
DOCUMENT
DE TRAVAIL
N° 453

**AGGREGATE FLUCTUATIONS AND
INTERNATIONAL MIGRATION**

Michel Beine, Jean-Charles Bricongne and Pauline Bourgeon

October 2013



**AGGREGATE FLUCTUATIONS AND
INTERNATIONAL MIGRATION**

Michel Beine, Jean-Charles Bricongne and Pauline Bourgeon

October 2013

Les Documents de travail reflètent les idées personnelles de leurs auteurs et n'expriment pas nécessairement la position de la Banque de France. Ce document est disponible sur le site internet de la Banque de France « www.banque-france.fr ».

Working Papers reflect the opinions of the authors and do not necessarily express the views of the Banque de France. This document is available on the Banque de France Website “www.banque-france.fr”.

Aggregate Fluctuations and International Migration¹

Michel Beine², Pauline Bourgeon³, Jean-Charles Bricongne⁴

¹ This paper has benefitted from comments from the audience at various seminars held in Paris at Banque de France (internal seminar and CEPR Global Spillovers and Business Cycles conference), Moscow (HSE), Paris (Paris 1 Macro Workshop), and Aix (AFSE congress). We thank in particular Simone Bertoli, Jean-François Carpentier, Xavier Chojnicki, Nicolas Coeurdacier, Frédéric Docquier, Lionel Fontagné, Jean Imbs, Daniel Mirza, Henri Pagès, Chris Parsons, Gilles Saint-Paul, Wessel Vermeulen for helpful comments on a previous version. The help of Jean-Marc Thomassin is gratefully acknowledged.

² CREA, University of Luxembourg, CES-Ifo and Banque de France, michel.beine@uni.lu

³ Banque de France and Université Paris 1 - Panthéon Sorbonne

⁴ Banque de France

Résumé en français

Les théories traditionnelles d'intégration économique accordent beaucoup d'importance à la mobilité internationale pour faire face aux chocs asymétriques au sein d'une zone. Pourtant, les travaux récents sur les migrations internationales ont ignoré le rôle des chocs conjoncturels dans la détermination des flux de migrations internationales. Ce papier a pour objectif de combler cette lacune. Nous dérivons d'abord un modèle de choix optimal de migration, qui est une extension du modèle d'utilité aléatoire (Random Utility Model). Notre modèle prédit qu'une amélioration de la situation économique d'un pays de destination potentielle relativement au pays d'origine pourrait accroître le flux de migrants entre ces deux pays. Et ce, en plus d'une augmentation due à des facteurs de migration structurels tels que le différentiel de salaire ou la distance géographique. En construisant une base de données de flux migratoires bilatéraux annuels bruts entre 30 pays développés sur la période 1980-2010, nous testons empiriquement l'ampleur de l'effet des chocs conjoncturels sur les flux de migration bilatéraux. Nos résultats indiquent que les fluctuations agrégées et les taux d'emploi relatifs affectent l'intensité des flux migratoires bilatéraux. Par ailleurs, nous apportons la preuve que les accords de Schengen et l'introduction de l'euro ont permis d'augmenter la mobilité des travailleurs entre les États membres.

Codes JEL : F22, O15

Mots clés : Migrations internationales, Chocs conjoncturels, Pays de l'OCDE, Maximisation du revenu

Abstract

Traditional theories of integration such as the optimum currency area approach attribute a prominent role to international labour mobility in coping with relative economic fluctuations between countries. However, recent studies on international migration have overlooked the role of short-run factors in explaining international migration flows. This paper aims to fill that gap. We first derive a model of optimal migration choice based on an extension of the traditional Random Utility Model. Our model predicts that an improvement in the economic activity in a potential destination country relative to any origin country may trigger some additional migration flows on top of the impact exerted by long-run factors such as the wage differential or the bilateral distance. Compiling a dataset with annual gross migration flows between 30 developed origin and destination countries over the 1980-2010 period, we empirically test the magnitude of the effect of short-run factors on bilateral flows. Our econometric results indicate that relative aggregate fluctuations and employment rates affect the intensity of bilateral migration flows. We also provide compelling evidence that the Schengen agreements and the introduction of the euro significantly raised the international mobility of workers between the member countries.

JEL Classification: F22, O15

Keywords: International Migration, Business cycles, OECD countries, Income Maximization.

1 Introduction

International movements of workers between OECD countries have steadily increased over the last 50 years. According to OECD data, this trend clearly intensified as of the early 1980s.¹ Historically, migration has always been a labor market alternative for economic agents. In the face of adverse economic developments, households or workers may choose to migrate to a particular external country (from a set of alternative destinations) based on considerations that are essentially related to expectations regarding future income. Such decisions are generally based on their perceptions of current and future economic conditions both within their country of origin and in a number of potential destinations. Although many other factors are relevant for migration decisions, this paper focuses on the role of short-run economic factors in shaping the migration choice, and in particular on the role of business cycle fluctuations and employment prospects.

For many years, economists have considered labour mobility as an important macroeconomic adjustment mechanism. The literature on optimum currency areas pioneered by Robert Mundell in 1961, has underscored the role of labor mobility as an adjustment mechanism within a currency union in the face of asymmetric shocks between the participating countries or regions. The criterion of labour mobility has been used as a key measure in assessing whether or not a particular area represents a so-called optimum currency area. Indeed, during the 90s, numerous studies disqualified Europe as an optimum currency area because of its lack of labour mobility. In contrast, Blanchard and Katz (1992) argued that labour mobility could be seen as a dominant adjustment mechanism in reaction to transitory fluctuations in the United States. In the absence of reliable data on labour movements, the supporting evidence was however obtained via an indirect analysis based on a VAR approach involving price, wage and unemployment dynamics. One of the underlying assumptions used to infer the degree of labour mobility is that labor mobility will induce wage and employment adjustment. This is a debatable assumption in the light of recent literature on the impact of immigration on wages (Borjas et al. (1996), Card (2001), Docquier et al. (2011)). As an alternative to this indirect approach, this paper proposes a direct analysis of the relationship between labour mobility and business cycle fluctuations, taking advantage of new data on migration flows and building on recent developments in microfounded estimable gravity models. In other words, our aim is to tackle an old problem with a fresh approach.

In particular, we test how international migration flows react to economic fluctuations in a sample of mostly OECD countries. To do so, we build and use data of annual migration flows between 30 countries over the 1980-2010 period. We also focus on the European Monetary Union and in particular on the impact of the Schengen agreements and the EMU itself on the degree of labour mobility between European countries. Such an investigation might be useful in assessing whether Europe may be more of an OCA ex-post rather than ex-ante.² If the integration process itself leads to a change in the sensitivity of labour mobility to asymmetric shocks, this in turn lowers the need to rely on alternative adjustment mechanisms within a monetary union.

Our analysis belongs to the extensive literature on the determinants of migration. Up to now, this literature has mostly focused on long-run factors of an economic, geographic, cultural and demographic nature.³ We build on this extensive literature and extend it by looking at the

¹Cf. OECD, International Migration Outlook 2007.

²Work in this area was primarily conducted in the 90s, but using different criteria. See for instance Frankel and Rose (1998) relating trade integration to the asymmetry in business cycle fluctuations.

³Since the early work of Mayda (2010), empirical literature on the determinants of migration has developed rapidly. For instance, among many others, Chiquiar and Hanson (2005) focus on the role of education. Grogger

specific marginal role of short-run factors such as the business cycle and the employment rate. In doing so, we integrate the traditional impact of long-run factors identified in the previous literature in order to isolate the specific role of the short-run variables.

There is, however, a body of recent literature acknowledging the importance of short-run factors. Coulombe (2006) empirically investigates the determinants of internal labor mobility in Canada. He finds an important role for the wage differentials between Canadian provinces but finds no impact from business cycle fluctuations. Simpson and Sparber (2012) disentangle the reaction of immigrant inflows to short-run and long-run factors between American States. Other papers also consider these short-run factors in an international perspective. Mc Kenzie, Thoharrides and Yang (2010) focus on the impact of economic fluctuations in destinations on the intensity of emigration from the Philippines. Bertoli et al. (2013b) analyze the reaction of German immigration flows to the onset of the economic crisis in Europe. We contribute to this literature by generalizing this type of approach to a large set of origin and destination countries over a period including various episodes of macroeconomic fluctuations. In turn, the use of a large pool of origin and destination countries observed over a relatively long period gives additional flexibility in the empirical identification of the factors. One important element is our use of relative measures of business cycle fluctuations and employment rates allowing the capture of situations in both origin and destination countries.

Our empirical strategy directly results from the derivation of a random utility model commonly used in the literature of determinants of migration (Borjas (1987), Grogger and Hanson (2011), Beine et al. (2011)). The income maximization framework allows the capture of migrants' choices of destination from a set of alternative destinations. The traditional benchmark model is extended to allow some role for short-run factors. In the model, business cycles and current employment rates exert an ultimate role on migration as they signal the evolution of future employment opportunities for economic agents. The theoretical equilibrium then leads to a pseudo-gravity model of international migration which can be readily estimated (Anderson, (2011)).

To sum up, our contribution is thus fourfold. First, we look at the importance of cyclical shocks in explaining international migration flows in a cross-country perspective. Second, we derive an empirical specification with theoretical microfoundations. Third, we compile a complete dataset of annual gross bilateral flows covering a large set of countries over 1980-2010 and including macroeconomic indicators both at origin and at destination. Fourth, this overall framework allows us to account for short-run and long-run factors within the same model. Our results suggest that short-run economic developments (business cycles fluctuations and employment prospects) both at origin and at destination affect the level of bilateral migrant flows on top of the long-run factors such as the wage differential. As a by-product of the empirical analysis, we also provide evidence that the Schengen agreements and the introduction of the euro significantly raised international mobility between the countries.

The remainder of the paper is organized as follows. Section 2 presents the theoretical foundations of our empirical model. Section 3 describes in detail the data used, thereby providing a number of stylized facts on migration flows. Section 4 outlines the econometric model(s) and presents the main empirical results and section 5 concludes.

and Hanson (2011) look at the role of wages while Rosenzweig (2006) focuses on skill prices. Other papers such as Beine et al. (2011) or McKenzie and Rapoport (2010) look at the role of networks. Clark, Hatton and Williamson (2007) investigate the role of distance in a broad sense. Beine and Parsons (2012) focus on push factors like climatic shocks and natural disasters. Bertoli and Fernandez-Huerta Moraga (2012) investigate the role of bilateral migration policies.

2 Theoretical background: the income maximization approach

Our theoretical foundation is derived from the income maximization framework, which is used to identify the main determinants of international migration and to pin down our empirical specification. The income maximization approach was first introduced by Roy (1951) and Borjas (1987) and further developed by Grogger and Hanson (2011) and Beine et al. (2011). It is also directly related to the extensive literature dealing with discrete choice models initiated by the seminal work of McFadden (1974). This approach allows the capture of migrants' choices of destination from a set of alternative destinations. The theoretical equilibrium leads to the use of pseudo-gravity models of international migration which can be readily estimated (on this point, see Anderson (2011)). One of the main strengths of the income maximization approach is its ability to generate predictions in line with the recent (macro-economic) literature on international migration. By grounding our empirical specification in a theory with a well-established track record, we try to eliminate any ad-hoc specifications and to rationalize the obtained empirical relationships. This model has been successfully applied to analysis of the impact of various determinants of international migration. For instance, it has been used to capture the specific role of wage differentials (Grogger and Hanson (2011)), the significance of social networks (Beine et al. (2011 a and b)), the "brain-drain" phenomenon (Gibson and McKenzie, (2011)) and the impact of climatic factors (Beine and Parsons (2012)).

Our model considers homogeneous agents who decide whether or not to migrate, and then their optimal destination in the event they should decide to move. Agents therefore maximize their expected utility across the full set of possible destinations which includes the home country as well as all possible foreign countries globally. In this study, we analyze migrations among developed countries. All included countries are therefore considered as potential origin and destination countries. Time is included and the model is estimated over a period ranging from 1980 onwards using annual data. In contrast with the benchmark model of Random Utility Maximisation used by McFadden (1974), we do not assume full employment at origin and destination. In the traditional model, agents do not face any uncertainty about future employment, so that what matters for their optimal decision is only the amplitude of wage differential and the level of migration costs. In a world with unemployment rates closer to 10% rather than to what can be viewed as the natural unemployment rate, this assumption may well be too strong. We have therefore extended the traditional RUM approach and assumed that agents will form expectations of future employment based on information provided by the current state of the economy. This involves the current level of economic dynamism (here, the business cycle) and the current employment rate.

2.1 Utility, income, unemployment and expectations

An individual's utility is log-linear in expected income ($E(y_{i,t})$) and depends on the characteristics of his country of residence, the characteristics of any particular destination among the set of potential destinations, and the costs of moving between the origin and the selected destination.⁴ The utility of an individual born in country i and staying in country i at time t

⁴The assumption of a log-linear utility function is discussed in Anderson (2011). Note that in contrast with utility linear in income, the log-linear utility implies constant relative risk aversion (with a degree of relative risk aversion equal to 1). Endogeneizing the wages, Anderson (2011) derives a pseudo-gravity model including inward and outward multilateral resistance for a degree of relative risk aversion equal to 2.

is given by:

$$u_{ii,t} = \ln(E(y_{i,t})) + A_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $A_{i,t}$ denotes country i 's characteristics (amenities, public expenditures, social benefits and other push or pull factors) and $\varepsilon_{i,t}$ is a iid extreme-value distributed random term. The utility related to migration from country i to country j at time t is given by:

$$u_{ij,t} = \ln(E(y_{j,t})) + A_{j,t} - C_{ij,t}(\cdot) + \varepsilon_{j,t} \quad (2)$$

where $C_{ij,t}(\cdot)$ denotes the migration costs of moving from i to j at time t . In this framework, $\varepsilon_{i,t}$ satisfies the hypothesis of the independence of irrelevant alternatives (IIA) (see McFadden, 1984).⁵

Agents form expectations regarding the future incomes prevailing in all possible destinations including their country of origin. Expected incomes in country i and country j are given by the expected income conditional upon being employed (the average wage level) times the expected probability of being employed in that country. We suppose that each individual receives some unemployment benefits in his/her native country denoted by B but not abroad. For the sake of simplicity, B is supposed to be the same across countries, across individuals and over time, i.e. $B_{i,t} = B$. For country i , expected income is given by:

$$E(y_{i,t}) = E(y_{i,t}|e_{i,t} = 1).E(e_{i,t}) + B.(1 - E(e_{i,t})) = w_{i,t}.E(e_{i,t}) + B.(1 - E(e_{i,t})). \quad (3)$$

where $e_{i,t} = 1$ if the individual is employed in country i at time t , 0 otherwise. Expected income under employment $E(y_{i,t}|e_{i,t} = 1)$ is given by the average level $w_{i,t}$. For country j , we have:

$$E(y_{j,t}) = E(y_{j,t}|e_{j,t} = 1).E(e_{j,t}) = w_{j,t}.E(e_{j,t}). \quad (4)$$

We suppose that when migrating to a new country, the migrant is not immediately eligible for unemployment benefits. Hence we suppose that $B_{j,t} = 0$.

In turn, agents form expectations regarding the probability of being employed in the future. Given that there is uncertainty about the future stance of the economy, the expected probability of employment is supposed to be given by a mixture of the current level of employment in the economy and its current cyclical state. Migrants use both types of information since they encompass different types of information, both in terms of economic mechanisms and in terms of forecast horizon of the employment rate in the country.

The current employment rate is supposed to exert some signal to the migrants about the future rate of employment in the economy through extrapolative expectations. Migrants can directly observe the current employment rate which provides a good prediction of the next period employment rate for a given level of business cycle. The current level of employment rate integrates to a certain extent the impact of past business cycles and some structural effect of the labour market. The current business cycle provides some information which is more forward looking in terms of future employment rates. The rationale behind such a signalling process refers to the feedback mechanisms from output changes to unemployment as captured for instance by Okun's law. This law relates the business cycle and future labour market tightness at the aggregate level. Empirical literature has shown the relevance of this law in many developed countries and has also documented that there are lags in the transmission of the

⁵This hypothesis implies a constant rate of substitution between alternative destinations. In the econometric framework which is derived from this model, deviations from the IIA hypothesis might lead to inconsistent estimators. Therefore, we check after estimation that our estimates are robust to the successive drop of the various destination countries included in the sample.

cycle to the labour market.⁶ While positive, the correlation between the current employment rate and the business cycle is far from 1, reflecting the complex dynamics between the current employment rate and the business cycle.⁷

Based on these assumptions, the expected probability of employment in country i is given by:

$$E(Prob(e_{i,t} = 1)) = (1 - ur_{i,t})^\theta (bc_{i,t})^\lambda. \quad (5)$$

where $ur_{i,t}$ denotes the unemployment rate and $bc_{i,t}$ is a business cycle indicator. This indicator may be expressed on a 0 – 100% scale to match the metric in the employment rate. θ is a parameter capturing the importance of current employment rate for predicting unemployment while λ captures the importance of business cycles in the expectation process.

2.2 Equilibrium migration rate

Let $N_{i,t}$ be the size of the native population in country i at time t . When the random term follows an iid extreme-value distribution, we can apply the results in McFadden (1974) to write the probability that an agent born in country i will move to country j as:

$$\Pr \left[u_{ij,t} = \max_k u_{ik,t} \right] = \frac{N_{ij,t}}{N_{i,t}}$$

where $N_{ij,t}$ is the number of migrants in the i - j migration corridor at time t . Similarly, $N_{ii,t}$ stands for the proportion of workers remaining in their country of origin during period t . This gives:

$$\frac{N_{ij,t}}{N_{i,t}} = \frac{\exp [\ln(w_{j,t}) + \theta \ln(1 - ur_{j,t}) + \lambda \ln(bc_{j,t}) + A_{j,t} - C_{ij,t}]}{\sum_k \exp [\ln(w_{k,t}) + \theta \ln(1 - ur_{k,t}) + (\lambda \ln(bc_{k,t}) + \ln(B * ur_{k,t}) + A_{k,t} - C_{ik,t})]} \quad (6)$$

Likewise we may compute the equilibrium rate of stayers over natives, giving the equilibrium probability for a native to stay in his or her own country rather than emigrating as:

$$\frac{N_{ii,t}}{N_{i,t}} = \frac{\exp [\ln(w_{i,t}) + \theta \ln(1 - ur_{i,t}) + (\lambda) \ln(bc_{i,t}) + \ln(B * ur_{i,t}) + A_{i,t}]}{\sum_k \exp [\ln(w_{k,t}) + \theta \ln(1 - ur_{k,t}) + (\lambda) \ln(bc_{k,t}) + \ln(B * ur_{k,t}) + A_{k,t} - C_{ik,t}]} \quad (7)$$

The equilibrium bilateral migration rate between i and j is obtained by taking the ratio ($N_{ij,t}/N_{ii,t}$) at equilibrium :

$$\frac{N_{ij,t}}{N_{ii,t}} = \frac{\exp [\ln(w_{j,t}) + \theta \ln(1 - ur_{j,t}) + (\lambda) \ln(bc_{j,t}) + A_{j,t} - C_{ij,t}]}{\exp [\ln(w_{i,t}) + \theta \ln(1 - ur_{i,t}) + (\lambda) \ln(bc_{i,t}) + \ln(B * ur_{i,t}) + A_{i,t}]} \quad (8)$$

Taking logs, we obtain an expression giving the log of the bilateral migration rate between i

⁶Early estimates of the transmission lags in the Okun's law amount to about 6 to 8 quarters, i.e. 1.5 to 2 years. For some recent evidence on Okun's law in OECD countries, see among others Ball et al. (2013) Gordon (2010) and Lee (2000). In general the empirical literature points to the relevance of Okun's law for all developed countries, although with different sensitivities of unemployment rate to output fluctuation. There is also a general controversy on whether there has been a shift in the average key elasticity and on whether there are asymmetries in the response of unemployment to output shocks.

⁷Depending on the measure of the business cycle, the correlation between the relative employment rate and the relative business cycle is comprised between 0.02 and 0.24.

and j over stayers at time t :

$$\ln\left(\frac{N_{ij,t}}{N_{ii,t}}\right) = \ln\left(\frac{w_{j,t}}{w_{i,t}}\right) + \theta \ln\left(\frac{1 - ur_{j,t}}{1 - ur_{i,t}}\right) + (\lambda) \ln\left(\frac{bc_{j,t}}{bc_{i,t}}\right) - \ln(B) - \ln(ur_{i,t}) + A_{j,t} - A_{i,t} - C_{ij,t}(\cdot) \quad (9)$$

Expression (9) allows us to identify the main components of the aggregate bilateral migration rate: (i) the wage differential in the form of the wage ratio ($\frac{w_{j,t}}{w_{i,t}}$), (ii) differential in employment rates, (iii) differential in business cycles; (iv) differential in pull and push factors at destination $A_{j,t}$, and at origin ($A_{i,t}$); (v) the level of unemployment benefits in the origin country; (vi) the unemployment rate in the country of origin and (vii) finally the bilateral migration costs between i and j , $C_{ij,t}$. It should be emphasized that in that framework, a rise in unemployment in the origin country exerts two separate effects. The first one is that in presence of unemployment benefits, an increase in unemployment rate might reduce the propensity to migrate. This effect is stronger the higher the average level of unemployment benefits paid to native workers. If the native is not eligible for unemployment benefits or if the origin country does not pay benefits ($B = 0$), then this effect does not exist and only the second effect prevails.⁸ Second, an increase in current unemployment lowers the probability of employment for the individual and increases the differential with respect to the potential destinations. This favors emigration from country i .

Note that by construction, the impact of the relative business cycle on the bilateral migration rate is proportional to its importance for building expectations of future employment rate. This reflects the theoretical channel that is favored in the model. Nevertheless, in the empirical part, the estimated value of λ could be also driven by alternative channels.

2.3 Migration costs

Putting everything together, our cost function can be expressed as:

$$C_{ij,t} = c(x_i, x_j, x_{ij}, x_{it}, x_{jt}, x_t, x_{ijt}) \quad (10)$$

The cost function is supposed to be separable (i) into time-invariant origin country factors (x_i) such as being an island, being landlocked, time-invariant destination country factors (x_j) such as being an island, being landlocked (ii) country pair specific time-invariant (x_{ij}) that include for instance linguistic proximity or bilateral migration policies that are constant over the period under investigation, (iii) time-varying origin country factors (x_{it}) that include for instance unemployment benefits at origin or human capital level of the country, (iv) time-varying destination specific factors (x_{jt}) such as unilateral immigration policies and finally (v) time-varying pair-specific factors x_{ijt} such as diasporas at destination or time-varying bilateral policies between the origin and the destination, such as the Schengen agreements in Europe. Given the data dimension, all those cost components, except one can be either directly observed or captured by the relevant combination of fixed effects. The main exception is of course the last component which requires only observable variables for that component to be explicitly accounted for, otherwise, it would encompass all other variables.

⁸Note however that our framework does not account for liquidity constraints in the migration process. If unemployment at origin makes those constraints more binding, this could lead to an additional decrease in the bilateral migration flows. We do not account explicitly for such a possibility but this could be done easily by making the bilateral migration costs $C_{ij,t}$ to depend on $ur_{i,t}$. In that case, the estimated coefficient of $ur_{i,t}$ will capture the joint effect due to unemployment benefits and liquidity constraints.

3 Data

The estimation of the equilibrium condition (9) requires the collection of data relative to international migration, relative to economic outcomes such as aggregate wage, GDP, employment rates and relative to relationships between countries such as bilateral agreements or geographic distance.

3.1 Migration and population data

The key data needed to estimate equation (9) is about international migration. From equation (9), we can identify three important and desirable features for this data. First, the data must capture flows of international migration between countries. Second, the dimension must be dyadic, i.e. the data must capture flows between country pairs. Furthermore, the international migration data must have a large enough time dimension. Finally, given the focus on the role of economic fluctuations in explaining international migration flows, the migration flows must be observed at a business cycle frequency. To the best of knowledge, there is no ready-to-use dataset combining those desirable features.⁹

To estimate equation (9), we also need to know the population of native workers $N_{ii,t}$. Since this data is not available and cannot be computed on an annual basis, we proxy it by $N_{i,t}$. This latest data of total population in a given country i at year t is obtained from the World Population Prospects (2010 revision database). This database is produced by the Population Division (Department of Economic and Social Affairs) of the United Nations. Data cover total populations (both genders combined) of major countries, on an annual basis, from 1950 to 2010. The corresponding data can be found on <http://esa.un.org/unpd/wpp/Excel-Data/population.htm>.

As a result, following number of previous authors who have studied migration flows, we built our own dataset combining different sources of information.¹⁰ Our migration data display important features in terms of cross-country coverage and in terms of time span. First, our bilateral migration flows cover 30 origin and destination countries.¹¹ Overall, our data captures an important share of total international migration to and from OECD countries.¹² Second,

⁹For instance, two well-known cross-country data on international migration, namely Docquier and Marfouk (2007) on the one hand and Ozden et al. (2011) on the other hand are suited more for capturing the long-run determinants of international migration. Docquier, Marfouk and Lowell (2009) provide bilateral migration stocks with information about education levels (as well as gender) for two years only, 1990 and 2000. Ozden et al. (2011) provide a complete coverage at the global level of bilateral stocks for 5 years (1960, 1970, 1980, 1990 and 2000) by gender only.

¹⁰For instance, Belot and Ederveen (2012) build their own dataset to analyse the role of cultural barriers between 22 OECD countries over the 1990-2003 period. Pedersen et al. (2008) build migration flows for 27 OECD countries and more than 120 origin countries for the 1990-2000 period. They combine information provided by the national statistical offices of the destination countries with OECD data extracted from "Trends in International Migration".

¹¹The list of countries is: Australia, Austria, Belgium, Canada, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden, Switzerland, the United States, Spain and the UK.

¹²Comparing our data with the most comprehensive data provided by Docquier, Marfouk and Lowell (2007), we cover most of the migration process between OECD countries. Our data does not include 6 destination

we capture annual migration flows over a period of 30 years, from 1980 to 2010. Our sample period therefore covers a number of major episodes of economic fluctuations in the modern era, such as the recession following the second oil shock in the early 80's, the recovery of the late eighties in many OECD countries, the US recession in the early nineties, the European recession of the mid-nineties, the US expansion in the late nineties and last but not least the financial crisis in 2008.

Appendix A gives the details of the collected migration data in terms of definitions, sources and available information. We combine two sources, the international migration flows dataset from the UN¹³ and the OECD International Migration database.¹⁴ These two databases give us, for all destination countries, migrant inflows by origin country. They both aggregate information registered at the country level. Since the national authorities use different data collection processes and because we associate two different sources, we face some potential problems of data comparability. The first one is geographic and time coverage. Only a few countries provide data for all origin countries over the whole period (1980-2010). In order to keep a sufficiently balanced panel data set, we retained in our final selection only countries which provided data on a substantial number of origins and over a long enough period of time. Another issue relates to the definition of migrant flows because national authorities use three distinct criteria to register immigrants. We tried to keep the same criterion for all countries to obtain as harmonized a sample as possible. Most countries in our sample use the residence criterion, others use the citizenship criterion and only one country uses the country of birth criterion.¹⁵ The last issue refers to particular migrant groups. Some countries register only foreigners migrants and do not consider citizens who migrate back to their country of origin.¹⁶ The residence criterion allows us to capture better short-term mobility since it covers the last origin of migrants, while citizenship and birth criteria capture respectively long-term immigrants and immigrants from a permanent origin. The residence criterion involves the delivery of a residence permit, the duration of stay considered varies among countries.¹⁷ In addition, it is important to remember that the date of a residence permit may or may not coincide with the date of arrival of a migrant.

In spite of a strong selection of countries, our panel data set remains quite unbalanced in terms of migration flows. Overall, we have a significant number of missing observations but very few zero values. For all years, all origins and destination countries, we have 11816 missing values, i.e. 43.8% of all potential observations. In contrast, we have only 206 zero flows, i.e. less than 1% of our observations. These 206 zero flows represent less than 1.5% of the non-missing observations. In terms of econometric implications, the low occurrence of zeros allows us to use the traditional panel data methods as opposed to the alternative techniques such as Poisson

countries (out of 31) covered by Docquier et al. (2007): Japan, Korea, Mexico, Poland, Turkey and South Africa. Still, the 25 common destination countries represent respectively 90 and 91% of total migration stocks captured in Docquier et al. (2007) respectively for 1990 and 2000; and it represents 96% of skilled migrants observed in 1990 and 2000. With respect to Docquier et al. (2007), we capture 4 additional destination countries, namely Romania, Russia, Slovakia and Croatia.

¹³This dataset is provided by United Nations Population division. More information may be found on <http://www.un.org/esa/population/migration/>.

¹⁴Downloadable on <http://stats.oecd.org/>

¹⁵For countries for which it was possible, we checked the correlation between alternative criteria. We get quite a positive correlation in the range of 0.8.

¹⁶We also checked that this, in terms of migrant definition, would not be an issue for our analysis.

¹⁷More information is available on http://www.un.org/esa/population/migration/CD-ROM%20DOCUMENTATION_UN_Mig_Flow_2010.pdf

Maximum likelihood or hurdle models.¹⁸

The number of missing observations for bilateral migration flows is highly unbalanced in terms of years and destinations countries. In terms of time, we have a higher proportion of missing data in the eighties. There is a steady decrease of missing values over time reflecting a global improvement of the statistical collection of migration flows as well as the progressive integration of Eastern European countries such as Slovenia, Slovakia and Russia. The data for 2010 shows nevertheless a high number of missing observations as well, because the data collection for that year was still underway at the time this paper is written.

The proportion of missing values is unequally distributed across destination countries, reflecting differences in size and quality of data collection. In short, there is a large proportion of missing values in relatively small destination countries such as Luxembourg, Greece, Portugal and Israel. There is also a significant proportion of missing values for Eastern European countries such as Russia, Romania and Croatia. There are nevertheless exceptions to that rule, with large developed countries such as France and the UK displaying a relatively high number of missing observations.

Figure 1 reports the number of zeroes and missing observations for the bilateral flows over the full period 1980-2010 for each destination.

3.2 Wages, business cycles, employment rates and bilateral migration costs

Our key equilibrium equation (9) implies that we also need data on wages, business cycles, employment and unemployment rates at origin and destination. Many cross-country analyses of migration flows face issues in finding comparable measures of wages across countries. Grogger and Hanson (2011) definitely provide the best approach with respect to this issue, recovering wages by education level from the observed wage distribution in microeconomic databases specific to each destination country. This is made possible however by the relatively low number of countries (only 13) considered in their analysis. Some studies capture wages by proxies such as GDP per capita, which might imply significant measurement errors in some cases.¹⁹ Other analyses do not directly observe wage data but capture their role through the use of fixed effects.²⁰

In this paper, in contrast to those previous studies, we use explicit measures of wages at origin and destination (see Appendix A for more detail).

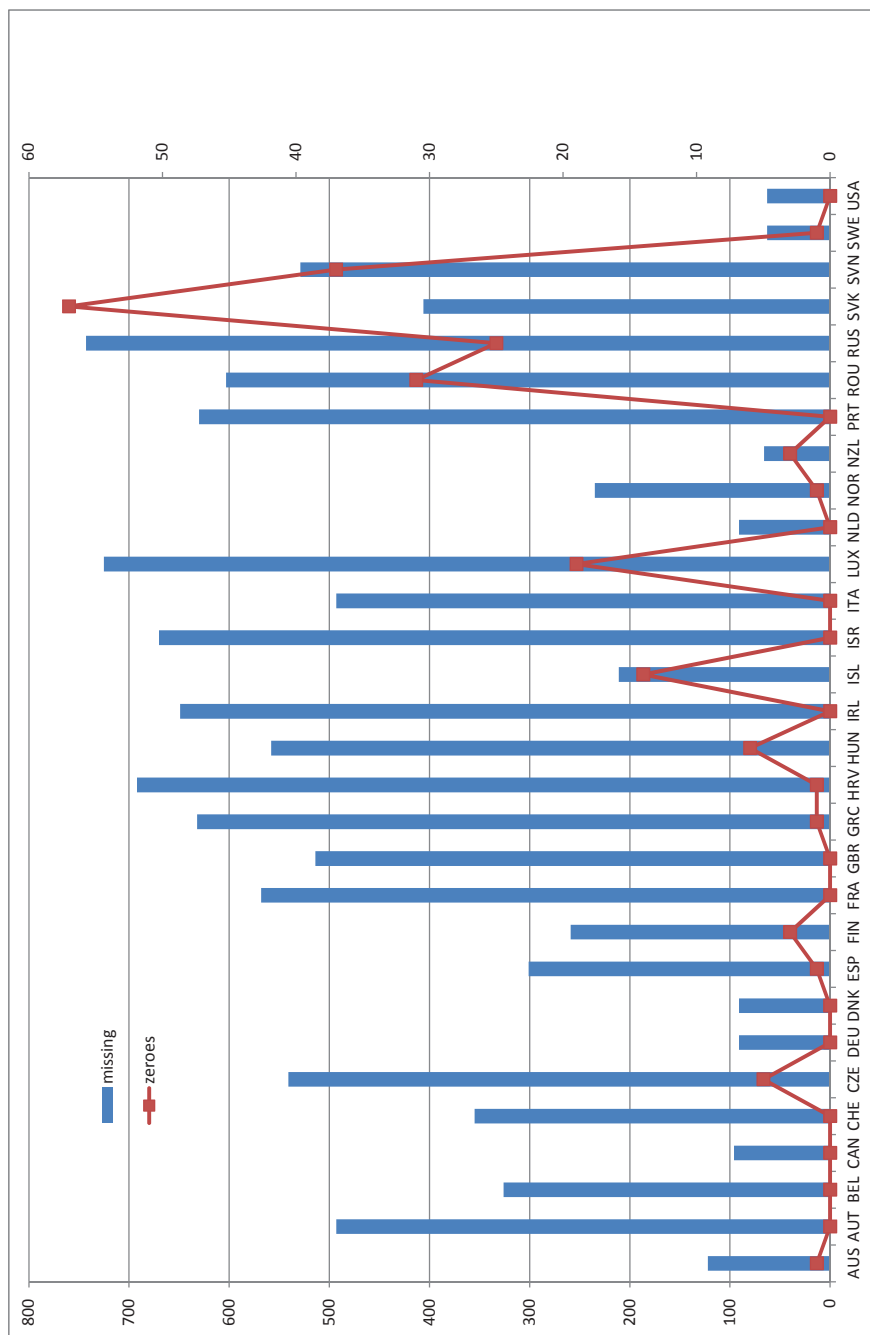
We extract cyclical stance from GDP data and use two different measures. The first one relies on the deviation from GDP trend and uses the traditional Hodrik-Prescott filter for that purpose. Given the annual frequency, we extract the trend based on a value of the smoothing parameter λ equal to 400. As an alternative, we use a more simple measure based on the annual growth rate of GDP. We also rely on the standardized unemployment rates provided by the OECD. These are used to build differential in employment rates and unemployment

¹⁸On this point, see Santos Silva and Tenreyro (2006). These techniques are specifically designed to deal with the statistical consequences of the presence of a large proportion of zeros for the dependent variable. They are nevertheless associated with a high level of computational difficulties.

¹⁹See for instance Beine and Parsons (2012) who capture wage differentials by differences in GDP per capita for all origin and destination countries.

²⁰See for instance Beine et al. (2011) and Bertoli and Fernandez-Huerta Moraga (2013a).

Figure 1: Number of missing (left axis) and zero (right axis) values for bilateral migration flows by destination country.



rates at origin as identified in equation (11). The exact data sources are also provided in Appendix A.

In addition to these measures, we also capture time-varying dyadic variables (x_{ijt} in terms of equation (10)) thought to affect bilateral migration costs. We use three main measures to tackle integration between countries: (i) Schengen agreements between (a subset of) European countries, (ii) other bilateral agreements favouring the international mobility of workers and (iii) joint membership of the European Monetary Union. These measures are explained below in more details when discussing the benchmark econometric specification (see section 4.1.). The exact construction and sources of the bilateral agreements are also described more in details in Appendix B.

3.3 Migration stylized facts

Table 1 reports some summary statistics for the sample of destination countries. For countries which recently joined the European Union (Czech Republic, Hungary, Slovakia) we observe over the 2000s a large decrease in the average growth rate of emigrant outflows. We also see that Germany is the primary destination country with an average yearly immigrant inflow by origin country of 11,613 people. Correspondingly, United Kingdom appears as the first origin country with average yearly emigrant outflow of 7,403 people.

Table 1: Inflows and outflows figures by destination and origin country of the sample

Countries	Immigrant inflows						Emigrant outflows					
	N flows	Mean	Median	Average Growth rate 1980-1990	Average Growth rate 1990-2000	Average Growth rate 2000-2010	N flows	Mean	Median	Average Growth rate 1980-1990	Average Growth rate 1990-2000	Average Growth rate 2000-2010
Australia	777	4644	1000	5.57%	8.65%	3.87%	564	1909	376	8.00%	-1.12%	7.47%
Austria	406	1322	479	n.a	3.83%	6.07%	564	1219	228	4.16%	8.70%	20.93%
Belgium	573	1523	491	3.95%	4.19%	5.93%	568	899	410	16.20%	5.88%	50.35%
Canada	803	1361	442	3.68%	9.29%	2.86%	614	1802	372	4.50%	4.66%	7.45%
Croatia	207	393	173	n.a	17.64%	0.73%	347	1177	145	n.a	48.04%	9.10%
Czech Republic	358	572	93	n.a	-2.57%	69.02%	322	839	222	n.a	33.13%	16.80%
Denmark	808	937	444	6.55%	7.10%	4.92%	526	763	343	6.69%	1.70%	35.45%
Finland	640	372	99	35.09%	16.98%	10.95%	539	567	216	7.53%	10.49%	35.76%
France	331	1854	668	n.a	4.34%	-2.42%	516	3027	1361	3.06%	8.87%	48.15%
Germany	808	11613	6445	4.84%	0.34%	0.80%	615	4578	2667	3.82%	177.99%	34.49%
Greece	267	2019	289	-0.66%	14.43%	12.87%	520	1489	275	10.99%	20.90%	56.44%
Hungary	341	509	82	n.a	7.72%	475.99%	554	1202	698	15.00%	7.62%	45.46%
Iceland	688	122	28	39.92%	24.52%	35.34%	391	218	44	11.80%	7.32%	17.58%
Ireland	250	961	302	34.23%	6.35%	17.83%	495	1085	280	12.56%	7.77%	59.63%
Israel	229	879	88	n.a	-6.75%	6.39%	510	653	216	6.12%	101.06%	13.10%
Italy	406	3319	653	n.a	8.29%	7.52%	528	3478	575	-1.01%	6.57%	38.26%
Luxembourg	174	125	11	n.a	-1.34%	21.77%	542	270	37	11.61%	7.21%	8.60%
Netherlands	808	949	402	7.26%	7.41%	6.39%	552	1760	716	0.96%	5.95%	18.56%
New Zealand	833	1318	93	22.10%	12.91%	15.31%	435	2350	119	10.41%	9.56%	9.92%
Norway	664	687	221	2.59%	11.71%	10.64%	517	753	260	9.47%	3.90%	20.96%
Portugal	269	3076	1058	13.69%	4.98%	24.65%	499	1999	369	22.09%	4.51%	40.65%
Romania	296	106	29	n.a	74.36%	33.88%	500	6334	353	64.12%	26.66%	32.11%
Russian Fed.	156	434	74	n.a	1411.00%	7.00%	361	5330	920	n.a	19.73%	14.68%
Slovakia	493	116	21	n.a	-2.00%	68.02%	354	1104	190	n.a	63.53%	42.43%
Slovenia	370	78	15	n.a	58.66%	62.19%	345	209	38	n.a	38.79%	38.57%
Spain	598	3753	718	18.76%	42.83%	6.88%	540	2084	608	2.09%	8.73%	24.44%
Sweden	836	972	427	6.35%	9.77%	7.99%	566	1066	473	6.86%	2.84%	30.03%
Switzerland	544	2248	656	n.a	1.60%	6.59%	593	1490	358	5.00%	6.80%	5.81%
United Kingdom	385	5473	2545	-1.35%	9.06%	18.74%	558	7403	2978	3.94%	11.49%	118.58%
United States	836	2933	1135	3.70%	16.78%	2.49%	619	4570	2289	4.82%	40.43%	6.05%

Note: N flows refers, for a given destination or origin country, to the total number of flows for which there is a known value (which can be equal to null) over the partner countries and the period. Thus, the maximum theoretical number of N flows is equal to 899 (=29 partner countries * 31 years).

4 Estimation

We start from equation (9) and estimate a set of alternative specifications that are all consistent with the equilibrium equation. We propose different specifications depending on the specification of the cost component in equation (10).

4.1 A suboptimal benchmark specification

Combining equations (9) and (10), we estimate the following benchmark equation:

$$\ln\left(\frac{N_{ij,t}}{N_{ii,t}}\right) = \beta_0 + \beta_1 \ln\left(\frac{w_{j,t}}{w_{i,t}}\right) + \beta_2 \ln\left(\frac{1 - ur_{j,t}}{1 - ur_{i,t}}\right) + (\beta_3)\left(\frac{bc_{j,t}}{bc_{i,t}}\right) - \beta_4 \ln(ur_{i,t}) + \beta_5 Schengen_{ij,t} + \beta_6 EMU_{ij,t} + \beta_7 Bilateral_{ij,t} + \alpha_{ij} + \alpha_t + \epsilon_{ij,t} \quad (11)$$

$Schengen_{ij,t}$, $EMU_{ij,t}$ and $Bilateral_{ij,t}$ are respectively dummy variables capturing the joint participation at time t of to the Schengen agreements, the joint participation at time t to the European Monetary Union and the existence at time t of other bilateral agreements favoring worker's mobility between the two countries. Details on how these variables are explicitly measured are provided here below.

We capture the $c(x_{ij,t})$ terms by three important observable factors. The first two focus on agreements that could lead to a decrease in the mobility costs within a subset of European countries (namely the Schengen agreement and EMU), while the last one captures other bilateral agreements that favour economic migration between any two countries included in our sample. First and more importantly, we account for the fact that two European countries involved in the pair have already implemented the Schengen agreements. More precisely, the Schengen variable ($Schengen_{ij,t}$) is a time-moving dyadic variable taking 1 if both countries had implemented the Schengen rule at time t , and 0 otherwise. The Schengen agreements were progressively signed and implemented by a subset of European countries and were designed to favour mobility between European countries. We take into account the implementation criterion, i.e. by considering cases in which the country signed and implemented the Schengen rules of people mobility. There is a significant variation of member and non-member European countries.²¹ There is also a significant variation in terms of timing between member countries of the Schengen area.²²

We also introduce a second measure of integration that is dyadic and moving over time. More particularly, we capture the fact that two countries belong to the European Monetary Union (EMU) that for a subset of European countries was launched in 1999. The use of a common currency between countries should mean a significant drop in currency conversion costs between the destination and the origin countries for migrants. It also favours direct comparison of economic aggregates between countries, such as wages and prices. EMU implementation also led to facilities and economies in terms of international bank transfers. There is also a drop in uncertainty regarding the converted wage amount at destination due to the full eradication of bilateral exchange rate volatility. It is important if the prospective migrants intend to remit part of their earnings to their relatives staying behind. As for the Schengen agreements, the $uem_{ij,t}$ variable takes 1 if both countries were (EMU) members at time t , and 0 otherwise. As for the Schengen agreements, there is a balanced mix of EMU and non-EMU members in our sample of countries. There is also a significant variation between member countries in terms of timing of adherence to the EMU for our sample of origin and destination.

Finally, we capture the existence of bilateral agreements in terms of labour mobility between

²¹Among the European countries, Ireland, the UK, Croatia are not members. Romania is a future member and was not a member during the sample period.

²²Basically, implementation for signing members followed three different waves. The first wave took place for most of the European founders around 1995-1997. A second wave concerning mostly Scandinavian countries plus Greece occurred around 2000-2001. Finally joining East European countries implemented the Schengen agreements around 2007.

countries included in the sample beyond the agreements specific to European countries. These bilateral agreements are supposed to facilitate the migration of economic agents through a set of mechanisms. For example, one mechanism is visa waiving arrangements for the candidates to migration. We build a dyadic dummy variable $bilateral_{ij,t}$ taking 1 if there is a bilateral agreement at time t favouring the mobility of workers between countries i and j , and 0 otherwise. The existence of those bilateral agreements is identified using the agreements collected by the International Organization of Migration (IOM). Details about the sources and the exact nature of those agreements are provided in Appendix B. We find that out of 26970 possible observations, we have 871 observations for which there was a bilateral agreement of that kind between the two countries at that time. This represents about 3 % of the observations.

A couple of important comments are in order here. First, due to lack of data, we do not have a direct observable measure for $\ln(N_{ii,t})$, i.e. the total number of native workers of country i staying in their own country at time t . Unlike in Beine and Parsons (2012), since we do not have full information regarding emigration flows, i.e. just a subset of destinations j , so it is not possible to estimate $N_{ii,t}$ from the population stock ($N_{i,t}$ and the full set of emigration flows $\sum_k N_{ik,t}$). As a second best alternative, we approximate $N_{ii,t}$ by $N_{i,t}$ that is available on an annual basis. While it makes the estimated model closer to the equilibrium equation, we should be aware that for some origin countries with high emigration rates, $N_{ii,t}$ will be plagued with significant measurement errors.

A second comment concerns the set of included fixed effects. In this set-up, $\alpha_{ij} = c(x_{ij})$ and $\alpha_t = c(x_t)$. In other terms, the dyadic fixed effects and the time-fixed effects respectively capture the part of the migration costs that are pair-specific and time-specific. In contrast, we do not include here origin-time dummies ($\alpha_{i,t}$), at least at this stage, since such an inclusion would prevent estimation of the role of the unemployment rate at origin, i.e. the estimation of β_4 . However, failure to include $\alpha_{i,t}$ might generate various problems. First, if $N_{ii,t}$ is not correctly measured by $N_{i,t}$, model (11) might be subject to measurement errors. Second, the model does not account for multilateral resistance to migration. Multilateral resistance to migration terms capture the fact that any change in the flow between i and j will affect the other bilateral relationships. Concepts of multilateral resistance have been originally identified in literature analysing bilateral trade flows (Anderson and van Wincoop (2003), Anderson (2011)). It has also recently received some specific attention in the migration literature (see Bertoli and Fernandez-Huertas Moraga (2013a)).²³ In turn, failure to account for the multilateral resistance to migration might lead to a violation of the underlying independence from irrelevant alternatives (IIA) hypothesis. The IIA hypothesis underlies the discrete choice model *à la* McFadden (1984) in the income maximization approach that we outlined in section 2. It is

²³Bertoli and Fernandez-Huertas Moraga (2013a, 2012) propose to capture multilateral resistance to migration by using the Pesaran CCE estimator. This requires the use of nests of destination countries. The underlying assumption is that shocks $\epsilon_{ij,t}$ are correlated across countries belonging to the same nests but are independent across countries included in different nests. In the context of our study, the exact composition and the number of the nests would first rely on arbitrary criteria that could be difficult to justify. Furthermore, the use of 30 time periods along with 30 origin countries would lead to a strong inflation of the number of included parameters (871*the number of nests). To illustrate, the inclusion of 6 nests as in Bertoli and Fernandez-Huertas Moraga (2012) would lead to 5226 additional parameters to estimate. Since we rely on the Least Square Dummy Variable approach instead of the within transformation approach -due to the fact that our panel data set is strongly unbalanced (due to zeros, missing observations over time, missing destinations for given origins) (see Baltagi, 1995)-, the implementation of that approach would lead to important computational problems. As a result, while recognizing its value, we disregard the Bertoli and Fernandez-Huertas Moraga (2013a) approach and follow instead the Ortega and Peri (2009) strategy, as outlined in the next section.

therefore important to check after estimation that the IIA hypothesis holds given the adopted specification.

These concerns shed some doubts on the validity of the estimates of model (11). This is why we report the full results in Appendix C and give here only a quick summary of the main results. The main value added of model 11 is that it allows identification of the marginal impact of unemployment at origin. Overall, the estimation results support a negative impact of unemployment on the bilateral emigration rate on top of the impact of the differential in employment opportunities. This result is consistent with the one considered in the model. If unemployment benefits are only available for native workers and not for migrants (at least shortly after arrival) and in the presence of uncertainty of being employed in the destination, an increase in unemployment might reduce the propensity to emigrate. This marginal negative impact offsets at least partly the positive impact of the differential in employment rates between the origin and the destination, so that the net total effect of unemployment is uncertain. A second mechanism, not considered in our theoretical model, might also generate the negative marginal impact of unemployment, namely the presence of liquidity constraints. If unemployment raises the number of people subject to liquidity constraints, this would decrease the number of potential migrants able to cover the migration costs, which in turn would lead to a decrease in the emigration rates.

Beyond the impact of unemployment, we find some support for the key mechanisms identified in equation (11). In particular, we find a positive impact of the wage differential, the business cycle differential and employment opportunities. Results also support a significant impact of Schengen agreements and EMU participation in terms of lowering migration costs between countries. Nevertheless, given the reservations mentioned above, these results should be completed with other models taking into account the influence of countries other than the origin and the destination countries. These models are considered in the next sections.

The results in Table 6 and 7 yield some interesting insights. First, we find some support for the key mechanisms identified in equation (11). In particular, we find a positive impact of the wage differential, the business cycle differential and employment opportunities. Results also support a significant impact of Schengen agreements and EMU participation in terms of lowering migration costs between countries. Nevertheless, given the reservations mentioned above, these results should be completed with other models taking into account the influence of countries other than the origin and the destination countries. The main value added of model (11) is that it allows for the identification of the marginal impact of unemployment at origin.

Nevertheless, overall those results should be treated with caution, to the extent that model (11) might suffer from mis-specification problems. By way of a straightforward illustration the results relative to the bilateral agreements cast some doubts on the estimation properties. The impact is found to be significantly negative while we would expect either a positive or a negligible impact. One reason might be that model (11) fails to include some multilateral resistance terms that might be correlated with the bilateral agreements. In that case, it would generate a bias in the estimation due to omitted variables. The negative elasticity obtained in columns (1) and (5) suggests that this might be the case here. In turn, failure to integrate those terms might lead to a violation of the IIA assumption. The inclusion of time-origin fixed effects α_{it} in a slightly modified specification (see next section) will capture the outward multilateral resistance to migration.

4.2 Accounting for origin-time fixed effects

In order to take into account important elements like the outward multilateral resistance to migration, we modify model (11) and consider an alternative specification that specifically includes α_{it} fixed effects. The specification takes the following form:

$$\begin{aligned} \ln(N_{ij,t}) = & \beta_0 + \beta_1 \ln\left(\frac{w_{j,t}}{w_{i,t}}\right) + \beta_2 \ln\left(\frac{1 - ur_{j,t}}{1 - ur_{i,t}}\right) + \beta_3 \left(\frac{bc_{j,t}}{bc_{i,t}}\right) + \beta_4 Schengen_{ij,t} \\ & + \beta_5 EMU_{ij,t} + \beta_6 bilateral_{ij,t} [\beta_7 x_{ij} + \alpha_j] [\alpha_{ij}] + \alpha_{it} + \epsilon_{ij,t} \end{aligned} \quad (12)$$

In terms of the equilibrium equation (9), $\alpha_{it} = \ln(N_{ii,t}) - \ln(B) - \ln(ur_{i,t}) + c(x_{it}) + c(x_i) + c(x_t)$. This specification therefore also explicitly accounts for the size of the native population. It also captures the impact of unobserved migration costs which are origin specific and that move over time. These include the push factors such as international violence or demographic shocks as well as domestic barriers to movement such as passport costs. It also incorporates the role of origin specific time-invariant factors such as geographic factors. On top of that, the inclusion of the α_{it} fixed effects allows to migration (see Anderson, 2011) to be taken into account.²⁴ The price to pay for using specification (12) instead of specification (11) is that we are no longer able to have an explicit estimation of the marginal impact of unemployment rates at origin.

We use two alternative specifications with respect to the role of time-invariant dyadic factors. In a first estimation, we include dyadic fixed effects of type α_{ij} . The inclusion of these fixed effects allows accounting for the impact of time-invariant dyadic non-included factors such as distance, common language or colonial links.²⁵ However, since we are interested in uncovering the impact of some of those factors (for instance when both countries belong to the EMU), we use an alternative specification including explicit variables such as x_{ij} . In this alternative specification, we include α_j that capture the role of time-invariant destination specific unobserved factors. In other terms, in this latter specification, α_{ij} is replaced by $(\beta_7 x_{ij} + \alpha_j)$. While interesting, this latter specification should yield inferior results in terms of goodness-of-fit since the observed set of dyadic variables x_{ij} captures only part of the variation with respect to the one captured by the α_{ij} fixed effects.²⁶ The results based on this specification should therefore be regarded with much caution and are provided here only for the sake of capturing the possible impact of those time-invariant dyadic observed factors. We consider four pair-specific factors of that kind: geographic distance, contiguity, existence of a common official language and location on the European continent.

Table 2 reports the estimates with the business cycle being measured using the deviation of GDP from the trend extracted using the HP filter. Table 3 reports exactly the same infor-

²⁴A similar strategy has been used by Ortega and Peri (2009). While the inclusion of the α_{it} fixed effects de facto allows them to account for outward multilateral resistance to migration, their initial motivation was to capture the heterogeneity between stayers and migrants at origin.

²⁵Note that the joint inclusion of α_{it} and α_{ij} fixed effects makes the inclusion of monodic fixed effects (such as α_o for $o = i, j$ or t) unnecessary since these are embedded in the first ones.

²⁶For instance, one type of factor that is clearly omitted in this specification are bilateral explicit or implicit agreements based on historical links or colonial links. One obvious example is relationships between countries belonging to the Commonwealth. These agreements are implicit and are therefore not reported in the IOM database of bilateral agreements. Nevertheless, since they are in place for the whole period of estimation (1980-2010), they are well captured by the α_{ij} fixed effects.

mation, but using the annual growth rate of GDP as an alternative measure of the economic cycle. We use two different measures for the numerator of the dependent variable $\ln(\frac{N_{ij,t}}{N_{ii,t}})$. The first one takes the log of $1 + N_{ij,t}$ in the numerator in order to keep the country pairs with zero observations for $N_{ij,t}$ in the estimation sample. This is sometimes called Scaled OLS estimation (Simpson and Sparber, 2012). The second one uses simply $\ln(N_{ij,t})$ in the numerator as in the equilibrium condition, which leads to a modest decrease in the sample size.²⁷ Columns (1) and (2) give the estimates using $\ln(\frac{1+N_{ij,t}}{N_{ii,t}})$ as our dependent variable while Columns (3) and (4) give the estimates based on $\ln(\frac{N_{ij,t}}{N_{ii,t}})$.

²⁷Actually, we have only a reduction of 43 data points, which reflects that the proportion of (true) zeroes for the bilateral flows in our dataset is negligible. This further justifies the use of OLS estimators instead of the Poisson Pseudo Maximum Likelihood estimators advocated by Santos Silva and Tenreiro (2006).

Table 2: Business cycle and migration with α_{it} FE and HP extraction

Estimation Method Variables	Scaled OLS		OLS	
	(1)	(2)	(3)	(4)
Wage differential	0.732*** (12.05)	0.433*** (3.92)	0.714*** (11.29)	0.397*** (3.49)
Business cycles Diff.	0.0074*** (3.24)	0.005 (1.00)	0.0074*** (3.15)	0.005 (0.98)
Employment rates	4.475*** (13.51)	4.938*** (9.29)	4.464*** (13.18)	4.922*** (9.13)
Schengen	0.247*** (11.20)	0.489*** (11.68)	0.259*** (11.63)	0.501*** (11.84)
UEM	0.163*** (5.51)	0.284*** (5.99)	0.161*** (5.43)	0.275*** (5.76)
Bilateral Agreements	0.076*** (3.37)	0.277*** (4.98)	0.076*** (3.32)	0.275*** (4.91)
Ln(distance)	-	-0.656*** (18.46)	-	-0.664*** (18.55)
Common language	-	0.851*** (21.04)	-	0.859*** (21.08)
Contiguity	-	0.304*** (5.99)	-	0.289*** (5.69)
Europe	-	-0.167* (1.89)	-	-0.175* (1.95)
Destination FE (α_j)	No	Yes	No	Yes
Dyadic FE (α_{ij})	Yes	No	Yes	No
Origin-time FE (α_{it})	Yes	Yes	Yes	Yes
# observations	11055	11055	11012	11012
R^2	0.956	0.792	0.955	0.787

Estimated equation: equation (12). Estimation period: 1980-2010.

Dep. variable in (1-2): $\ln(1 + N_{ij,t})$; Dep. variable in (3-4): $\ln(N_{ij,t})$.

Business cycle extraction method: HP filter.

Superscripts ***, **, * denote statistical significance at 1, 5 and 10% respectively.

Robust standard errors are provided in parentheses.

Table 3: Business cycle and migration with α_{it} FE and growth rates

Estimation Method Variables	Scaled OLS		OLS	
	(1)	(2)	(3)	(4)
Wage differential	0.879*** (13.71)	0.486*** (11.60)	0.855*** (12.80)	0.457*** (3.81)
Business cycles Diff.	0.021*** (7.08)	0.013** (2.19)	0.019*** (6.28)	0.010* (1.66)
Employment rates	4.863*** (17.10)	5.204*** (11.09)	4.874*** (16.93)	5.217*** (11.01)
Schengen	0.237*** (10.75)	0.486*** (11.60)	0.249*** (11.25)	0.498*** (11.45)
UEM	0.166*** (5.65)	0.284*** (6.01)	0.163*** (5.53)	0.274*** (5.77)
Bilateral Agreements	0.074*** (3.31)	0.274*** (4.93)	0.075*** (3.31)	0.274*** (4.88)
Ln(distance)	-	-0.649*** (18.10)	-	-0.657*** (18.19)
Common language	-	0.852*** (20.93)	-	0.860*** (20.97)
Contiguity	-	0.310*** (6.06)	-	0.295*** (5.76)
Europe	-	-0.153* (1.72)	-	-0.161* (1.79)
Destination FE (α_j)	No	Yes	No	Yes
Dyadic FE (α_{ij})	Yes	No	Yes	No
Origin-time FE (α_{it})	Yes	Yes	Yes	Yes
# observations	10883	10883	10840	
R^2	0.957	0.793	0.957	0.788

Estimated equation: equation (12). Estimation period: 1980-2010.

Dep. variable in (1-2): $\ln(1 + N_{ij,t})$; Dep. variable in (3-4): $\ln(N_{ij,t})$.

Business cycle measure: annual growth rates.

Superscripts ***, **, * denote statistical significance at 1, 5 and 10% respectively.

Robust standard errors are provided in parentheses.

Before looking specifically at the key parameters estimates we should look at a comparison between the two alternative specifications, i.e. on the one hand the specification with α_{ij} fixed effects and on the other hand the model with α_j fixed effects and observable time-invariant factors. A straightforward comparison reveals that the share of explained variability by the first specification significantly outperforms the second one, with R^2 close to 0.96 instead of 0.80. This suggests that there are many other unobserved time-invariant dyadic factors that are not accounted for in the second specification but which are captured in the first. Again, this suggests that interpretations based on results reported in columns (1) and (3) of tables 3 and 4 are the most reliable.

Overall, we find evidence in favour of long-run and short-run factors on the bilateral migration flows. First, and importantly, we find a very robust and stable elasticity for the wage differential. An increase of around 10% in the wage ratio leads on average to an increase in the bilateral migration flows of about 8.5% (see Table 4). Nevertheless, on top of that, we find support for a role of short-run factors, i.e. of business cycles and employment rates. Starting with the specification including the α_{ij} fixed effects, the positive impact of the relative business cycles is observed regardless of the business cyclical stance measure. The same holds for the differential employment rates. These results are consistent with the idea developed in our theoretical framework that the cyclical stance provides an additional signal to the candidates to migration for choosing the optimal destination. According to this interpretation, this signal is in terms of the future probability of employment for those migrants, which ultimately affects the expected wage at destination and in turn the net gain derived from moving to that destination.

The estimation results suggest that short-run factors contribute to the understanding of the variability of bilateral migration flows. Depending on the estimation method, the decrease in the Root Mean Square Error when adding those factors is around 3.5%. While this can sound as a modest contribution, one should not forget that the model accounts for many unobserved factors through the set of fixed effects. While the business cycle seems to enter in migrants' expectations of future employment rates, the relative contribution seems to come mostly from the current employment rates. In terms of economic magnitudes, a rise of 1% in the ratio of employment rates between the destination and the origin leads to a 5% increase in the bilateral migration rates. The estimated business cycle elasticities suggest that a 1% differential in growth rates between the origin and the destination countries leads to a 0.02% increase in the bilateral migration flow. Even though these orders of magnitude seem to be modest, the cumulated effects over the whole business cycle can be substantial, especially for migration corridors that are already important.

To give a more tangible assessment of the impact of employment rates, one may for instance consider the flows from Germany to Italy, which represented between 8,000 and 14,000 migrants over the considered period. Using the fact that a 1% increase in the ratio of employment rates leads to a 5% increase in bilateral migrations rates, we find that the rise of the ratio of employment rates, cumulated between 2000 and 2005 (+6.5 points) contributed to a supplementary cumulated flow of immigrants from Germany of 3,740 persons (620 in average per year). Conversely, when the situation reversed between 2006 and 2008, with a cumulated decrease of the ratio of employment rates of -3 points, this contributed to a cumulated decrease of immigration flows from Germany to Italy of 1,800 persons (600 persons in average per year). Yet, the contribution of the differential in growth rates between the two countries was negligible for this couple of partners. To get more substantial contributions of the differential in growth rates, we can take for example the flows from Romania to Spain, which rose up to around 174,000 in 2007. Between 2001 and 2008, with growth rates that were significantly more important in Romania than in Spain, the differential in growth rates contributed to a

cumulated diminution of around 500 immigrants. To take another case, the contribution of the differential in growth rates between Germany and Poland, which was in favor of Poland between 2002 and 2009, contributed to a cumulated diminution of around 800 immigrants from Poland to Germany, to be compared with annual flows representing between 100,000 and 160,000 immigrants a year: the comparison between the two shows a contribution which is not negligible in absolute terms, but remains limited in proportion of the magnitude of annual flows.

An important by-product of our estimation is the impact of the time-varying dyadic factors affecting the migration costs. We find a positive impact on mobility for the Schengen agreements between European countries, a positive role for currency unification as well as a positive impact for the other bilateral agreements. The first two results are important in terms of our discussion about the optimal nature of the European Monetary Union. The traditional Optimum Currency Area literature (Mundell, 1961; De Grauwe, 2009) emphasized the important role of labour mobility in coping with asymmetric business cycle shocks. Our estimation results show that with respect to labour mobility, the Schengen agreement as well as the inception of the Euro made Europe closer to an Optimum currency area. This of course does not mean that Europe is or has become an OCA. Nevertheless it shows that integration measures increased the net gains (or decreased the net costs) derived from introduction of the Euro. For example, migration flows from the Netherlands to Belgium, which amounted to around 6,000 in the nineties rose to 12,000 in 2007. The corresponding impact of the euro area, equal to 17.4% (Cf. tables 3 and 4), would thus represent around 1,000 migrants.²⁸ Also, the results are in line with the new OCA literature that shows that the optimal nature of a monetary union is itself endogenous with the monetary unification process (Frankel and Rose, 1998; Beetsma and Giuliodori, 2010). Frankel and Rose (1998) show that the optimality of a currency union depends on the degree of asymmetric shocks within the union, which itself depends on the monetary unification process. The same holds for the intensity of trade flows. Related to those findings, we show that currency unification decreases the costs of moving between Euro area countries, and therefore increases the scope of labour mobility as an alternative adjustment mechanism to the flexibility in exchange rates.

The estimates relating to the bilateral agreement in columns (1) and (3) of Tables 2 and 3 are all found positive, which is more in line with the expected impact of bilateral agreements on the migration costs. We find that the existence of bilateral agreements favouring worker mobility between two countries raises the bilateral migration flow by 7 to 8 %. The positive semi-elasticity obtained in this specification, as opposed to the negative elasticity yielded by the former model, suggests that the current model does a better job in accounting for important determinants. We will further assess the relevance of the model, particularly regarding the validity of the IIA assumption.

Turning to the specification involving time-invariant dyadic observable variables (columns 2 and 4 of Tables 2 and 3), we find evidence in favour of a role of the usual determinants such as distance, contiguity and common language. The insignificant impact of Europe is more surprising but might be rationalized at least in two ways. First, the role of European integration is already captured by the Schengen agreements and the EMU membership. Second, the results should be viewed with caution for the reasons mentioned above, namely, the obvious scope for a mis-specified model due to omitted time invariant dyadic factors.

²⁸Since the coefficient of the euro area variable is related to a dummy, the corresponding elasticity cannot be used directly and is equal to $(\exp(0.16)-1)=0.174$. To take another case, flows from Germany to Italy, between 8,000 and 10,000 in the nineties, rose up to 14,000 in 2004, with a contribution of the euro area that would thus represent around 1,500 migrants.

An indirect way of testing for the validity of the IIA assumption is to look at the stability of estimated coefficients when some destinations are dropped from the estimation sample. This method was used, for example, by Head et al. (1995) for an analysis of location choices in the US by Japanese manufacturing firms during the 1980's. We implement this method by dropping one destination at a time and by plotting the estimated coefficients. Before examining the patterns of coefficients, two comments are in order. First, we rely on visual examination only rather than on a formal test because our sample is strongly unbalanced. It is unbalanced in several ways. For some country pairs, there may be missing years. For some origins, there might be missing destinations for the whole time period, and for some destinations, there might also be missing origins. Therefore, the removal of different destinations might lead to quite different subsamples. For instance, since the US is the most important destination, removing the US reduces the sample by a maximum number of observations ($30 \times 29 = 870$ data points). In contrast, removing Romania has little impact on the sample as the Romanian destination is widely unavailable for most origins. Tests of equality of estimates with different subsamples are therefore difficult to implement. Second, the fact that removing different destinations leads to different subsamples means that our evaluation of the IIA assumption is done assuming that there is no selection issue here. This late assumption might of course be too strong.

Figures 5, 6, 7 and 8 reported in Appendix C plot the evolution of the estimated key coefficients of equation (12) when dropping successively one destination country from the regression.²⁹ Overall, with few exceptions in terms of destinations (Spain) and in terms of coefficients ($\hat{\beta}_2$) of equation (12), the rolling estimates display quite stable estimated coefficients.³⁰ Comparing the key estimated coefficients of Table 3 with the range displayed in those figures, we find that in general the estimated impact is robust to the exclusion of alternative destinations. The estimate of the wage differential elasticity (0.88) lies in the middle of the range in terms of the coefficients displayed in Figure 5. The same basically holds for the other coefficients of interest, particularly those related to the employment rate differential, the business cycle differential and the Schengen agreements.

4.3 Focusing on destination driven shocks

While specification (12) yields better estimation results, the inclusion of the α_{it} raises a number of statistical issues. One of them is the high degree of collinearity between the α_{it} and the time-varying dyadic variables such as the wage differential, the differential in business cycles and the differential in employment opportunities. In other terms, while accounting for many unobserved factors, the inclusion of α_{it} eliminates much of the variability of those variables due to the fact that they are built using time-varying origin specific variables. This might result in a magnification of the standard errors of those variables and, in turn, a decrease in the significance of the variables. A second aspect is that the business cycle considerations and employment prospects that agents take into account could be essentially destination specific. It is possible that agents will consider migrating to destination countries with higher wages if the employment prospects are good enough, regardless of the cyclical stance of the origin economy. If so, what matters are destination-specific shocks. The specification implied by

²⁹The measure of the cycle differential is given by the differential in growth rate.

³⁰More precisely, the removal of Spain from the sample tends to decrease the magnitude of the impact of the employment differential (but not its statistical significance). This can be rationalized by the fact that Spain is precisely a country having attracted a lot of migrants due to the economic boom and an improving labour market, especially in the 90's and the years prior to the financial crisis. This is well documented in Bertoli and Fernandez-Huerta Moraga (2013a).

such a scenario is close to the one adopted by Ortega and Peri (2009).

To deal with this issue, we re-estimate the same model but define the key variables in terms of destination specific variables only. This yields the following model:

$$\ln(N_{ij,t}) = \beta_0 + \beta_1 \ln(w_{j,t}) + \beta_2 \ln(1 - ur_{j,t}) + \beta_3(bc_{j,t}) + \beta_4 Schengen_{ij,t} + \beta_5 EMU_{ij,t} + \beta_6 bilateral_{ij,t} [+ \alpha_{ij}] [+ \alpha_j] + \alpha_{it} + \epsilon_{ij,t} \quad (13)$$

Note that the exclusion of wages, business cycles and employment rates at origin leads to a more than 20% increase in the size of the sample. This mitigates the comparability of the results with respect to the previous specification. This new specification leads to a change in the implicit composition of α_{it} with $\alpha_{it} = \ln(N_{ii,t}) + \beta_1 w_{it} + \beta_2 bc_{it} + \beta_3 (1 - ur_{it}) - \ln(B) - \ln(ur_{i,t}) + c(x_{it}) + c(x_i + c(x_t))$. It now includes the role of wages, business cycles and employment rates at origin.

The results are reported in Table 4. Columns (1) and (3) report the results obtained with the HP component as the measure of the business cycle at destination. Columns (2) and (4) report the results obtained with the growth rate as the alternative measure of the business cycle at destination. For the sake of parsimony, we do not report the estimations with the time-invariant dyadic variables since this specification has proved to be dominated by the current adopted one. Overall, the results with the destination-specific variables are substantially in line with the ones obtained with the differentials between the origin and the destination. Regardless of the business cycle measure and the estimation method, we find a positive role for the wage at destination, the employment rate and the business cycle. The results suggest that while the differential between the origin and the destination definitely plays a role, the most important role is played by the economic developments at destination. Also, the results relative to the role of the Schengen agreements, bilateral policy agreements and EMU membership are much in line with the estimations obtained from model 12. The estimated coefficients for the three time-varying dyadic dummies are quite close to the ones obtained in columns (1) and (3) of Tables 2 and 3. This suggests that the estimation results of those variables are fairly robust to alternative specifications.

In order to assess the validity of the IIA assumption we reiterate the previously implemented procedure of dropping one destination at a time. As before, Figures 9 to 12 in Appendix E plot the evolution of the estimated key coefficients of equation (13) when dropping successively one destination country from the regression.³¹ The same conclusions drawn concerning the relevance of model 12 can be made for model 13. With few exceptions in terms of dropped destination (once again in the specific case of Spain) and in terms of coefficients (employment rate at destination- coefficient $\hat{\beta}_2$), the Figures report a strikingly stable range of the key coefficients, supporting the relative validity of the IIA assumption for the adopted specification.

³¹The measure of the cycle at destination is measured by the growth rate at destination.

Table 4: Business cycles and migration: destination specific variables

Estimation Method	Scaled OLS		OLS	
Variables	(1)	(2)	(3)	(4)
Wage	0.766*** (13.40)	0.903*** (15.04)	0.736*** (12.45)	0.872*** (13.99)
Business cycle	0.0067*** (2.91)	0.019*** (6.77)	0.0068*** (2.91)	0.018*** (6.11)
Employment rate	5.250*** (14.52)	5.614*** (18.32)	5.223*** (14.37)	5.611*** (10.70)
Schengen	0.252*** (11.66)	0.243*** (11.25)	0.262*** (12.03)	0.252*** (11.63)
UEM	0.137*** (4.88)	0.139*** (4.99)	0.139*** (4.94)	0.140*** (5.03)
Bilateral	0.097*** (4.36)	0.095*** (4.27)	0.094*** (4.22)	0.094*** (4.20)
Destination FE (α_j)	No	Yes	No	Yes
Dyadic FE (α_{ij})	Yes	No	Yes	No
Origin-time FE (α_{it})	Yes	Yes	Yes	Yes
# observations	13483	13277	13416	13211
R^2	0.952	0.952	0.951	0.951

Estimated equation: equation (13). Estimation period: 1980-2010.

Dep. variable in (1-2): $\ln(1 + N_{ij,t})$; Dep. variable in (3-4): $\ln(N_{ij,t})$.

Business cycle measure: (1) and (3): HP filter.

Business cycle measure: (2) and (4): Annual growth rates.

Superscripts ***, **, * denote statistical significance at 1, 5 and 10% respectively.

Robust t-stats are provided in parentheses.

4.4 Caveats: endogeneity and network effect

4.4.1 Endogeneity

One traditional concern in terms of estimation of models such as models 12 and 13 is the occurrence of endogeneity. In particular, given the focus of the paper, the potential endogeneity of the aggregate fluctuations should be assessed with great care. For the sake of understanding, it is nevertheless important to identify the sources of endogeneity in this context. Basically, two traditional sources can be considered : (i) reverse causality from international migration to aggregate fluctuations and employment rates and (ii) endogeneity due to omission of factors that could be correlated with aggregate fluctuations, namely unilateral immigration policies.

4.4.2 Reverse Causality

One particular concern is whether international migration can affect the economic conditions, i.e. whether there is a reverse causal relationship from international migration to economic fluctuations and employment rates. One important reason for which this concern is mitigated here is that we rely on bilateral migration flows. Migration flows at the bilateral level remain quite modest with respect to the size of the labour market and the goods market, either at origin and at destination. To illustrate, in our sample, only 7 bilateral flows out of 870 are over the 50000 threshold. Out of those 7 flows, 4 flows concern Germany as the destination country, with obviously one outlier in the case of Polish migrants in 1989 after the fall of the Berlin wall. Only 37 country pairs involve flows that are over 20000 migrants. Those figures suggest that even if economic migration can affect economic outcomes in general, the bilateral nature of our analysis makes this concern much less serious than in unilateral analysis of migration. Even in the unilateral case, the literature is in general very mixed about the potential effect of immigration. To illustrate, the huge literature about the impact of immigration on domestic wages (Borjas, 2006; Card, 2005, Ottaviano and Peri, 2012) is divided about the exact nature of that effect. When conclusions in favour of some effects are drawn, the expected magnitude on domestic wages remains quite modest in economic terms.

4.4.3 Omission of unilateral immigration policies

In the estimation of models 12 and 13, immigration policies are explicitly accounted by the Schengen agreements among European countries as well as by the additional bilateral agreements captured by the IOM database. These variables refer to bilateral policies, i.e. policies that are specific to a particular migration corridor. They include preferential treatments often granted by the host country. Due to absence of data, we do not capture explicitly the other dimension of immigration policies, i.e. the unilateral dimension. These include immigration policies that are conducted towards all the partner countries. Models 12 and 13 include α_{it} and α_{ij} fixed effects but these do not capture the role of immigration policies conducted at destination. One legitimate concern is that the omitted variable can lead to biased estimates. The discussion is about the expected magnitude and size of that possible bias.

The bias related to the omission of immigration policies arises if these immigration policies are contemporaneously correlated with our business cycle measures. While one can expect a negative correlation of liberal immigration policies and the business cycle over time, the timing of that correlation is more debatable. A contemporaneous correlation which is needed to generate such a bias requires that the immigration policy and its implementation reacts within a year to adverse or positive economic developments at the country level. While it might be

the case for some particular episodes, on average, the design and the implementation of such immigration policies takes time. In other terms, an underlying assumption in our estimates is that the contemporaneous correlation between unilateral immigration policies and the cycle is quite low and requires more than a year to be of significant magnitude. Since this assumption is important, we further assess its validity by focusing on a set of specific cases. More precisely, we focus on the cases of four important countries: United States, Canada, Spain and France. We adopt two complementary perspectives in that respect. We first consider national acts (laws, decrees, ministries' decisions...) related to immigration that are considered in the literature as potentially reactive to business cycles. We then conduct a complementary analysis of national acts concerning visas, registered in the International Organization for Migration database, and compare the dates at which these rules were passed along with peaks and troughs of economic cycles. This comparison remains qualitative since it is very difficult to numerically code those acts (this depends among other things on the impact of their contents). This analysis is fully detailed in the Appendix D.

The analysis leads us to conclude that the contemporaneous correlation of business cycles and unilateral immigration policies is quite low. Appendix D illustrates from case studies the various reasons of this low correlation. Among those reasons, even if policies account for the economic cycle, there is clearly a time lag needed to pass the immigration laws. Also, while business cycles might be a concern, a lot of immigration acts target non economic goals. This is for instance the case for family reunification policies which affect a significant proportion of migrants. From the whole analysis, we conclude therefore that the omission of immigration policies should not invalidate the results of our empirical exercise.

4.4.4 Migrants Networks

A second source of concerns is that specifications 12 and 13 do not account for the effect of migrants network. Diasporas at destination are known to generate mechanisms that lower the migration costs of the natives of their countries of origin. This effect has been documented in various papers dealing with macroeconomic data (Beine et al., 2011 among others). In those models, the network is often captured by the size of the bilateral migration stock at the start of the migration period. Most of the papers consider migration periods of ten years and use either cross sectional data (Beine et al. 2011; Bertoli and Fernandez-Huertas Moraga, 2012) or panel data (Beine and Parsons, 2012). In the context of this paper, bilateral migration stocks are unavailable at an annual frequency, which explains the omission of the network in specifications 12 and 13. One question is whether this is detrimental for the estimations of our models. In that respect, some comments are in order here.

First, the empirical literature emphasizes the variation of network elasticities across types of migration process. The network effect is obviously more important for unskilled migrants and for South-North migration. While it is not negligible for North-North migration and skilled migrants, the fact that we focus on migration flows among OECD countries makes the omission of the network less important. Second, at the annual frequency, migration stocks are quite stable over time. These are for a lot of country pairs quite collinear to some fixed effects, and in particular with the dyadic ones (α_{ij}). This implies that models with α_{ij} fixed effects partly account for some implicit network effect. Finally, our observable variable capturing the bilateral agreements is likely to be highly correlated with some of the bilateral stocks. In that sense, part of the effect associated to the migrants networks is also reflected in the elasticity of that variable. All in all, while the inclusion of the network variables should be desirable if data were available, the specifications of our models and the sample of countries over which estimations are conducted makes the omission of those effects less concerning.

5 Conclusion

In this paper, we empirically test the impact of macroeconomic fluctuations on migration flows. We revisit an old issue but with a fresh approach building the recent advances in the empirical literature on international migration. By contrast with some previous macroeconomic approaches evaluating the degree of labour mobility through indirect evidence, we adopt a more direct approach relating gross migration flows and macroeconomic fluctuations. In particular, we rely on micro-founded gravity models that include the traditional long-run determinants and take into account important concepts such as the multilateral resistance terms. Our analysis looks specifically at the sensitivity of gross migration flows to relative business cycles and relative employment rates. These variables act as signals in the formation of expectations about future employment probabilities among prospective agents.

In particular we find evidence that relative business cycles and employment rates affect the intensity of gross bilateral flows. We also find that the destination-specific variables such as the business cycle or the growth rate at destination are particularly important for prospective migrants in choosing their optimal destination. As a by-product of this analysis, we also show that the introduction of Schengen agreement and the inception of the common currency in Europe significantly raised the international mobility of workers between the relevant countries. These results are important as they show that compared to previous studies conducted in the 90's, labour mobility in Europe seems to have increased and has become more reactive to asymmetric shocks. This dimension is key in the traditional definition of an Optimum Currency Area. This of course does not mean that Europe has become an Optimum Currency Area but suggests that labour mobility as an adjustment mechanism is more a reality than in the past. A caveat of this analysis is that we consider only homogeneous labour. Due to data constraints, we are unable to evaluate the sensitivities of agents per skills or education level to business cycles. Such an investigation would indeed be a natural direction for future research agenda.

6 References

- Anderson, J. E. (2011), "The Gravity Model", *Annual Review of Economics*, vol. 3, pp. 133-160.
- Anderson, J. E. and E. Van Wincoop (2003), "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, vol. 69 (1), pp. 106-116.
- Ball, L.M., D. Leigh and P. Loungani (2013), Okun's Law: Fit at Fifty?, *NBER Working Paper No. 18668*
- Baltagi, B.H. (1995), *Econometric Analysis of Panel Data*, Wiley, London.
- Beetsma, R. and M. Giuliodori (2010), The Macroeconomic Costs and Benefits of the EMU and Other Monetary Unions: An Overview of Recent Research, *Journal of Economic Literature*, 48, 603-641.
- Beine, M., F. Docquier and C. Ozden (2011), "Diasporas", *Journal of Development Economics*, 95(1), 30-41.
- Beine, M. and C. Parsons (2012), Climatic Factors as Determinants of International Migration, CES-IFO Working paper no. 3747.
- Bertoli, S. and J. Fernandez-Huerta Moraga (2013a), Multilateral Resistance to Migration, Forthcoming in *Journal of Development Economics*.
- Bertoli, S. and J. Fernandez-Huerta Moraga (2012), Visas Policies, Networks and the Cliff at the Border, IZA Discussion Paper 2012, December.
- Bertoli, S., H. Brücker and J. Fernandez-Huerta Moraga (2013b), The European Crisis and Migration to Germany: Expectations and the Diversion of Migration Flows, mimeo, CERDI, University of Auvergne.
- Borjas, G (1987), "Self-selection and the earnings of migrants", *American Economic Review*, 77 (4), 531-53.
- Borjas, G. J, Freeman, R. B and Katz, L., 1996. "Searching for the Effect of Immigration on the Labor Market", *American Economic Review*, American Economic Association, vol. 86(2), pages 246-51, May.
- Borjas, G.J. (2006), "Native Internal Migration and the Labor Market Impact of Immigration", *Journal of Human Resources*, 41(2), 221-258.
- Card, D., 2005. "Is the New Immigration Really so Bad?" *The Economic Journal*, 115, 300-323.
- Card, D., 2001. "Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration," *Journal of Labor Economics*, University of Chicago Press, vol. 19(1), pages 22-64, January.
- Chiquiar, D. and G. Hanson (2005), "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States", *Journal of Political Economy*, 113(2), 239-281
- Coulombe, S. (2006), Internal Migration, Asymmetric Shocks, and Interprovincial Economic Adjustments in Canada, *International Regional Science Review*, 29(2), 199-223.
- De Grauwe, P. (2009), *Economics of Monetary Union*, 8th edition, Oxford University Press,

Oxford, UK.

Docquier, F., A. Marfouk and B.L. Lowell (2007), a Gendered Assessment of Highly Skilled Emigration, *Population and Development Review*, 35, 297-322.

Docquier, F., Özden, Caglar and Peri, Giovanni, 2011. "The Labor Market Effects of Immigration and Emigration in OECD Countries," IZA Discussion Papers 6258, Institute for the Study of Labor (IZA).

Feenstra, R. (2004), "Advanced International Trade: Theory and Evidence", Princeton University Press, Princeton, NJ.

Frankel, J. A and Rose, A. K, 1998. "The Endogeneity of the Optimum Currency Area Criteria", *Economic Journal*, Royal Economic Society, vol. 108(449), pages 1009-25, July.

Green, A. G. and Green, D. (2004) "The goals of Canada's immigration policy: a historical perspective", *Canadian Journal of Urban Research*, Vol. 13(1): 102-139.

Gordon, R.J. (2010), "Revisiting and Rethinking the Business Cycle, Okun's Law and Productivity Innovations", *American Economic Review*, 11-15.

Grogger, J., and G.H. Hanson, (2011), "Income Maximization and the selection and sorting of international Migrants, *Journal of Development Economics*, 95(1), 42-54.

Hatton, T. J. and J. G., Williamson, (2002) "What Fundamentals Drive World Migration?". NBER Working Paper Series, Vol. w9159, 2002.

Head, K., J. Ries and D. Swenson (1995), Agglomeration Benefits and Location Choice: Evidence from Japanese manufacturing investments in the United States, *Journal of International Economics*, 38, 223-247.

Head, K., T., Mayer and J., Ries, (2010). "The erosion of colonial trade linkages after independence," *Journal of International Economics*, Elsevier, vol. 81(1), pages 1-14, May.

Heston, A., R., Summers and B., Aten, (2011), "Penn World Table Version 7.0", Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

Lee J. (2000), The Robustness of Okun's law: Evidence from OECD countries, *Journal of Macroeconomics*, 22, 331-356

Martin, S. and Lowell B. L., (2005), "Competing for skills: US immigration policy since 1990", *Law and Business Review of the Americas*

Mayda, A. M., (2008), "International migration: A panel data analysis of the determinants of bilateral flows", *Journal of Population Economics*.

McFadden, D. (1984), "Econometric analysis of qualitative response models", in: Z. Griliches and M. Intriligator, eds., *Handbook of Econometrics*, Volume 2, Amsterdam. Elsevier/North-Holland.

McKenzie, D., C. Theoharides and D. Yang (2010), How Important are Macro Shocks in Determining Migration Flows? Evidence from Filipino Migration. Paper presented at the 2nd Migration and Development Conference, Paris School of Economics, June 2010.

McKenzie, D. and H. Rapoport (2010), "Self-selection patterns in Mexico-US migration: the role of migration networks", *Review of Economics and Statistics*, 92(4), 811-821.

OECD (2009), "Migrations internationales et crise économique, comprendre les liens et élaborer des politiques appropriées"

- OECD (2007), *International Migration Outlook 2007*. Paris: Organisation for Economic Co-operation and Development
- O'Rourke, K. and Sinnott, R. (2006), "The determinants of individual attitudes towards immigration", *European Journal of Political Economy*, 22 838-861.
- Ortega, F., and G., Peri, (2009), "The Causes and Effects of International Migrations: Evidence from OECD Countries 1980-2005". NBER Working Paper Series, w14833.
- Ottaviano, G. and Peri, G. (2012), "Rethinking the Impact of Immigration on Wages", *Journal of the European Economic Association*, 10(1), 152-197.
- Özden, C., C. Parsons, M. Schiff, and T. Walmsley, (2011) "Where on Earth is Everybody?", *World Bank Economic Review*, vol. 25(1), 13-58.
- Pedersen, P.J., Pytlikova M. and Smith N. (2008),. "Selection and network effects-Migration flows into OECD countries 1990-2000", *European Economic Review*, 52 (7), 1160-1186.
- Roy, A.D. (1951), "Some thoughts on the distribution of earnings", *Oxford Economic Papers*, 3 (2), 135-46.
- Rosenzweig, M. R. (2006), The Circulation Migration of the Skilled and Economic Development, *Proceedings Federal Reserve Bank of Dallas*, 147-170.
- Santos Silva, J.M.C. and S. Tenreyro (2006), "The Log of Gravity", *Review of Economics and Statistics*, 88 (4): 641-658.
- Simpson, N. and C. Sparber (2012), The Short- and Long-Run Determinants of Less-Educated Immigrant Flows into U.S. States, Colgate University, Mimeo.

Appendix A: Data sources and details

Two sources are used: the international migration flows dataset from the UN ³² and the OECD International Migration database.³³ These two databases give us, for all destination countries, migrant inflows by origin country. They both aggregate information registered at country level. The fact that national authorities use different processes of data collection and that we have associated two different sources of data naturally raises a number of data comparability problems. The first is geographic and time coverage. Few countries provide data for all origin countries over the whole period (1980-2010); however in our final selection we retained only countries that provided data on a substantial number of destinations and over a significant period. Another issue relates to the definition of migrant flows because national authorities use three distinct criteria to register immigrants. We tried to keep the same criterion for all countries in order to obtain as harmonized a sample as possible.

Most countries in our sample use the residence criterion, others use the citizenship criterion and only one country uses the birth-place criterion.³⁴ The last issue refers to particular migrant groups. Some countries register only foreign migrants and do not count citizens who migrate back.³⁵ The residence criterion gives us a better appreciation of short-term mobility since it captures migrants' last country of residence, while citizenship and birth-place criteria capture respectively long-term immigrants and their country of origin. The residence criterion involves the delivery of a residence permit, and the duration of that permit varies between countries.³⁶ However, it is important to remember that the date of a residence permit may or may not coincide with a migrant's date of arrival in a country.

Total population $N_{i,t}$ in a given country i at year t is obtained from the World Population Prospects: the 2010 Revision database. This database is produced by the Population Division (Department of Economic and Social Affairs) of the United Nations. Data cover total populations (both sexes combined) of major countries, on an annual basis, from 1950 to 2010. The corresponding data can be viewed at <http://esa.un.org/unpd/wpp/Excel-Data/population.htm>

Annual data relating to GDP, unemployment and wages (more precisely hourly wages in the manufacturing sector) are taken from the World Economic Outlook data of the International Monetary Fund. Wages series most often start from the beginning of the period under review (1980) but are sometimes available later (for the Czech Republic, Slovenia or even United Kingdom) or may be missing completely (Russia). Unemployment data are more complete, but may also begin after 1980 in the case of Eastern European countries.

Before merging migration series and other data, we applied statistical controls on migrations to search for potential problems. In particular, we checked the years in which there was a strong increase or decrease compared to data in the rest of the period, for most significant flows (above 1,000 migrants on average). Indeed, flows may possibly increase from 1 migrant to 10 migrants in the following year; but an increase from 10,000 to 100,000 migrants for a couple of countries and over two consecutive years is far more unlikely. Having identified a few

³²This dataset is provided by United Nations Population division. More information may be found on <http://www.un.org/esa/population/migration/>.

³³Downloadable on <http://stats.oecd.org/>

³⁴For countries for which it was possible, we checked the variation between alternative criteria. This was acceptable for the countries of the sample.

³⁵We also checked that this, in terms of migrant definition, would not be an issue for our analysis.

³⁶More information is available on http://www.un.org/esa/population/migration/CD-ROM%20DOCUMENTATION_UN_Mig_Flow_2010.pdf

cases, we have checked for possible political or economic reason to retain the data. In cases of doubt, we have replaced the series by missing data. Conversely, when a series was very stable with a missing point during the period, we have interpolated the values of the preceding and the following year. We have also checked for the comparability of migrations flows between the different concepts (residence, birth-place and citizenship).

Data sources and details

Destination Country	Sources	Period	Origin Countries	Migration criterion & category
Australia	UN	1980-2008	All origin countries	Residence, foreigners and citizens
Austria	UN	1996-2009	All origin countries	Residence, foreigners
Belgium	UN	1980-2007	All origin countries	Citizenship, foreigners
Canada	UN	1992-2009	Other origin countries	Residence, foreigners
			Croatia, Russian Federation, Slovenia	
			Slovakia	
Croatia	UN	1992-2009	Other origin countries	Residence, foreigners and citizens
		1999-2009	New Zealand	
		2002-2009	France, Hungary, Netherlands	
			Belgium, Czech Republic, Russian Federation, Slovakia, United Kingdom	
		2008-2009	Denmark, Finland, Greece, Iceland, Ireland, Israel, Luxembourg, Norway, Portugal, United Kingdom, United States	
Czech Republic	UN	Not available	Other origin countries	Residence, foreigners and citizens
			Croatia, Slovenia, Israel	
			Ireland	
			Iceland, Luxembourg, New Zealand, Portugal	
Denmark	UN	1980-2009	Other origin countries	Residence, foreigners and citizens
		1992-2009	Croatia, Russian Federation, Slovenia	
		1993-2009	Czech Republic, Slovakia	
Finland	UN	1987-2009	Other origin countries	Residence, foreigners and citizens
		1992-2009	Croatia, Russian Federation, Slovenia, Slovakia	
		1993-2009	Czech Republic	
France	UN	1994-2003	Other origin countries	Citizenship, foreigners
			Australia, Canada, Czech Republic, Croatia, Hungary, Israel, New Zealand, Romania, Russian Federation, Slovakia, Slovenia, United States	
			Switzerland	
Germany	UN	1980-2009	Other origin countries	Residence, foreigners and citizens
		1992-2009	Croatia, Russian Federation, Slovenia	
		1993-2009	Czech Republic, Slovakia	
Greece	OECD	1985-2001; 2006	United Kingdom	Residence, foreigners
		1988-2009	Belgium, Germany, Sweden	
		1995-2009	Hungary, Norway	
		1996-2009	Canada, Luxembourg	
			Australia, Denmark, Finland, Spain, Switzerland, United States	
		1997-2009	Italy	
		1998-2000	Austria, Israel	
		1998-2009	Netherlands	
		2000-2009	Slovakia	
		2003-2009	New Zealand	
		2006-2009	Croatia, Czech Republic, France, Iceland, Ireland, Portugal, Romania, Slovenia	
Hungary	UN	Not available	Other origin countries	Citizenship, foreigners
		1995-2008	Australia, Czech Republic, Iceland, New Zealand, Slovenia	
		2008	Slovenia	
Iceland	UN	1986-2010	Other origin countries	Residence, foreigners and citizens
		1993-2010	Russian Federation, Slovenia	
		1995-2010	Slovakia	
Ireland	OECD	1982-2009	United States	Residence, foreigners
		1985-2001; 2009	United Kingdom	
		1990-2009	Belgium	
		1991-2009	Australia	
		1995-2009	Germany, Hungary, Norway	
		1996-2009	Canada, Luxembourg	
		1997-2009	Denmark, Finland, Spain, Switzerland	
		1998-2009	Austria	
		2000-2009	Netherlands, Sweden	
		2003-2009	Slovakia	
		2006-2009	New Zealand	
			Croatia, Czech Republic, France, Greece, Iceland, Israel, Italy, Portugal, Russian Federation, Romania, Slovenia	
Israel	UN	Not available	Other origin countries	Residence, foreigners
		1995-2009	Russian Federation	
		1995-2001; 2009	Ireland, Norway	
		2000	Australia, Denmark, Finland, New Zealand, Sweden	
		2000-2001	Croatia, Czech Republic, Iceland, Luxembourg, Portugal, Slovakia, Slovenia	
		Not available		
Italy	UN	1995-2008	All origin countries	Residence, foreigners and citizens
Luxembourg	OECD	1995-2009	Germany, Hungary	Residence, foreigners
		1996-2009	Canada	
		1997-2008	Denmark	
			Australia, Finland, Norway, Spain, Switzerland, United States	
		1997-2009	Austria	
		1998-2009	Netherlands, Sweden	
		2000-2009	Slovakia	
		2005-2009	New Zealand	
		2006-2009	Belgium	
		2008-2009	Croatia, Czech Republic, France, Greece, Ireland, Italy, Portugal, Romania, Russian Federation, Slovenia, United Kingdom	
Netherlands	UN	Not available	Other origin countries	Citizenship, foreigners
		1980-2009	Croatia, Russian Federation, Slovenia	
		1992-2009	Czech Republic, Slovakia	
		1993-2009		
New Zealand	UN	1980-2010	Other origin countries	Residence, foreigners and citizens
			Croatia, Czech Republic, Russian Federation, Slovenia	
		1993-2010	Slovakia	
Norway	UN	1986-2009	Other origin countries	Residence, foreigners and citizens
		1992-2009	Croatia, Russian Federation, Slovenia	
		1993-2009	Czech Republic, Slovakia	
Portugal	OECD	1985-1989; 1995-2001	United Kingdom ³⁷	Residence, foreigners
		1986-2009	United States	
		1988-2009	Belgium, Germany, Luxembourg, Switzerland	
		1991-2009	Australia	

³⁷ We also have available data for years 1993 and 2004.

		1995-2009	Hungary, Norway	
		1996-2009	Canada, Finland	
		1997-2008	Denmark	
		1997-2009	Spain	
		2000-2009	Netherlands	
		2003-2009	Slovakia	
		2006-2009	New Zealand	
			Croatia, Czech Republic, France, Greece, Ireland, Iceland, Israel, Italy, Romania, Russian Federation, Slovenia	
		Not available		
Romania	UN	1994-2009	Canada, France, Germany, Hungary, Israel, Italy, Romania	Residence, foreigners and citizens
		2001-2008	Other origin countries	
Russian Federation	UN	1991-2009	Australia, Canada, Germany, Greece, Finland, Sweden	Residence, foreigners and citizens
		1991-2010	Israel, United States	
		Not available	Other origin countries	
Slovakia	UN	1993-2009	All origin countries	Residence, foreigners and citizens
Slovenia	UN	1996-2009	Austria	Citizenship, foreigners
			Ireland, Iceland, Israel, Luxembourg, Norway, New Zealand, Portugal, Spain, Slovakia	
		1998-2008	Other origin countries	
		1998-2009	Other origin countries	
Spain	UN	1983-2010	Other origin countries	Residence, foreigners and citizens
		1985-2010	Italy	
		1983-84; 2005-10	Norway	
		1985-1987; 1995-2010	Finland	
		1988-2010	Greece	
		1992-2010	Romania	
		1994-2000; 2005-2010	Croatia	
		1994-2010	Czech Republic, Slovakia, Slovenia	
		1996-2010	Russian Federation	
		2001-2010	Hungary	
		2006-2010	Iceland, Israel, New Zealand	
Sweden	UN	1980-2010 ³⁸	Other origin countries	Residence, foreigners and citizens
		1991-2010	Russian Federation	
		1992-2010	Croatia, Czech republic, Slovenia	
		1994-2010	Slovakia	
Switzerland	UN	1991-2009	Other origin countries	Citizenship, foreigners
		1992-2009	Croatia, Russian Federation, Slovenia	
		1993-2009	Slovakia	
United Kingdom	OECD	1980-2009	Canada, United States	Residence, Foreigners
		1986-2003	Netherlands, Norway	
		1988-2009	Sweden, Switzerland	
		1991-2009	Australia, Belgium	
		1992-2009	Finland, Portugal	
		1994-2008	Denmark	
		1994-2009	Ireland, New Zealand	
		1995-2009	Germany, Hungary	
		1996-2009	Luxembourg	
		1997-2009	Spain	
		1998-2004	Italy	
		1998-2009	Austria, Israel, Slovenia	
		2003-2009	Czech Republic, Slovakia	
			France, Greece, Ireland, Romania, Russian Federation	
		Not available		
United States	UN	1980-2010	Other origin countries	Birth, foreigners
		1992-2010	Croatia, Russian Federation, Slovenia	
		1993-2010	Slovakia	
		1994-2010	Czech Republic	

Sources: United Nations Population division, OECD international migration database.

³⁸ Year 1982 is not available for Greece and United Kingdom.

Figure 2: Total emigrant flows by country

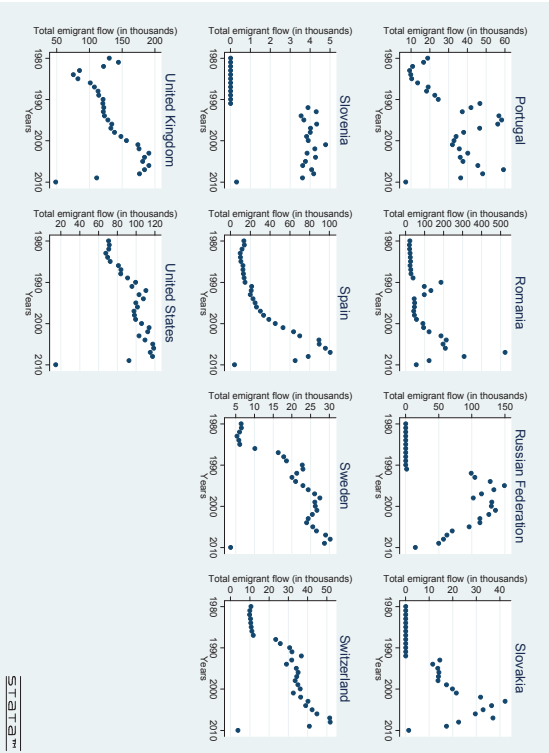
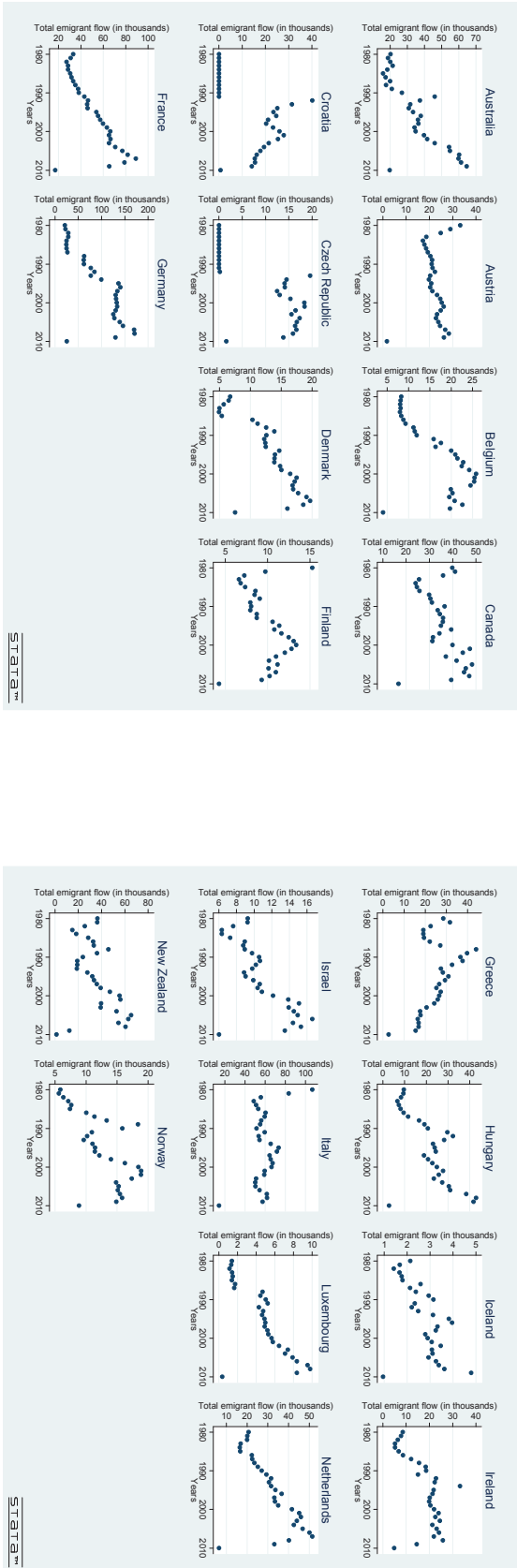
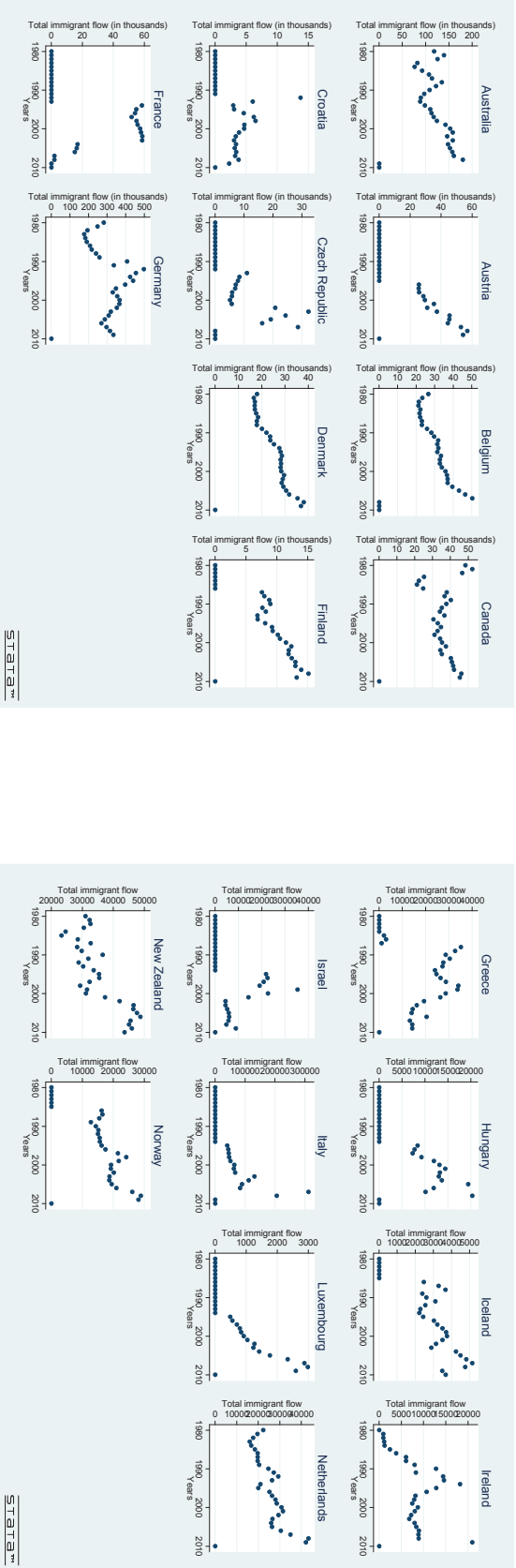


Figure 3: Total immigrant flows by country



Appendix B: Sources of data capturing the bilateral agreements

Signatory country A	Signatory country B	Date of effectiveness	Title of the agreement
Switzerland	Spain	1961	Accord entre la Suisse et l'Espagne sur l'engagement des travailleurs espagnols en vue de leur emploi en Suisse
Switzerland	Spain	1990	Echange de lettres des 9 août/31 octobre 1989 entre la Suisse et l'Espagne concernant le traitement administratif des ressortissants d'un pays dans l'autre après une résidence régulière et ininterrompue de cinq ans
Switzerland	France	1947	Traité de travail entre la Suisse et la France
Switzerland	France	1958	Accord entre la Suisse et la France relatif aux travailleurs frontaliers
Switzerland	Italy	1965	Accord entre la Suisse et l'Italie relatif à l'émigration de travailleurs italiens en Suisse
Switzerland	Portugal	1990	Echange de lettres du 12 avril 1990 entre la Suisse et le Portugal concernant le traitement administratif des ressortissants d'un pays dans l'autre après une résidence régulière et ininterrompue de cinq ans
Switzerland	27 European members	2002	Accord entre la Confédération suisse, d'une part, et la Communauté européenne et ses Etats membres, d'autre part, sur la libre circulation des personnes
Switzerland	Law concerning all foreign countries	2006	Loi fédérale sur les étrangers
Austria	Law concerning all foreign countries	2006	Federal Act concerning settlement and residence in Austria (the Settlement and Residence Act-SRA)
Italy	Legislative Decree concerning all foreign countries	1998	Combined text of measures governing immigration and norms on the condition of foreign citizens
United States	Canada	1994	North America Free Trade Agreement

To complement international texts such as the Schengen agreements, which legally facilitate migrations, we build a variable taking a value of 1 for a couple of countries when a bilateral labour agreement exists between these two countries, or when a general law easing foreigners' entrance is passed. When no agreement or law exists, the variable is equal to zero.

The main source is the International Organization for Migrations. The corresponding list of agreements can be consulted at the following link: <http://www.imldb.iom.int/changeLocale.do>

This main source has been complemented with the information from the North America Free Trade Agreement, which to a certain extent, facilitated labour migrations between the United States and Canada after 1994.

On the other hand, important migrations exist between the members of the Commonwealth, but without any formal agreement, as confirmed in an OECD source:

http://www.oecd-ilibrary.org/fr/social-issues-migration-health/migration-et-emploi_9789264108707-fr

In this latter case, the variable taking into account bilateral agreements does not take the value of one because these agreements are only implicit and, as this situation existed already before the beginning of the period under review in our article, there is no time variance. Thus, these implicit agreements are absorbed by dyadic fixed effects.

Appendix C: Results from the suboptimal benchmark specification.

Table 6 reports the estimates of model (11). The business cycle is measured using the deviation of GDP from the trend extracted using the HP filter. Table 7 reports exactly the same information, but using the annual growth rate of GDP as an alternative measure of the economic cycle. In each table, we use two different measures for the numerator of the dependent variable $\ln(\frac{N_{ij,t}}{N_{ii,t}})$. The first one takes the log of $1 + N_{ij,t}$ in the numerator in order to keep the country pairs with zero observations for $N_{ij,t}$ in the estimation sample. This is sometimes called Scaled OLS estimation (Simpson and Sparber, 2012). The second one uses simply $\ln(N_{ij,t})$ in the numerator as in the equilibrium condition, which leads to a modest decrease in the sample size.³⁹ Columns (1-4) give the estimates using $\ln(\frac{1+N_{ij,t}}{N_{ii,t}})$ as our dependent variable while Columns (5-8) give the estimates based on $\ln(\frac{N_{ij,t}}{N_{ii,t}})$. Columns (1) and (5) report estimates based on the full model as given in equation (11). In columns (3) and (7) the cycle is measured only at destination while in columns (4) and (8), the business cycle and the employment rate are both measured at the destination only.

³⁹Actually, we have only a reduction of 43 data points, which reflects that the proportion of (true) zeroes for the bilateral flows in our dataset is negligible. This further justifies the use of OLS estimators instead of the Poisson Pseudo Maximum Likelihood estimators advocated by Santos Silva and Tenreyro (2006).

Table 6: The impact of business cycles on migration: benchmark regression

Estimation Method	Scaled OLS				OLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Wage differential	0.139*** (10.28)	0.139*** (10.28)	0.138*** (10.16)	0.133*** (9.74)	0.135*** (9.86)	0.135*** (9.86)	0.133*** (9.72)	0.128*** (9.31)
Business cycles	0.0048*** (2.77)	0.0049*** (2.77)	0.017*** (7.52)	0.010*** (4.19)	0.0043** (2.36)	0.0043** (2.37)	0.017*** (7.23)	0.010*** (4.01)
Employment rates	2.640*** (9.67)	2.668*** (9.77)	2.237*** (8.44)	4.091*** (11.66)	2.669*** (9.58)	2.697*** (9.48)	2.239*** (8.28)	4.098*** (11.46)
Unempl. at origin	-0.154*** (8.59)	-0.159*** (8.91)	-0.121*** (6.55)	-0.006 (0.45)	-0.150*** (8.19)	-0.154*** (-8.50)	-0.117*** (-6.21)	-0.002 (-0.15)
Schengen	0.189*** (9.68)	0.192*** (9.91)	0.187*** (9.68)	0.204*** (10.60)	0.192*** (9.62)	0.196*** (9.83)	0.190*** (9.60)	0.207*** (10.50)
UEM	0.145*** (5.22)	0.146*** (5.26)	0.154*** (5.55)	0.127*** (4.68)	0.142*** (5.05)	0.143*** (5.09)	0.151*** (5.38)	0.124*** (4.52)
Bilateral	-0.077*** (3.75)	-	-	-	-0.075*** (3.58)	-	-	-
Dyadic FE (α_{ij})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
time FE (α_t)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# observations	11055	11055	11055	11055	11012	11012	11012	11012
R^2	0.942	0.939	0.942	0.943	0.941	0.941	0.941	0.942

Estimated equation: equation 11. Estimation period: 1980-2010.
 Dependent variable in (1-4): $\ln((1 + N_{i,j,t})/N_{i,t})$; Dependent variable in (5-8): $\ln(N_{i,j,t}/N_{i,t})$.
 Superscripts ***, **, * denote statistical significance at 1, 5 and 10% respectively.
 Absolute value of Robust t-stats are provided in parentheses.
 (3) and (7) business cycle at destination only; (4) and (8): business cycle and employment rate at destination only.

Table 7: The impact of business cycles on migration: growth rate as a measure of cyclical stance

Estimation Method Variables	Scaled OLS				OLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wage differential	0.166*** (9.37)	0.166*** (9.37)	0.168*** (9.44)	0.157*** (8.85)	0.150*** (8.43)	0.160*** (8.93)	0.161*** (9.01)	0.150*** (8.41)
Business cycles	0.013*** (6.18)	0.013*** (6.08)	0.018*** (7.52)	0.015*** (5.07)	0.014*** (4.52)	0.012*** (5.38)	0.016*** (5.13)	0.013*** (4.35)
Employment rates	2.900*** (11.83)	2.937 (11.99)	2.937*** (11.93)	4.634*** (15.30)	4.617*** (15.01)	2.944*** (11.82)	2.947*** (11.77)	4.657*** (15.15)
Unempl. at origin	-0.162*** (8.64)	-0.167*** (9.01)	-0.159*** (6.55)	-0.003 (0.19)	0.005 (0.33)	-0.162*** (8.59)	-0.155*** (8.17)	0.0017 (0.11)
Schengen	0.185*** (9.49)	0.189*** (9.73)	0.190*** (9.78)	0.205*** (10.68)	0.204*** (10.33)	0.192*** (9.66)	0.193*** (9.69)	0.209*** (10.57)
UEM	0.147*** (5.30)	0.148*** (5.34)	0.150*** (5.38)	0.123*** (4.52)	0.119*** (4.31)	0.145*** (5.17)	0.146*** (5.20)	0.120*** (4.35)
Bilateral	-0.086*** (4.16)	-	-	-	-0.082*** (3.96)	-	-	-
Dyadic FE (α_{ij})	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
time FE (α_t)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# observations	10883	10883	10883	10883	10840	10840	10840	10840
R^2	0.943	0.943	0.943	0.944	0.942	0.941	0.941	0.942

Estimated equation: equation (11). Estimation period: 1980-2010.
 Dependent variable in (1-4): $\ln((1 + N_{i,j,t})/N_{i,t})$; Dependent variable in (5-8): $\ln(N_{i,j,t}/N_{i,t})$.
 Superscripts ***, **, * denote statistical significance at 1, 5 and 10% respectively.
 Absolute value of Robust t-stats are provided in parentheses.
 (3) and (7) business cycle at destination only; (4) and (8): business cycle and employment rate at destination only.

Appendix D: Analysis of legal acts related to immigration and visas

In order to analyze the impact of business cycles on migrations acts among the countries in our sample, we focus on the cases of four important countries, namely the United States, Canada, Spain and France. With this sample, two non-European and two European countries are covered and they all have a sufficient size and/or large enough immigrations flows to be somewhat representative, though having their own characteristics.

To that purpose, we use two complementary perspectives. We first consider national acts (laws, decrees and ministerial decisions) related to immigration that are considered in the literature as reactions to business cycles.

We also make a complementary analysis of national acts concerning visas, registered in the International Organization for Migration database, and compare the dates at which these rules were passed with the economic cycles. This comparison remains qualitative: we have chosen not to give a value to these rules to include them in regressions because numerical values are difficult to be coded (this depends among other things on the impact of their contents).

A. Analysis of legal acts in the literature

We first consider legal acts passed by the four countries under review, in reaction to the economic cycle, as recorded in the literature.

According to Martin and Lowell (2005), the "Canadian policy [...], relative to the U.S., favors selection of skilled migrants and varies levels to immigration according to economic cycle." Moreover, "Unlike the U.S., where changes in admissions occur every few decades, Canadian admission levels change following ministerial consultations. The goal historically has been to set numerical targets that vary with the economic cycle. The numbers grew toward 200,000 in the 1970s only to be reduced to just over 100,000 in the mid-1980s, followed by a robust growth to just shy of 250,000 in the mid-1990s. Family immigrants made up an increasing share over that time period being about half of all admissions by 1994 and the independent stream about four tenths (balance refugee). It can be argued that a 50/50 balance of skilled and family admission will yield a net benefit, or at least minimize any potential adverse impact by balancing economically versus non-economically selected immigrants [...]"⁴⁰

It thus appears that Canada and United States have very different approaches: more immigrants selection and more quantitative limits that are likely to change merely by ministerial decisions in Canada. It does not mean that United States do not change their rules over time (Cf. graph in the following part showing national acts linked to visas recorded by the International Organization for Migration), but it is not as systematically linked to the economic cycle and not so easy to pass.

Indeed, although the United States have also set numerical limitations for employment-based legal permanent residents, this objective has been set by the Congress in 1990 at 140,000 immigrants a year, and this number has not fluctuated since then. Yet, there are more fluctuations in the United States for specific cases like temporary admissions. As stated in Martin and Lowell (2005), in the Immigration Act of 1990, Congress imposed restrictions on the growing

⁴⁰See also Green and Green, 2004 for a thorough analysis of the Canadian immigration policy over a long period of time.

use of the H visa, a visa originally set for temporary workers, and that concerned later on workers with a dual intent to stay either temporarily or permanently (H- 1B visa). These restrictions intended to protect domestic workers. Originally, the visa had no numerical limitations and few labor protections. In 1990, a numerical cap of 65,000 new H- 1Bs per year was imposed. Yet, this limit was increased several times, especially as the result of lobbying by the information technology industry: from 65,000 per year to 115,000 per year in 1999 and 2000, and 107,500 in 2001, and then decreased later on, but not only for economic reasons (Cf. the events of 11th September 2001).

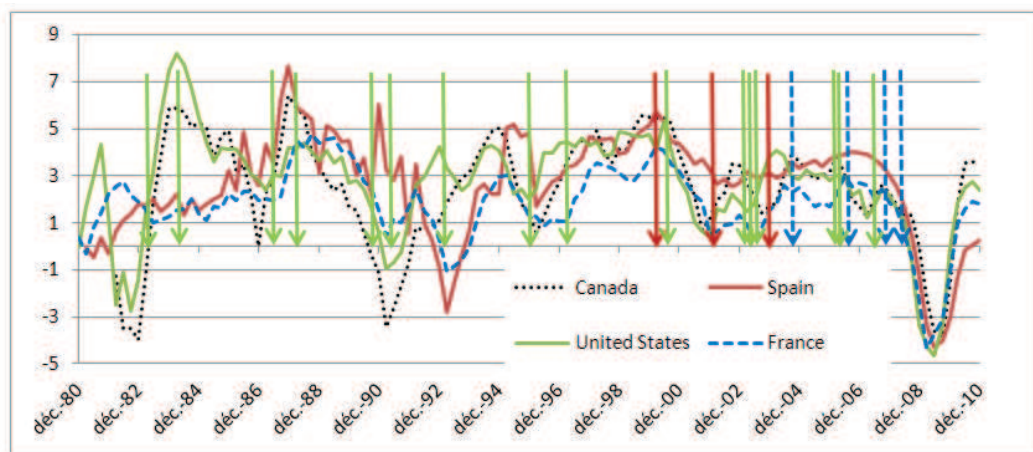
Concerning Spain, it was only in July 1985 that the government passed a law aimed at regulating immigration, as it was needed before the incorporation of Spain into the European Community in 1986. Up to the early 1990s, Spain maintained a relatively flexible stand on the implementation of effective policies of border closure while, simultaneously developing a restrictive legal framework in accordance with the requirements of its partners in the European Union. This attitude changed in 1991, coinciding with the expiration of the 1964 agreement with Morocco, and the 1966 agreement with Tunisia for the mutual suppression of visas, when the Spanish government reintroduced the requirement of visas for nationals of countries from North Africa, as a precondition for the incorporation of Spain into the Schengen agreement. Over latest years, a sizeable part of immigration has been non qualified, especially directed towards sectors such as construction. If Spain has decided to reduce its contingent of non-seasonal workers in 2009 (Cf. OECD (2009)), it concerned workers recruited anonymously abroad, thus rather non qualified workers. Thus, globally, we may say that Spanish legal acts, coming late, were rather directed towards countries mostly out of our sample, as confirmed in the analysis of acts related to visas recorded by the International Organization for Migration (see hereafter).

France is among the countries (it is also the case in the United Kingdom for instance) that use lists of workforce shortage, to regulate economic immigration. These lists are based on data related to job vacancies: if the ratio between jobs offers and available workers exceeds a certain level for more than one year (initially equal to 1, and then decreased to 0.9), the profession is included in a regional yearly list of jobs under tension. Yet, because of this time lag of one year, this list cannot fit the economic situation in real time (Cf. OECD (2009)). France has also established lists of jobs under tension in bilateral agreements, but rather with countries out of our sample (for example the agreement with Gabon in 2007). This policy is quite different from the one in "settlement countries" where long term needs contribute to determine the content of these lists (like New-Zealand or to a lesser extent Canada). From this point of view, France appears as adapting partly (because many immigrants still come for non economic reasons, including from countries in our sample), though with delay, its legal framework to the economic conditions.

B. Analysis of legal acts related to visas for four countries in the database of the International Organization for Migration

Considering the legal acts related to visas for four countries in the database of the International Organization for Migration, we find that national laws about visas are not changed at regular intervals and that these changes do not always take place at the same stage of the cycle. This is due to a large extent to time lags between an economic downturn and the moment when policies are decided and voted, which may last for some time.

Figure 4: Graph for United States, Canada, Spain and France: GDP growth rates (quarterly growth rates cumulate over four quarters, %) and dates of acts related to visas concerning potentially the countries of our sample (arrows, with the corresponding color for each country in legend)
 Source: International Organization for Migration, national accounts, calculations of the authors



If the United States' acts are passed over the whole period, with varying frequency over time though, France and Spain's acts are concentrated in the 2000s', without any major economic downturn to notice, and before the great recession. Besides, at the beginning of the 1980s' and in the first half of the 1990s, there were recessions in France and in Spain, which did not involve any acts related to visas to be passed. This suggests that significant economic evolutions do not necessarily involve legal changes and that, conversely, economic conditions are not the only reasons for passing laws on visas. As can be seen on the graph, there was a high concentration of laws related to visas that were passed shortly after the events on 11th September 2001, in the United States, in Spain and in France.

Table 8: Laws related to in the United States, Canada, Spain, and France is the International Organization for Migration database, concerning potentially the countries of our sample

References of the laws	1st version	Last version	Remarks
United States			
Migrant and seasonal agricultural worker protection	14/01/1983	15/11/1995	
Exchange visitor program	16/03/1984		Limited to special cases (research...) and for a duration up to 2 years
Special agricultural workers	29/03/1988	13/06/2003	
Exchange visitor program	19/03/1993	19/06/2007	Limited to special cases (research...)
Immigration and Nationality Act	11/09/1952	27/07/2006	Taken into account for its last date of change
Labor certification process for the temporary employment of aliens	13/09/1977	30/06/2006	Taken into account for its last date of change
Regulations pertaining to both non immigrants and immigrants under the INA	02/07/1991	08/09/2000	Completes other acts by giving definitions and making cases more precise
Control of employment of aliens	01/05/1987	13/06/2003	Indirect restriction of immigrants' entrance
Documentary requirements waivers	06/03/1997	13/03/2003	
Immigration Act of 1990*	29/11/1990		Imposed restrictions on the granting of temporary visas, to protect domestic workers.
Spain			
Orden PRE/237/2002, por la que se dictan instrucciones generales relativas al número de enlace de visado en materia de extranjería	08/03/2002		
Ley Orgánica sobre derechos y libertades de los extranjeros en España y su integración social (incluidas reformas)	11/01/2000	20/11/2003	
France			
Code de l'entrée et du séjour des étrangers et du droit d'asile	14/11/2004	06/08/2008	
Loi relative à l'immigration et à l'intégration	24/07/2006		
Loi relative à la maîtrise de l'immigration, à l'intégration et à l'asile	20/11/2007		

Source: International Organization for Migration

Note: no law related to visas was found over the period for Canada in the IOM database.

Only the dates for the first and last versions are available on the IOM website.

*: not in the IOM database, added as found in the article by Martin and Lowell (2005)

Appendix E: Robustness check: estimations with dropped destinations

This section provides the figures relative to the robustness checks of the estimation of models 12 and 13. The evolution of the coefficients can be used as indirect evidence in favour or against the validity of the underlying IIA assumptions in the estimated specifications.

Figures 5 to 8 plot the evolution of the estimated key coefficients of equation (12) when dropping successively one destination country from the regression.⁴¹ Figure 5 plots the estimated values of the coefficient relative to cycle differential, i.e. $\hat{\beta}_1$ of equation (12). Figures 6, 7 and 8 do the same for coefficients $\hat{\beta}_2$, $\hat{\beta}_3$ and $\hat{\beta}_4$ respectively.

Figures 9 to 12 plot the evolution of the estimated key coefficients of equation (13) when dropping successively one destination country from the regression with growth rates. Figure 9 plots the estimated values of the coefficient relative to cycle differential, i.e. $\hat{\beta}_1$ of equation(13). Figures 10, 11 and 12 do the same for coefficients $\hat{\beta}_2$, $\hat{\beta}_3$ and $\hat{\beta}_4$ respectively.

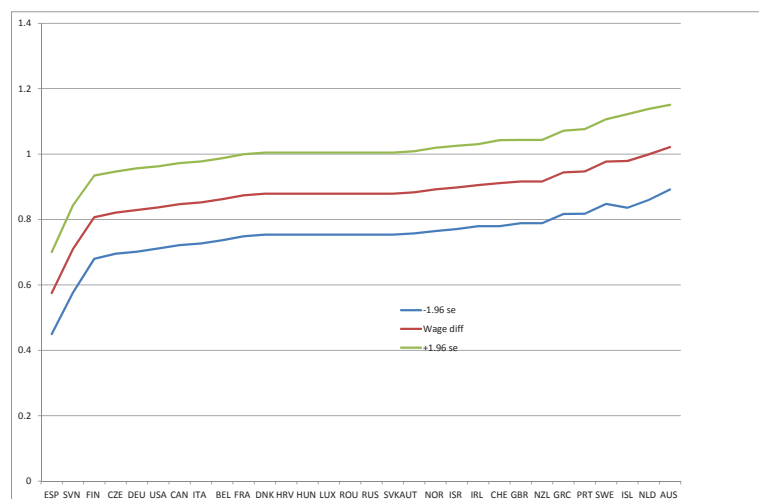


Figure 5: Wage differential coefficient estimates ($\hat{\beta}_1$) (equation 12) with 95% confidence interval; dropped destination reported on X axis

⁴¹The measure of the cycle differential is given by the differential in growth rate.

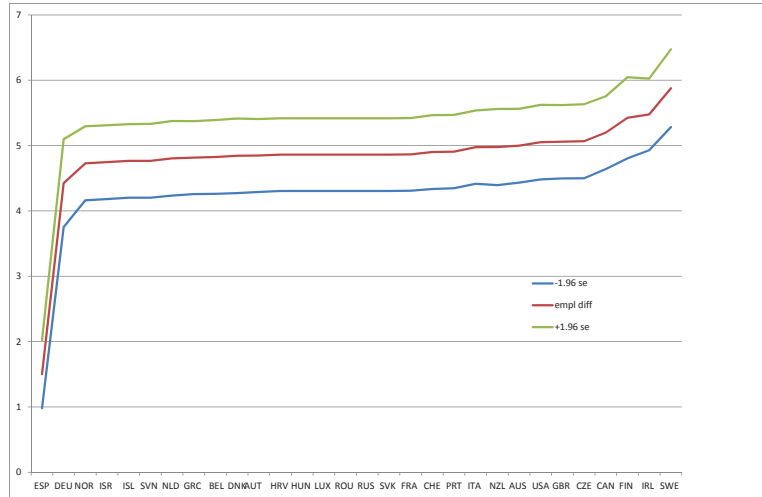


Figure 6: Employment rate differential coefficient estimates ($\hat{\beta}_2$) (equation 12) with 95% confidence interval; dropped destination reported on X axis

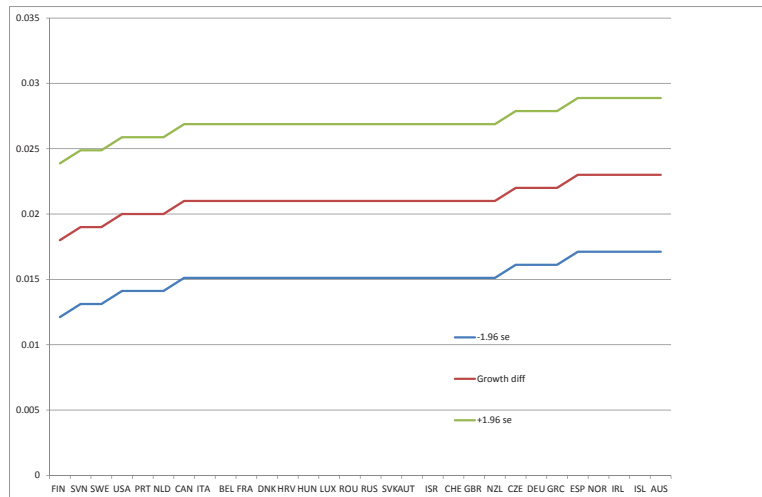


Figure 7: Business Cycle differential coefficient estimates ($\hat{\beta}_3$) (equation 12) with 95% confidence interval; dropped destination reported on X axis

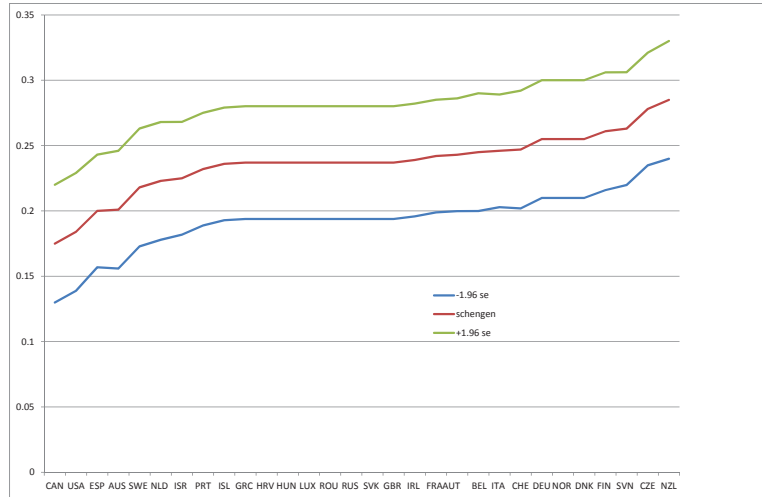


Figure 8: Schengen coefficient estimates ($\hat{\beta}_4$) (equation 12) with 95% confidence interval; dropped destination reported on X axis

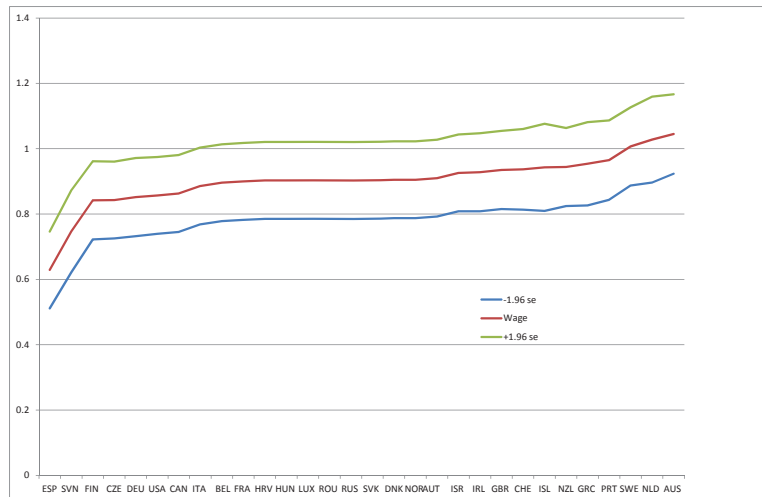


Figure 9: Wage differential coefficient estimates ($\hat{\beta}_1$) (equation 13) with 95% confidence interval; dropped destination reported on X axis

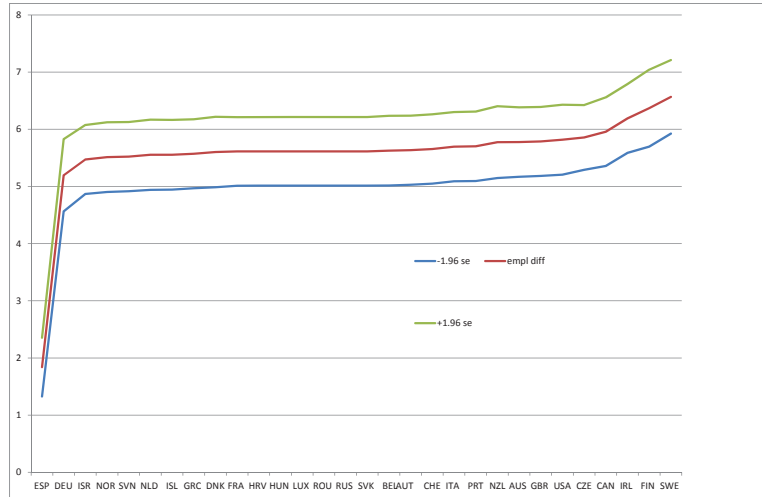


Figure 10: Employment rate at destination coefficient estimates ($\hat{\beta}_2$) (equation (13)) with 95% confidence interval; dropped destination reported on X axis

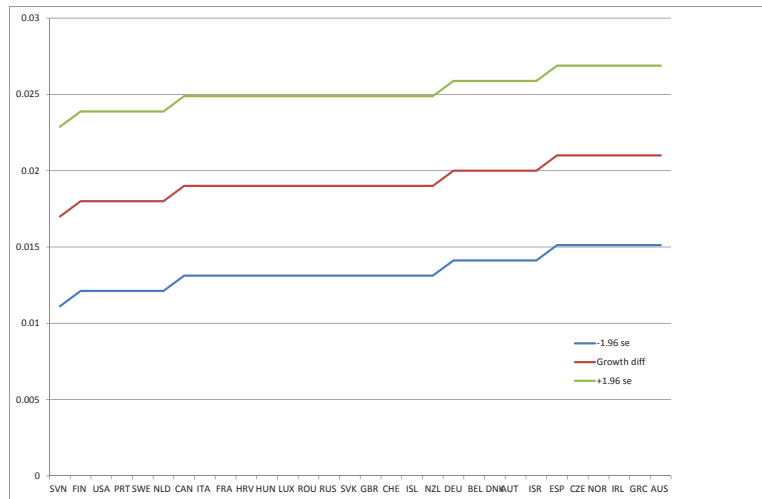


Figure 11: Business Cycle at destination coefficient estimates ($\hat{\beta}_3$) (equation (13)) with 95% confidence interval; dropped destination reported on X axis

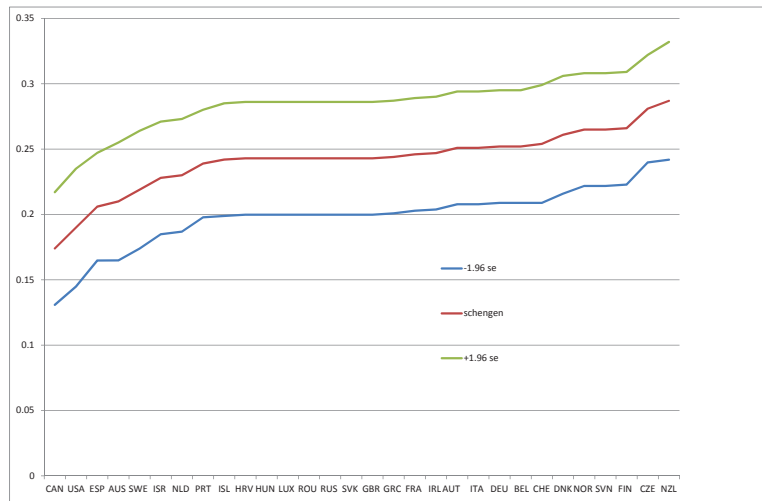


Figure 12: Schengen coefficient estimates ($\hat{\beta}_4$) (equation (13)) with 95% confidence interval; dropped destination reported on X axis

Documents de Travail

440. P. A. Pintus and J. Suda, "Learning Leverage Shocks and the Great Recession," August 2013
441. G. Clette, J. Lopez et J. Mairesse, "Upstream product market regulations, ICT, R&D and productivity," August 2013
442. M. Juillard, H. Le Bihan and S. Millard, "Non-uniform wage-staggering: European evidence and monetary policy implications," August 2013
443. G. Cheng, "A Growth Perspective on Foreign Reserve Accumulation," August 2013
444. D. Wesselbaum, "Procyclical Debt as Automatic Stabilizer," September 2013
445. A. Berthou and V. Vicard, "Firms' Export Dynamics: Experience vs. Size," September 2013
446. S. Dubecq, A. Monfort, J-P. Renne and G. Roussellet, "Credit and Liquidity in Interbank Rates: a Quadratic Approach," September 2013
447. V. Bignon, R. Esteves and A. Herranz-Loncán, "Big Push or Big Grab? Railways, Government Activism and Export Growth in Latin America, 1865-1913," September 2013
448. C. D'Avino, "Net interoffice accounts of global banks: the role of domestic funding," September 2013
449. J. Dugast, "Limited Attention and News Arrival in Limit Order Markets," October 2013
450. V. Bignon, R. Breton and M. Rojas Breu, "Currency Union with or without Banking Union," October 2013
451. M. Crozet, E. Milet and D. Mirza, "The Discriminatory Effect of Domestic Regulations on International Trade in Services: Evidence from Firm-Level Data," October 2013
452. P. Bacchetta, K. Benhima, and Y. Kalantzis, "Optimal Exchange Rate Policy in a Growing Semi-Open Economy," October 2013
453. M. Beine, J-C. Bricongne and P. Bourgeon, "Aggregate Fluctuations and International Migration," October 2013

Pour accéder à la liste complète des Documents de Travail publiés par la Banque de France veuillez consulter le site :
www.banque-france.fr

For a complete list of Working Papers published by the Banque de France, please visit the website:
www.banque-france.fr

Pour tous commentaires ou demandes sur les Documents de Travail, contacter la bibliothèque de la Direction Générale des Études et des Relations Internationales à l'adresse suivante :

For any comment or enquiries on the Working Papers, contact the library of the Directorate General Economics and International Relations at the following address :

BANQUE DE FRANCE
49- 1404 Labolog
75049 Paris Cedex 01
tél : 0033 (0)1 42 97 77 24 ou 01 42 92 63 40 ou 48 90 ou 69 81
email : 1404-ut@banque-france.fr