

In this equation, it may be observed that migration increases with skill levels (positive selection) if the return to skill is greater in the destination than in the source country ($\beta_f - \beta_h$). Conversely, migration decreases with skill levels (negative selection) if the return to skill is greater in the home country.

In terms of probability, each individual is willing to migrate if $m_{ihf} > 0$, i.e. if the expected earnings abroad exceed the earnings at home net of mobility costs. Summing for all individuals, the emigration rate from country h to country f is:

$$M_{hf} = 1 - \Phi \left(\frac{-\mu_{wf}(S_i) + \mu_{wh}(S_i) - \mu_{tf} + \mu_{th} + C_{hf}(D_{hf}, B_{hf}, L_{hf}, H_{hf}, X_{hf}, U_{hf}) + P(P_f, P_h) + \mu_c}{\sigma_{M_{hf}}} \right) \quad (5)$$

where μ_c is the mean of individual-specific costs (C_i), Φ is the standard normal distribution function and $\sigma_{m_{hf}}$ the standard deviation of m_{ihf} , which is equal to:

$$\sigma_{m_{hf}} = \sqrt{\sigma_{wf}^2 + \sigma_{wh}^2 - 2\sigma_{wf}\sigma_{wh} + \sigma_{tf}^2 + \sigma_{th}^2 - 2\sigma_{wf}\sigma_{tf} - 2\sigma_{wh}\sigma_{th} + \sigma_c^2} \quad (6)$$

Table 1 summarizes the impact on the emigration rate of each variables described above : the emigration rate between country h and f increases with country f' income, decreases with country h's income, and increases with the welfare benefit differential between f and h. In addition, migration decreases with bilateral migration costs (distance, border, differences in languages, etc.) or with the average individual specific mobility cost. It also decreases as country f's migration policy becomes more strict (reduction in the number of residence permits), or if country h's migration policy becomes more favorable (more freedom and human rights).

Skill levels also matter, as explained above, since they are included in wage means. In addition, the impact of skill distributions on migration are also included in equation (5), through income inequality. More precisely, it may be

shown that if the destination country is richer than the source country ($\mu_{wf} + \mu_{tf} > \mu_{wh} + \mu_{th} + C_{hf}(D_{hf}, B_{hf}, L_{hf}, X_{hf}, U_{hf}) + P(P_f, P_h) + \mu_c$), and if earnings in the source country are initially more equal than in the destination country, then rising inequality in the source country will increase emigration, up to a certain point beyond which emigration decreases. Conversely, rising inequality in the destination country will reduce immigration, up to a certain point before increasing. Opposite results hold if we assume that the richest country is the source country (instead of the destination country) or if we assume that the most equal country is initially the destination country (instead of the source country). As a consequence, the migration rate is an inverse U-shape function of the ratio of source to destination income inequality⁶.

In the same way, assuming that the destination country is richer than the source country, and assuming that welfare benefits are initially more equal than wages in the source and in the foreign country ($\sigma_{th} < \sigma_{wh}$ and $\sigma_{tf} < \sigma_{wf}$), the migration rate is positively related to an increase in welfare inequality in both countries, up to a certain point (Table 1). As a result, it may be shown that the migration rate is an inverse U-shape function of the product of the source and destination country's dispersion in social transferts. This original theoretical result extends the welfare magnet theory, by showing that migration does not only depends on public spending levels, but also on their dispersion.

Finally, the model may be extended in order to account for the age structure of the population in the source country. This may be achieved by assuming that migration is a forward-looking decision. As a result, any individual in the source country is willing to maximize the present value of its net expected income

⁶This last result holds whatever the income level and the income inequality in the source and in the destination country, since we work here with ratios involving source to destination income levels or income inequality. The detailed mathematical derivation of this result is available from the author on request.

earned in the foreign country. All things being equal, this present value depends on the age of this individual:

$$V_i = \frac{(W_{if} + T_{if}) - (W_{ih} + T_{ih}) - C_{ihf}}{r_i} \left[1 - (1 + r_i)^{-(R_f - A_i)} \right]$$

where r_i denotes the discount rate used by the individual to calculate the present value of its earnings; A_i reflects its current age and R_f the retirement age in the foreign country. For a given retirement age, e.g. $R_f = 65$, it is easy to show that V_i is a decreasing function of A_i . For example, if the individual enters the labour market when he is 20 years old, his expected remaining working life is equal to 45 years and the net expected gain is maximum if he migrates immediately. As the individual gets older, his net expected gain decreases down to 0 when he is 65 years old. In this case, there is no reason for him to migrate. If we now aggregate all individual behaviors, it is easy to show that the emigration rate is positively correlated with the share of young workers in the overall source country's population.

3 Empirical Evidence

3.1 The empirical model and the choice of the variables, data and sources

The theoretical model developed above makes it possible to derive its empirical counterpart, as follows:

$$\begin{aligned}
M_{hft} = & \alpha_0 + a_1 \frac{Y_{ft}}{Y_{ht}} + a_2 \frac{INEQ_h}{INEQ_f} + a_3 \left(\frac{INEQ_h}{INEQ_f} \right)^2 + a_4 \frac{SPEND_f}{SPEND_h} + \\
& \alpha_5 VARSPEND + \alpha_6 (VARSPEND)^2 + a_7 POV_h \\
& + b_1 DIST_{hf} + b_2 BORD_{hf} + b_3 POLICY_{ft} + b'_3 POLICY_{ht} + b_4 LANG_{hf} + b_5 \frac{COSTLIV_f}{COSTLIV_h} \\
& + b_6 \frac{UNEMP_f}{UNEMP_h} + b_7 TIES_{hft} + b_8 NETWORK_{hft-1} \\
& + c_1 AGE_h + c_2 \frac{EDUC_h}{EDUC_f} \\
& + \alpha_h + \beta_f + \gamma_t + \eta_{hf} + \varepsilon_{hft}
\end{aligned} \tag{7}$$

where the dependent variable M_{hft} denotes the gross emigration rate from the home to the foreign country in year t , as a proportion of the home country's population. 18 EU countries are selected as destination variables⁷, with 67 partners as source countries⁸. The time period spans from 1993 to 2002. Data mainly comes from the new dataset collected by the OECD, corresponding to the inflow of foreign population by nationality (OECD, 2005). In case of data unavailability, this dataset is complemented by CARIM (2005) as well as by national sources.

Although the gross emigration rate is the most often used as the dependent variable in this kind of model, some authors suggest using rather the stock of migrants. In particular, Brucker and Schroder (2005) show from a simple model that there is a long run equilibrium between the migration stock and its explanatory variables, especially the income differential. As a consequence, they recommend using the migration stock instead of (net) migration rate for which

⁷They correspond to the EU OECD countries. These are each EU-15 country, with Belgium and Luxembourg which account for a single country, in addition to Poland, Hungary, the Czech and the Slovak Republic.

⁸They include the 18 EU countries mentioned above as well as the USA, Canada, Mexico, Turkey, Israel, Japan, Australia, New-Zealand, China, South Korea, Hong-Kong, Taiwan, Singapore, Malaysia, Philippines, Thailand, India, Brazil, Chile, Argentina, Gulf countries and the EU new neighbors described in the introduction.

there is no long run equilibrium. The underlying assumption in this model is that net migration is a disequilibrium phenomenon, which eventually vanishes when the equilibrium stock of migrants is achieved.

One drawback of Brucker and Schroder's model is that it only relies on traditional migration theories, especially human capital models. It does not take into account the new development presented in the previous section. In particular, it does not focus on migration costs as determinants of migrations. In the present study, the presence of the distance and the border effects require working with gross flows, i.e. the gross migration rate. In fact, it is the counterpart of trade gravity models, where the dependent variable is gross trade flows, i.e. imports or exports, rather than the cumulative (stock of) trade.

For this reason, we have chosen to keep the gross migration rate as the main independent variable. However, in the sensitivity analysis, we will also test the model with the migration stock rate ($STOCK_{hft}$), defined as the stock of migrants in country f coming from country h, as a proportion of the home country's population⁹.

Turning to the independent variables, the first two lines in equation (7) include the economic and social variables which explain migration flows, as in the theoretical model. These variables involve first $\frac{Y_{ft}}{Y_{ht}}$, i.e. the ratio of GDP per capita in the foreign country as a proportion of that in the source country (purchasing power parity adjusted). The parameter a_1 is expected to be positive, according to the standard migration theory.

As a second economic variable, the ratio $\frac{INEQ_h}{INEQ_f}$ captures the relative income

⁹The source is the same as for the gross migration rate, i.e. OECD (2005). The stock of migrant is calculated according to the nationality of the migrants. In fact, OECD (2005) proposed a new dataset including the stock of foreign born population by country of birth. However, the latter dataset lacks much data for the source and destination countries included in our empirical model. As a consequence, it cannot be used here.

inequality between the source and destination country. As already mentioned, a_2 and a_3 are expected to be positive and negative respectively, according to the Roy model. Inequality is measured by the ratio of the Gini coefficients of households income or consumption. The data has been derived from the United Nations (2005).

$\frac{SPEND_f}{SPEND_h}$ denotes the ratio of social public spending in the destination country as a proportion of the source country's. This variable measures welfare magnets. It is expected to provide a positive coefficient a_4 . In the empirical model, several proxies may alternatively be used as a measure of social public spending. The first corresponds to public education and health spending, as a proportion of GDP. It will be called later $\frac{SPEND1_f}{SPEND1_h}$. A second proxy refers to the ratio of public education and health spending per capita $\left(\frac{SPEND2_f}{SPEND2_h}\right)$. For these two proxies, the data is based on World Health Organization (2005) and UNESCO (2005). Two additional proxies cover total social public expenditures in the destination country as a percentage of GDP. The data is derived from Source OECD (2005a) and Luxembourg Income Study (LIS, 2005). However, in both sources, the corresponding data are mainly available for OECD countries. Consequently, we will not use the ratio of foreign to source countries spending for these proxies, but only spending in the foreign (EU) countries ($SPEND3_f$ and $SPEND4_f$ respectively).

$VARSPEND$ refers to the dispersion of social transfers in countries h and f. In the same way as for income inequality, we combine country h and country f transfer inequality in a single variable, which is equal to:

$$VARSPEND = VARSPEND_h * VARSPEND_f$$

where $VARSPEND_h$ and $VARSPEND_f$ denote social transfers' coeffi-

cient of variation in country h and f respectively¹⁰.

However, unlike income inequality, we use a product rather than a ratio because the sign of the relationship between transfer inequality and migration is the same for country h and f (whereas it is the opposite for income inequality).

At already mentioned, α_5 and α_6 are expected to be positive and negative respectively. Calculations have been based on social transfers data provided by Luxembourg Income Study (LIS, 2005). The limitation of this dataset is that it mainly covers developed countries¹¹. Consequently, this will restrict the number of observations in the empirical model which includes this variable.

Finally, POV_h is assumed to measure the poverty constraint in the source country. We have stated previously that lower the income in the source country, the higher migration. However, when the income level is actually too low, people cannot migrate any longer, simply because they cannot bear the monetary migration costs of migrating. This poverty constraint can easily be introduced in our theoretical model, as in Hatton and Williamson (2005a). As a consequence, a_7 is expected to be negative.

Again, several proxies may be used in order to measure poverty. The first corresponds to the Human Poverty Index (HPI), calculated by the United Nations (2005). One problem with this index is that it is not calculated in the same way for developed and developing countries. Concerning the former, it is derived from four indicators: the probability at birth of not surviving to age 60, the proportion of adults lacking functional literacy skills, the population below income poverty line and the rate of long term unemployment. However,

¹⁰The coefficient of variation has been used instead of the Gini coefficient, due to data limitation.

¹¹More precisely, the LIS dataset includes EEA countries (except Portugal), in addition to the USA, Canada, Australia, Israel, Taiwan, Romania, Mexico and Russia.

concerning developing countries, it is calculated from three indicators: the probability at birth of not surviving to age 40 (P1) , the adult illiteracy rate (P2) as well as the unweighted average of population without sustainable access to an improved water source (and the proportion of children under weight for age) (P3). In order to make the HPI comparable for both developing and developed countries, we started from the index already calculated for developing countries, and we recalculated it for developed countries¹². We thus get an unique poverty index ($POV1_h$) equal to:

$$POV1_h = \left[\frac{1}{3} (P1_h^\alpha + P2_h^\alpha + P3_h^\alpha) \right]^{\frac{1}{\alpha}}$$

$$0 < POV1_h < 100$$

In this formula, we choose $\alpha = 3$ as in the United Nations (2005). The value of α determines the weight given to each indicator $P1_h$, $P2_h$ or $P3_h$: indeed, as α increases toward infinity, $POV1_h$ tends to the value of the largest indicator.

A second measure corresponds to the ratio involving inequality and income per capita in the home country (Hatton and Williamson, 2005a):

$$POV2_h = \frac{INEQ_h}{Y_h^2}$$

It is based on the idea that for a given income per capita level, a rise in inequality - measured by the Gini coefficient - increases poverty. In the same way, for a given inequality level, a decrease in GDP per capita worsens poverty. One problem with this proxy is that it includes variables which are already used as independent variables in equation (7), i.e. inequality and income per capita.

¹²For developed countries, we assume that $P3_h=0$, i.e. there is a full access to improved water and no children underweight for age.

This may produce multicollinearity problems. We will get back to this issue in the next subsection.

The third line in equation (7) includes direct migration costs as well as policy regulations (which have an impact on these costs). The first cost is related to the geographic distance between h and f ($DIST_{hf}$). It has been first calculated as the great circle distance between capitals, as is done traditionally in gravity equations ($DIST1_{hf}$). We also implemented the weighted distance index developed by CEPII (Clair and al., 2004). This index is based on the bilateral distances between the biggest cities in all countries. For this index, the inter-city distances are weighted by the share of each city in the overall country's population:

$$DIST2_{hf} = \left[\sum_{k \in h} \frac{POP_k}{POP_h} \sum_{k' \in f} \frac{POP_{k'}}{POP_f} DIST1_{d_{kk'}}^\theta \right]^{\frac{1}{\theta}} \quad (8)$$

where POP_k and $POP_{k'}$ denote the population in the various cities k in country h and k' in country f. The parameter θ measures the sensitivity of migration flows with regard to the bilateral distance $d_{kk'}$. For simplicity and as in trade gravity models, θ will be chosen to equal unity.

Border effects ($BORD_{hf}$) are proxied by a dummy variable which is equal to 1 for migrations across countries ($h \neq f$) and zero for migrations within countries ($h = f$). It measures the specific migration cost of crossing an international border. This variable requires data on both internal distance ($DIST_{ff}$) and internal migrations (M_{ff}). With regard to internal distance, ($DIST1_{ff}$) has been calculated from the index proposed by Head and Mayer (2002):

$$DIST1_{ff} = \frac{2}{3\Pi^{1/2}} S_f^{1/2}$$

where S_f denotes the size of country i . In this formula, it is implicitly assumed that a country's size is a disc and that the economic activity is evenly distributed within this disc. The internal distance is calculated as a proportion of this disc's radius.

($DIST2_{ff}$) has simply been calculated from equation (8) in the same way as international distances. It is more precise than $DIST1_{ff}$ since it accounts for the spatial distribution of population within country f . This proves to be possible because the CEPII dataset includes several cities in a same country.

Turning to internal migrations, there are still substantial problems in obtaining valuable cross national comparisons. For instance, the type of data that are collected in each country, the intervals over which internal migrations are measured, the population coverage and the migration definition, the division of space and data quality, widely differ for each country. This renders difficult the comparison of internal migration rates across countries (Bell, 2005). As a consequence, there is no comprehensive international dataset for internal migrations. However, since we only need internal migration rates for destination countries (M_{ff}), we used the data provided by Eurostat (2005) for most the EU countries in the dataset. When data are unavailable, as for the UK, we used national sources (National Health Service). We also complemented the collection of data with OECD (2000). For each country, we selected a comparable number of regions in order to avoid the bias due to the division of space. Thus, we generally used the nomenclature of statistical territorial units (NUTS) at level 2.

The third migration cost variable included in the empirical model refers to the destination country's migration policy ($POLICY_{ft}$). Traditionally, it proves difficult to calculate an appropriate policy variable which allows cross-country comparisons. This is due to several reasons. One major reason is that migration

policy instruments differ widely across countries. In particular, as our dataset includes EU countries as destination countries, there is no single EU migration policy: each EU country has its own policy regulation and instruments. An additional problem is that these instruments may change over time within a same country. Moreover, policy can differ within a same country according to the status of migrants (refugees, asylum seekers, labour migrants, students, etc...). Ideally, we should use a policy variable for each country and for each type of migrants, which is not possible due to the lack of comparable international data.

For all these reasons, the impact of migration policy is not often included in empirical models. When it is included, these models generally concentrate on one country (Clark and al. 2002) or use time or country dummy policy variables for international comparisons (Clark and al, 2004, Hatton and Williamson, 2005a, Kamerama and al., 2000; Mayda, 2005). One exception is Pederson et al. (2004), who do not use specific proxies, but estimate the migration model for Anglo-Saxon countries on the one hand, and Western Europe on the other. Subsequently, they compare parameter estimates for each country group and interpret the differences according to the migration policies in each country group. This last attempt seems unsatisfactory however since differences in the parameter estimates may reflect other factors than policy regulation. In other words, there is no theoretical reason for assuming that the elasticity of migration with regard to the various independent variables would be the same in each country group for a given migration policy.

In the present study, we propose two alternative policy proxies. The first ($POLICY1_{ft}$) corresponds to the total number of residence permits delivered by each destination country, as a percentage of the world population¹³. It is

¹³We first attempted to use the ratio of delivered permits as a proportion of the number permits demanded. Theoretically, this ratio should be a better proxy for policy constraints,

expected that the higher this rate, the less important the migration policy constraint, and thus the higher migration rates ($b_3 > 0$). This variable has already been tested by Clark and al. (2002) in the case of the USA only. It generally provided a significant parameter value. In the present study, we use data from OECD (2005), complemented by national sources.

The second policy proxy corresponds to a dummy which is equal to one for migration flows within the European Economic Area (EEA) and zero for migration across EEA frontiers ($POLICY2_{ft}$)¹⁴. Indeed, in our full country sample, only the EEA provides the free movement of people within its own area, whereas migration policies restrict migration flows elsewhere. As a result, the dummy is expected to correctly reflect the migration policy of EEA countries vis-à-vis the rest of the world. A positive coefficient b_3 is expected. This would mean that migration flows are greater within the EEA than with non EEA countries, once all the other migration determinants are controlled. Thus, if the model is correctly specified, e.g. there are no omitted variables, this dummy is expected to reflect EEA countries migration policy only. The problem of omitted variables is tackled at the end of this section.

The other variables included in line 3 of equation (7) are easier to measure: the source country policy instruments ($POLICY_{ht}$) are measured by the un-weighted average of the index of civil and political deprivation of rights. The

since it takes into account the proportion of the resident permits which have been demanded but not delivered by the destination country. However, we faced several problems for this variable. The first is the data unavailability for some countries. The second is an endogeneity bias. Indeed, if the proportion of residence permits which are delivered increases, this may be either because the policy regulation is less stringent, or because some potential migrants have renounced asking for a permit. But this may be in turn explained by their discouragement if the policy constraints are reinforced. A final problem is due to the fact that the number of demanded permits also depends on exogenous factors. For instance, in France, this number decreased by 18% in 2004 as compared with 2003, mainly because the French authorities started charging a fee. This artificially increased the proportion of permits delivered by the French administration.

¹⁴Although Switzerland does not belong to the EEA, a special agreement with the EU ensures the free movement of people. Accordingly, we included this country in the EEA dummy.

data comes from Freedom House (2005). The parameter b'_3 is generally expected to be positive: indeed, the deprivation of freedom may encourage people to escape from their home country. However, this policy is often complemented with threatening, police supervision or fear policies which can impede or make it more difficult for people to escape. Therefore, this variable must be used and interpreted carefully. Finally, ($LANG_{h,f}$) accounts for the difference in language between the source and destination country. This is captured by a dummy which is equal to zero when two countries speak the same language, and unity otherwise.

Finally, ($\frac{COSTLIV_f}{COSTLIV_h}$) denotes the cost of living in the foreign country as a proportion of that in the source country. This variable seems to be more appropriate than the housing or rental price index ratio, which is generally used in comparable studies, e.g. Hunt and Mueller (2004). The reason for this is that the cost of living not only takes into account housing prices, but also the cost of many other items, such as urban transport, food, clothing and entertainment in the biggest cities in each country. The data is derived from the cost of living survey (Mercer, 2005).

The fourth line in equation (7) reflects indirect and individual-specific migration costs, in accordance with the theoretical model developed above. These costs first include differences in the employment rate between the foreign and the home country ($\frac{UNEMP_f}{UNEMP_h}$). The higher unemployment in the foreign country compared to the home country, the lower migration (b_6 is expected to be negative). The data is derived from the International Labor Organization (2005).

The lack of business ties ($TIES_{h,f}$) between the two countries may be measured by an inverse proxy, which corresponds to trade flows (imports plus exports) between countries h and f. Indeed, it is generally recognized that the

lower trade flows between two countries, the fewer business ties (Razin and Sadka, 1997, Pederson et al. 2004). This should push migration down ($b_7 > 0$)¹⁵.

The final indirect cost corresponds to the lack of human network ($NETWORK_{hft-1}$) between the source and the destination country. It may be expected that such networks primarily depend on the stock of migrants from country h who are already settled in country f, with $b_8 > 0$. Consequently, we use the lagged migrant stock in country h by nationality as a proxy for human networks (source: OECD, 2005).

The fifth line in equation (7) includes the remaining variables, i.e. those which are not related to economic, social or migration costs issues. First, the age structure of country h's population matters (AGE_h), as theoretically expected. Indeed, before migrating, each individual wants to maximize the present value of its net expected income over its entire working life. Hence, migration must rise with the share of young people in country h's total population ($c_1 > 0$). As a proxy, we use the share of people younger than age 15 (source: United Nations, 2004).

We also include a ratio of education level ($\frac{EDUC_h}{EDUC_f}$), as in many other studies, in order to capture the specific and direct impact of skills on migration. It is measured by the net secondary enrollment ratio between country h and f (source: UNESCO, 2005). However, in the theoretical model, the influence of skills does not directly appear, since it is captured by the income inequality variables. This may produce some problems of significance if we introduce a specific education variable. We will come back to this issue later on in the sensitivity analysis.

The problem of omitted variables is tackled in the last line of equation (7). It

¹⁵Data are derived from Source OECD (2005b).

includes source country specific effects (α_h), destination country specific effects (β_f), time effects (γ_t) as well as bilateral country effects (η_{hf}). These effects may capture several factors, such as the impact of the business cycle on migration flows, the effects of history (colonies, etc.), wars or coups d' Etat, or country-specific policies (other than migration policies). It has recently be shown that these effects must be included simultaneously in order to take into account the potential unobserved effects or omitted variables in gravity models (Baltagi et al., 2003; Egger and Pfaffermayr, 2003; Egger, 2004). These effects may be considered as fixed or random depending on the econometric specification of the model. Their significance will be tested later in the following section.

3.2 Estimation, results and sensitivity analysis

Although the existing empirical models generally estimate linear models, we choose here to implement a semi-log specification, with the dependent variable expressed in log. This choice is motivated by the Davidson and MacKinnon test, which rejects the linear model, but does not reject a semi-log specification (see note in Table 2)¹⁶. However, preliminary estimations with the linear model do not significantly change the results compared to the semi-log model.

Additional preliminary estimations have also been implemented with the OLS and the Within estimators. The LM test clearly rejects the OLS specification, whereas the Wald tests show that the specific effects referred to above are all very significant, especially the bilateral effects (see Table 2). This correlates

¹⁶The Davidson and MacKinnon estimate is essentially used to test the linear versus log-linear model. The logic of this test is to estimate the linear regression, including as an additional variable (called f_0) the difference between the predictions from the loglinear model and the log of the predictions of this model. If f_0 is statistically significant, we conclude that the loglinear model adds significant fit to the linear one, thus arguing against the linear model. This model has been adapted here to test the linear versus the semi-log model.

with some new results found in international trade models (Egger and Pfaffermayr, 2003; Péridy, 2005) and justifies the inclusion of these specific effects in this type of model.

However, the Within estimator can hardly be implemented here, since a significant number of variables are time invariant. In particular, some crucial migration cost variables, such as border effects, distance or differences in language cannot be estimated, as they are all time-invariant. The same problem applies to income inequality and the dispersion of social transfers, which are calculated for one year only. As a consequence, a random effect estimator must be implemented.

Nevertheless, the Hausman test clearly indicates a correlation of the residuals with some independent variables. This implies that the standard GLS or FGLS estimators for random effects models cannot be carried out without any bias. In order to solve this problem, we propose to use the Hausman and Taylor estimator, as suggested by several authors in this case (Greene, 2003; Egger, 2004). In order to implement this estimator, equation (7) must be first transformed as follows:

$$\begin{aligned}
 Z_{hft}^* &= Z_{hft} - \theta_{hf} Z_{hft}^m \\
 \theta_{hf} &= 1 - \frac{\sigma_v}{\sigma_s} \\
 \sigma_s &= \sqrt{(T_{hf} \sigma_\mu^2 + \sigma_v^2)}
 \end{aligned} \tag{9}$$

where Z_{hft}^* denotes any variables in equation (7) and Z_{hft}^m reflects the group means of these variables.

As a second step, deviations from group means are calculated to consistently estimate the parameters corresponding to the time-varying independent variables. This has been carried out with LSDV. The residual variance estimator is a consistent estimator of σ_v . As a next step, σ_s is estimated from a 2SLS regression of the bilateral averages of the previous residuals (Within) on the time-invariant variables. The instruments used for these steps are the variables which are assumed to be uncorrelated with the residuals. This provides a consistent estimator of the time-invariant variables. This also makes possible to deduce an estimator of σ_μ^2 (between variance) from the estimation of σ_s and σ_v . The final step consists in re-estimating the complete model (with the transformed variables), with instrumental variables (see the detailed computation procedure in Greene, 2003, p.303). The model is only identified if the number of uncorrelated time-varying variables is at least as large as the number of correlated time-invariant variables.

From a practical point of view, the choice of the variables which are supposed to be correlated with the residuals is guided by the value of θ . The closer θ to one, the more similar the estimated variance (σ_s) to the Within variance (σ_v). As a result, the closer the estimated parameters to the Within parameters, the smaller the bias due to the correlation of the residuals to the selected independent variables. Consequently, we selected the correlated variables so as to choose a θ value as close to one as possible. This led us to select three variables, namely $\frac{Y_{ft}}{Y_{ht}}$, $TIES_{hft}$ and $BORD_{hf}$ as the correlated variables.

Table 2 reports the estimation results. A first set of specifications is proposed by using the full country sample, i.e. the 67 source countries and the 18 EU destination countries. Each specification differs according to the proxies which are selected. This provides a first sensitivity analysis concerning the robustness of the results. Models (1) to (4) only differ about the choice of the proxy for

public spending. Models (5), (6) and (7) respectively test different proxies for poverty, distance and the destination country's migration policy. Finally, as a final specification, model (8) includes the education level as a specific variable. In this first set of models, the impact of the dispersion in public spending is not tested, since the corresponding data is not available for all the countries included in the sample. From a theoretical point of view, the omission of this variable in the model amounts to assuming that social transfers do not differ across individuals in a same country, as in Hatton and Williamson (2004b). This assumption will be relaxed later.

Overall, the parameter estimates are remarkably stable whatever the specification. Moreover, most of them are significant at the 1% level and display signs which are consistent with the theoretical model. This concerns first the economic and social migration determinants (lines 1 and 2 of equation 7). For example, the parameter corresponding to the destination country's GDP (as a proportion of the source country's GDP) is always positive and significant at the 1% level. Similarly, the higher public spending in the destination country, the higher migration flows. This strongly supports the welfare magnet theory. In this regard, it must be observed that the proxy $SPEND4_f$ is even more significant than the other proxies, especially $\frac{SPEND1_f}{SPEND1_h}$ and $\frac{SPEND2_f}{SPEND2_h}$. This is not surprising because the former takes into account all social transfers, whereas the latter only consider public education and health spending. Consequently, $SPEND4_f$ will be included in the next specifications. The poverty constraint is also highly significant, especially $POV1_h$. This proxy will also be included in the following specifications of the model, since it is a specific variable, unlike $POV2_h$. Indeed, the latter is a combination of other independent variables (income inequality and GDP) and introduces some multicollinearity problems.

The parameter estimates related to migration costs are also very significant:

to start with, the distance between the source and destination country unambiguously reduces the emigration rate to country f . In this regard, although $DIST1_{hf}$ and $DIST2_{hf}$ are both significant and of similar magnitude, we select $DIST2_{hf}$ only in the final specification because it is a more precise measure, as shown in the previous section. Border effects are also very significant with a strong negative sign. This means that all things being equal, migrating within a country is much easier than migrating across countries. This result extends that found by Hunt and Mueller (2004) as well as Helliwell (1997) for the USA and Canada. It also complements some new results found in international trade theory, which point out the impact of border effects on international trade (Anderson and van Wincoop, 2004).

Differences in languages, in the cost of living and in the unemployment rate are also significant and clearly reduce the emigration rate, in accordance with theoretical expectations and whatever the model specification. Similarly, the presence of business ties or human networks always increases migration flows through the reduction of migration costs. The destination country migration policy is also a key variable in explaining migration flows. In this regard, the two selected proxies are significantly positive at the 1% level. In the final specification, we selected $POLICY1_f$ (number of residence permits) which is more precise than $POLICY2_f$ (dummy). The source country migration policy ($POLICY_h$), measured by the deprivation of rights, is also significant but shows a negative sign. As already mentioned, this can be explained by the choice of the proxy: the deprivation of freedom may in fact impede or discourage people from escaping their own country.

The age structure of the population also matters, as expected theoretically, and whatever the specification of the model. Finally, the education level ($\frac{EDUC_h}{EDUC_f}$) is introduced in the final specification (8) as a specific variable. Al-

though it does not directly appear in the theoretical model (since the impact of skills is captured in the income inequality variable), its value is significant at the 1% level and this variable does not alter the sign and the value of the other parameters. It can thus be kept in the final model, as in some other empirical studies (Clak and al., 2004; Hatton and Williamson, 2005a). Its negative signs are consistent with the theoretical model (refer to equation 4). Indeed, since EU countries are on average more equal than their partners, the EU return to skill is lower. As a result, an increase in the source country education level should reduce migration rate into the EU. From an empirical point of view, this result also reflects the change in the migration patterns into the EU over the past ten years, with the increase in the share of poor and unskilled migrants.

In Table 2's last column, a last specification includes the stock of migrants instead of the emigration rate as the dependent variable. As a consequence, the model now becomes dynamic, since it also includes the lagged stock of migrants as an independent variable (to account for human networks). From an econometric point of view, this introduces a potential bias due to the correlation between the residuals and the lagged variable. In order to tackle this problem, the most appropriate solution is the use of the Arellano, Bond and Bover's GMM estimator (Arellano and Bond, 1998; Arellano and Bover, 1995). The results are very similar to the HT models, since all the variables show the same sign as the final HT model (8).

In all the models presented in Table 2, the only parameter which is not always significant corresponds to income inequality, although it always presents the expected sign. This result can be explained by the fact that the country sample includes heterogeneous source countries in terms of income levels and income inequality. Indeed, we must remember that the coefficient a_2 and a_3 should be significantly positive and negative provided that the source countries are

either richer or poorer than the destination countries, and either more equal or more unequal. However, in this first set of models, the country sample includes both developed and developing countries. It thus simultaneously includes source countries which are richer and poorer than destination countries. As well, it includes source countries which are more equal and more unequal. Despite this problem, the income inequality variables can still be maintained in this first set of specifications, since they do not modify the sign and the value of the other parameter estimates.

As a second step, this problem can be addressed by reducing the source country sample to more homogenous countries. For that purpose, Table 3 first restricts the source country sample to developing countries only (non OECD). We check from our database that these countries are all poorer and almost all more unequal than the destination (EU) countries. Results unambiguously provide income inequality parameters which are significant at the 1% level, both in the HT and in the GMM specification¹⁷.

A final estimation is based on OECD source countries only. The advantage of this country restriction is to make it possible to estimate the impact of the dispersion in social transfers, and thus to relax the assumption of identical transfers across the individuals in a same country. As theoretically expected in section 2, a_5 and a_6 exhibit a positive and negative coefficient respectively, in both the HT and the GMM model. This original result complements the welfare magnet theory. It shows that migration flows not only depend on the public spending level, but also on the public spending dispersion.

4 Concluding remarks

¹⁷Note that in this specification, the Border effect parameter cannot be estimated, since there is no EU country in the restricted source country sample.

The results developed above point out that migration into the EU is driven both by traditional and new factors. Starting with the traditional ones, it has been shown that an increase in the income differential between the EU and the other countries significantly increases migration flows into Europe. In addition, and according to the Roy model, migration is an inverse U-shape function of source to destination country income inequality. Traditional migration costs also matter, as the geographical distance, the differences in languages, as well as differences in the cost of living and the unemployment rate between the EU and its partners. Human and business networks also play a significant role: the more important these networks, the lower migration costs and the higher migration. The final traditional variable is the age structure of the source country population. As theoretically expected, the younger this population, the higher migration flows into the EU.

New variables are also of particular significance for explaining migration flows into the EU. In particular, public spending in the EU is a significant variable in accordance with the welfare magnet theory. This result is also complemented by the significance of the dispersion in public spending. As expected from the theoretical model developed in the second section, migration is an inverse U-shape function of this variable. New migration costs also matters: in particular, border effects proved to be a major barrier to migration. Finally, source and destination countries' policy regulations are both of particular importance in explaining migration into the EU. In particular the EU migration policy, by determining the number of residence permits afforded to foreign people, represents a significant variable for the explanation of migration flows into the EU. Finally, the model has shown that migration flows into the EU are inversely related to the education level in foreign countries. This result is in contradiction with the current need of the EU labor markets, which require

an increasing number of skilled migrants. This inevitably raises the question of the opportunity of creating a unified skill-selective EU migration policy, as it is already the case in Canada.

Table 1: Variables' expected signs from the theoretical model

$\frac{M_{if}}{wh}$	0	
$\frac{M_{if}}{wf}$	0	
$\frac{M_{if}}{tf - th}$	0	
$\frac{M_{if}}{C_{if}}$	0	
$\frac{M_{if}}{c}$	0	
$\frac{M_{if}}{P_f}$	0	
$\frac{M_{if}}{A_i}$	0	
	destination country richer than source country	source country richer than destination country
	$wf - tf - wh - th - C_{if} - P_f - c$	$wf - tf - wh - th - C_{if} - P_f - c$
$\frac{M_{if}}{wh}$	0 if $wh - th$ wf up to $\frac{wh}{wf}$ 1 $\frac{th}{wf}$	0 if $wh - th$ wf up to $\frac{wh}{wf}$ 1 $\frac{th}{wf}$
$\frac{M_{if}}{wf}$	0 if $wf - tf$ wh up to $\frac{wf}{wh}$ 1 $\frac{tf}{wh}$	0 if $wf - tf$ wh up to $\frac{wf}{wh}$ 1 $\frac{tf}{wh}$
$\frac{M_{if}}{th}$	0 if th wh up to $\frac{th}{wh}$ 1	0 if th wh up to $\frac{th}{wh}$ 1
$\frac{M_{if}}{tf}$	0 if tf wf up to $\frac{tf}{wf}$ 1	0 if tf wf up to $\frac{tf}{wf}$ 1

Table 2: Estimation results: full country sample

Description	Variable	HT (1)	HT (2)	HT (3)	HT (4)	HT (5)	HT (6)	HT (7)	HT (8)	GMM (8)
GDP	Y_f/Y_h	0.0141***	0.0153***	0.0136***	0.0132***	0.0066***	0.0128***	0.0137***	0.0130**	0.0076**
Gini	$INEQ_f/INEQ_t$	0.184*	0.2273*	0.0074	0.0240	0.3428*	0.1190*	0.2110*	0.6564**	0.5724**
Gini ²	$(INEQ_h/INEQ_t)^2$	-0.207*	-0.2495*	-0.1915*	-0.1837*	-0.3502**	-0.2248*	-0.2460*	-0.3796***	-0.1615*
public spending	SPEND1 _f /SPEND1 _h SPEND2 _f /SPEND2 _h SPEND3 _f SPEND4 _f	0.183*	0.0132*	0.0281**	0.0726D-03***	0.0941D-03***	0.0786D-03***	0.0807D-03**	0.0870D-03**	0.0097D-03***
Poverty constraint	POV1 POV2	-0.0719***	-0.0660***	-0.0721***	-0.0721***	-0.0208*	-0.0726***	-0.0716***	-0.0534***	-0.0248***
Distance	DIST1 _{hf} DIST2 _{hf}	-0.00013***	-0.00013***	-0.00014***	-0.00013***	-0.00011***	-0.00013***	-0.00013***	-0.00013***	-0.00015***
Border effects	BORD _{hf}	-3.996***	-4.003***	-3.960***	-4.023***	-4.581***	-4.027***	-4.066***	-4.088***	-1.041***
Destination country's migration policy	POLICY1 _f POLICY2 _f	12.54***	12.48***	13.06***	11.98***	13.99***	12.08***	0.292***	11.89***	7.47***
Source country's migration policy	POLICY _h								-0.0689***	-0.0152***
Differences in language	LANG _{hf}	-1.434***	-1.433***	-1.479***	-1.283***	-1.497***	-1.305***	-1.281***	-1.222***	-2.276***
Cost of living	COSTLIV _f /COSTLIV _h	-0.909***	-0.909***	-0.918***	-0.901***	-0.981***	-0.920***	-0.889***	-0.869***	-0.381***
Unemployment	UNEMP _f /UNEMP _h	-0.0313***	-0.0214***	-0.0239***	-0.0213***	0.0603***	-0.0222***	-0.0206***	-0.0233***	-0.0761***
Business ties	TIES _{hf}	0.282D-05***	0.283D-05***	0.279D-05***	0.281D-05***	0.266D-05***	0.271D-05***	0.276D-05***	0.259D-05***	0.174D-05***
Human networks	NETWORK _{hf}	53.131***	52.708***	52.393***	53.015***	52.922***	52.915***	53.970***	54.281***	0.1201***
Age	AGE _h	0.0661***	0.0666***	0.0650***	0.0645***	0.0715***	0.0668***	0.0688***	0.0676***	0.0979***
Education Level	EDUCH/EDUC _f								-0.4659***	-0.6827***
Constant		-5.285**	-5.422***	-6.001***	-5832***	-5844***	-5.894***	-5.705***	-5.773***	-3.060***
R2 (adjusted)		0.885	0.884	0.884	0.885	0.866	0.885	0.885	0.885	0.888
number of observations		12060	12060	12060	12060	12060	12060	12060	12060	10854
Hausman and Taylor test (theta)		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	-

***) significant at a 1% level; **) significant at a 5% level; *) significant at a 10% level.

Davidson and McKinnon test for linear versus log-linear model: $f_0=0.00027$; test for linear versus semi-log model: $f_0=0.034**$

LM test: 30 633.72***

Wald tests: country h (α_h): 1292.5***; country f (β_f): 10396.7***; bilateral effect (η_{hf}): 18640.3***; time effect (γ_t): 17.9*

Hausman test: 218.24***

Table 3: Estimation results: Restricted country sample

Description	Variable	Developing		OECD	
		HT	GMM	HT	GMM
GDP	Y_f/Y_h	0.0100***	0.0067***	0.0352***	0.0355***
Gini	$INEQ_h/INEQ_f$	1.9640***	1.4825***	0.6179***	0.6121**
Gini ²	$(INEQ_h/INEQ_f)^2$	-0,6146***	-0.7204**	-0,5639***	-0,248**
public spending	$SPEND4_f$	0.0068D-03**	0.0076D-03**	0.0741D-03**	0.0011D-03***
dispersion of social transfers	$VARSPEND$			1.1397***	0.9331***
dispersion of social transfers (square)	$VARSPEND^2$			-0,1814*	-0,1124*
Poverty constraint	$POV1$	-0.0585***	-0.0120***	-0.1137***	-0.0489***
Distance	$DIST2_{hf}$	-0.00019***	-0.00016***	-0.00019***	-0.00020***
Border effects	$BORD_{hf}$			-4.372***	-1.501***
Destination country's migration policy	$POLICY1_f$	6.23***	7.63***	9.45***	7.88***
Source country's migration policy	$POLICY_h$	-0.0863**	-0.0296**	-0.0496**	-0.0221***
Differences in language	$LANG_{hf}$	-1.873***	-1.9666***	-1.089***	-1.8017***
Cost of living	$COSTLIV_f/COSTLIV_h$	-0.130***	-0.192***	-0.412***	-0.271**
Unemployment	$UNEMP_f/UNEMP_h$	-0.0352***	0.0543***	-0.0946***	-0.1381***
Business ties	$TIES_{hf}$	0.439D-05***	0.964D-05***	0.266D-05***	0.141D-05***
Human networks	$NETWORK_{hf}$	61.225***	0.1245***	27.222***	0.0964***
Age	AGE_h	0.0614**	0.0590***	0.0830***	0.1248***
Education Level	$EDUCH/EDUCf$	-0.9902***	-0.6281***	-0.8565***	-0.4298***
Constant		-9.538***	-5.206***	-4.081***	-3.314***
<i>R2 (adjusted)</i>		<i>0.851</i>	<i>0.991</i>	<i>0.952</i>	<i>0.994</i>
<i>number of observations</i>		<i>5720</i>	<i>5147</i>	<i>4589</i>	<i>4128</i>
<i>Hausman and Taylor test (theta)</i>		<i>0.99</i>		<i>0.99</i>	<i>-</i>

References :

Alvarez-Plata, H. Brucker and B. Silvertovs (2003) "Potential Migration from Central and Eastern Europe into the EU-15", Report for the European Commission, DG Employment and Social Affairs.

Anderson, J. and E. van Wincoop (2004) "Trade Costs", *Journal of Economic Literature*, 42(3): 691-751.

Arellano, M. and S. Bond (1998) "Dynamic Panel Data Estimation Using DPD98 for Gauss: A Guide for Users" CEMFI, Madrid

Arellano, M. and O. Bover (1995) "Another Look at the Instrumental Variable Estimation of Error Component-Models", *Journal of Econometrics*, 68: 29-51.

Baltagi, B., P.Egger and M. Pfaffermayr (2003) "A Generalized Design for Bilateral Trade Flow Models", *Economics Letters*, 80: 391-397.

Bauer, T. and A. Kunze (2004) "The Demand for High-skilled Workers and Immigration Policy", CEPR Discussion Paper 4274.

Bauer, T., M. Lofstrom, and K. Zimmermann (2000) "Immigration Policy, Assimilation of Immigrants and Natives' Sentiments towards Immigrants: Evidence from 12 OECD Countries", *Swedish Economic Policy Review*, 7(2): 11-53.

Bell, M. (2005), "Towards Rigorous Cross-National Comparison of Internal Migration: Who Collects What?", Paper presented for the International Union for the Scientific Study of Population, 25th Conference, 18-23 July, Tours, France.

Benhabib J. (1996), "On the Political Economy of Immigration", *European Economic Review*, 40(9): 1737-43.

Borjas, G. (1987) "Self Selection and the Earnings of Immigrants", *American Economic Review*, 77: 531-553.

Borjas, G. (1989) "Economic Theory and International Migration", *International Migration Review*, 23(3): 457-485.

Borjas, G. (1994) "The Economics of Immigration", *Journal of Economic Literature*, 32: 1667-1717

Borjas, G. and B. Bratsberg (1996) "Who Leaves? The Outmigration of the Foreign-Born", *Review of Economics and Statistics*, 78(1): 165-176.

Borjas, G. (1999) "Immigration and Welfare Magnets", *Journal of Labor Economics*, 17(4): 607-637.

Borjas, G. and S. Bronars (1991) "Immigration and the Family", *Journal of Labor Economics*, 9(2): 123-148.

Borjas, G., S. Bronars and S. Trejo (1992) "Self-selection and Internal Migration in the United States", *Journal of Urban Economics*, 32: 159-185.

Brucker, H. and B. Siliverstovs (2005) "On the Estimation and Forecasting of International Migration: How Relevant is Heterogeneity Across countries", IZA Discussion Paper 1710, Bonn: IZA

Brucker, H. and J.H. Schroder (2005) "International migration with Heterogeneous Agents: Theory and Evidence", mimeo, DIW Berlin.

CARIM (2005), Mediterranean Migration, 2005 Report, Euro-Mediterranean Consortium for Applied Research on International Migration, Robert Schumann Center, European University Institute.

Chiswick B. (1999) "Are Immigrants Favourably Self-Selected?", *American Economic Review*, 89(3): 181-185.

Clair and al. (2004) "Notes on CEPII's distances measures", www.cepii.fr.

Clark, X., J. Hatton and J. Williamson (2002) "Where do US Immigrants Come From and Why", NBER Working Paper 8998.

Clark, X., J. Hatton and J. Williamson (2004) "What explains Emigration out of Latin America?", *World Development*, 32(11): 1871-1890.

Dustmann, C. (2003) "Return Migration, Wage Differentials, and the Optimal Migration Duration", *European Economic Review*, 47(2): 353-369.

Dustmann, C. and A. Glitz (2005) "Immigration, Jobs and Wages: Theory, Evidence and Opinion", CEPR Reports and Books..

Egger, P. (2004) "On the Problem of Endogenous Unobserved Effects in the Estimation of Gravity Models", *Journal of Economic Integration*, 19(1): 182-191.

Egger, P. and Pfaffermayr (2003) "The Proper Panel Econometric Specification of the Gravity Equation : a Three-Way Model with Bilateral Interaction Effects" *Empirical Economics* 28(3): 571-580.

Eurostat (2005), Regio dataset, Population statistics.

Fertig, M (2001), "The Economic Impact of EU-Enlargement: Assessing the Migration Potential", *Empirical Economics*, 26: 707-720.

Freedom House (2005), Freedom in the World Rating Table, Civil and Political Rights, 1972-2004.

Greene W. (2003), *Econometric Analysis*. New York: Prentice-Hall International. 5th edition.

Greenwood, M. (1985) "Human Migrations: Theory, Models and empirical studies", *Journal of Regional Science*, 25(4): 521-544.

Hatton, T. (1995) "A Model of UK Emigration, 1870-1913", *The Review of Economics and Statistics*, 77(3): 407-415.

Hatton, T. (2005) "European Asylum Policy", IZA Discussion paper 1721.

Hatton, T. and J. Williamson (2005a) "What Fundamentals Drive World Migration?", in: G. Borjas and J. Crips (eds.), *Poverty, International Migration and Asylum*, Hampshire, Palgrave-MacMillan, pp.15-38.

Hatton, T. and J. Williamson (2005b) "Refugees, Asylum Seekers and Policy in Europe", CEPR Discussion Paper 5058.

Hatton, T. and J. Williamson (2004a) "Refugees, Asylum Seekers and Policy in Europe", NBER Working Paper 10680.

Hatton, T. and J. Williamson (2004b) "International Migration in the Long Run: Positive Selection, Negative Selection and Policy", NBER Working Paper 10529.

Head, K. and T. Mayer (2002) "Effet Frontière, intégration économique et Forteresse Europe", *Economie et Prévision* 0: 71-92.

Helliwell, J. (1997) "National Borders, Trade and Migration", *Pacific Economic Review*, 2(3), 65-85.

Hunt, H. and R. Mueller (2004) "North American migration: returns to skill, border effects and mobility costs", *The Review of Economics and Statistics*, 86(4): 988-1007.

International Labor Organization (2005), Laborsta, International Labour Office database on labour statistics, ILO Bureau of Statistics

Karemera, D., V. Oguledo and B. Davis (2000) "A gravity Model Analysis of International Migration to North America", *Applied Economics*, 32: 1745-1755.

Lalonde, R. and H. Topel (1997) "Economic Impact of International Migration and the Economic Performance of Migrants", in: M. Rosenzweig (ed), *Handbook of Population and Family Economics*, vol. 1B, Amsterdam: Elsevier, 799-850.

LIS (2005), Social transfers, basic descriptive, Luxembourg: Luxembourg Income Study.

Mayda, A.M. (2005) "International Migration: A Panel Data Analysis of Economic and Non Economic Determinants", IZA Discussion Paper 1590, Bonn: IZA.

McCallum, J. (1995) "National Borders Matter: Canada-U.S. Regional Trade Patterns", *American Economic Review*, 85(3): 615-23.*

Mercer (2005), Worldwide cost of living survey, London: Mercer, Human Resource Consulting.

OECD (2000), Perspectives de l'emploi de l'OCDE 2000 , Annual Report, Paris: OECD.

OECD (2005), *Trends in International Migrations*, SOPEMI, Annual Report, 2004, Paris: OECD Publishing.

Pederson, J., M. Pytlikova and N. Smith (2004) "Selection or Network Effects? Migration flows into 27 OECD Countries, 1990, 2000", IZA Discussion Paper 1104.

Péridy, N. (2005) " Trade Prospects of the new EU neighborhood policy : evidence from Hausman and Taylors' models ", *Global Economy Journal*, 5(1), pp.1-25

Razin, A and E. Sadka (1997) "International Migration and International Trade", in: M. Rosenzweig (ed), *Handbook of Population and Family Economics*, vol. 1B, Amsterdam: Elsevier, 851-887.

Source OECD (2005a) Social Expenditure Database, vol. 2001, public expenditure (SNA93).

Source OECD (2005b) Monthly International Trade, Total Trade by Partner Country, annual, vol.7, 2005.

UNESCO (2005), Statistical Yearbook.

UNHCR (2004), Statistical Yearbook, United nations High Commission for Refugees.

United Nations (2004), World Population Prospects Database, 1950-2000, the 2004 Revision.

United Nations (2005), *World Development Report*, Annual Report, UN: United Nations Development Programme.

World Health Organization (2005), World Health Report.

Zimmerman, K. (1994) "European Migration: Push and Pull", in: K. Zimmerman and T. Bauer (eds), *The Economics of Migration*, vol.1, pp.70-99

Zimmermann, K. (ed) (2005) *European Migration: What do we Know?*, CEPR, Oxford: Oxford University Press.

Zimmermann, K. and T. Bauer eds. (2002) *The economics of Migration*, vol.I-IV, Cheltenham/Northampton: Edward Elgar Publishing Ltd.