
11. The migration–trade link in developing economies: a summary and extension of evidence

*Robert E. B. Lucas**

Gravity models of migration and of trade have much in common, and the last two decades have witnessed an integration of these two strands of literature. Since the appearance of the seminal paper by Gould (1994), a substantial empirical literature has emerged documenting significant positive associations between bilateral international trade and migration, typically within a gravity model framework, usually with the presumption that migration causes trade expansion. For the developing countries this potential link may be of considerable importance. The notion that openness to trade is the *sine qua non* of economic development has been largely abandoned since the 1980s. Nonetheless, reductions in trade barriers and improvements to the trade balance often remain critical for lower-income states. Yet only a small portion of the extensive empirical literature on the migration–trade link focuses on the context of developing regions. The aim of the present chapter is then twofold: first to present some fresh evidence on the migration–trade link with particular reference to developing countries, using data on bilateral trade and migration among 192 countries from 1960 to 2000; and second to summarize some of the prior literature tangential to these results. The chapter in this volume by Christopher Parsons and L. Alan Winters (Chapter 4) offers a more complete synthesis of this genre of literature.

1. MODELS AND ISSUES IN ESTIMATION

Three explanations are common for the enhancement by migrants of bilateral trade between the migrants' origin and host countries.

* I am grateful to Sam Bazzi, Chris Parsons, Çağlar Özden and the members of the KNOWMAD seminar group at the World Bank for helpful comments and suggestions on a preliminary version of this chapter.

1. The preference effect refers to emigrants retaining a taste for items from the old country. This may be enlarged by a consumption spill-over effect, in which natives of the host country learn to prefer goods from their immigrants' lands.
2. An information bridging effect: emigrants may well have a better grasp of trading opportunities and the norms of conducting business in their home country than do non-nationals. They may also possess more contacts able to realize potential trade deals.
3. A contract enforcement effect: in many parts of the world, and in some sectors in particular, contracts are sealed with a handshake rather than via legal documents. Members of a diaspora may possess friends and family at home who are able to enforce such informal deals, if only through social embargoes and pressure.¹

The preference effect postulates that migrants from country i to country j may increase exports from i to j . The remaining two effects both suggest that migrants from country i to country j may enhance exports from j to i as well as from i to j . Since essentially every country undergoes simultaneous immigration and emigration, openness to trade in both directions should ensue. Openness is not synonymous with freer trade; however, to the extent that migrants mitigate trade costs, such as those associated with distance, efficiency gain results. Typically these mitigating effects are presumed to be associated with the information-bridging and contract-enforcement effects derived from migrants, but not from their preference effect on trade.²

Together the three effects indicate augmenting the standard gravity model of bilateral trade³ along the following lines:

$$LX_{ijt} = \phi_0 + \phi_1 LY_{it} + \phi_2 LY_{jt} + \phi_3 LD_{ij} + \phi_4 F_{ij} + \phi_5 LN_{ijt} + \phi_6 LN_{jti} + \Phi' \mathbf{V}_{ijt} + \varepsilon_{ijt} \quad (11.1)$$

- where: LX_{ijt} = the natural logarithm of exports, in current prices, from country i to j at time t
- LY_{it}, LY_{jt} = the natural logarithm of GDP, in current prices, in i and j at time t
- LD_{ij} = the natural logarithm of distance between i and j
- F_{ij} = a dummy variable for whether i and j have a common border
- LN_{ijt} = the natural logarithm of the stock of migrants from i in j at time t
- LN_{jti} = the natural logarithm of the stock of migrants from j in i at time t
- \mathbf{V}_{ijt} = a vector of control variables.

Along somewhat similar lines, a bilateral migration, gravity model may be specified as⁴

$$LN_{ijt} = \lambda_0 + \lambda_1 LW_{it} + \lambda_2 LW_{jt} + \lambda_3 LP_{it} + \lambda_4 LP_{jt} + \lambda_5 LD_{ij} + \lambda_6 F_{ij} + \mathbf{\Lambda}' \mathbf{U}_{ijt} + \xi_{ijt} \quad (11.2)$$

where: LW_{it}, LW_{jt} = real income per capita, or real wage, in countries i and j at time t

LP_{it}, LP_{jt} = the natural logarithm of population in i and j

\mathbf{U}_{ijt} = a vector of augmenting control variables.

Together these present a recursive system in which trade is commonly presumed not to affect migration.⁵ Although this exclusion restriction rules out reverse causality, correlation may remain between the migration and disturbance terms in (11.1). In particular, considerable overlap exists between terms commonly included in vectors \mathbf{V} and \mathbf{U} , the control or augmenting variables in the trade and migration equations respectively; omission of elements of \mathbf{V} that are common to both \mathbf{V} and \mathbf{U} can then result in biased estimates of (11.1).

An alternative is to replace any observed or unobserved elements in \mathbf{V} that are fixed with respect to the country of origin, the host country, or their dyad, by inclusion of corresponding fixed effects.⁶ Any time dimension to the data also raises concerns about use of current price measurement of variables, which is common in estimating trade gravity models in part because of the lack of good trade deflators. Perhaps as a result, virtually all estimates that are based on panel data also include time fixed effects.⁷

Over the last two decades, at least 43 papers have appeared examining bilateral exports (or imports, or both), for a specific OECD country (or its sub-national states) in relation to that nation's immigrant stocks from a subset of partner countries (N_{jt}). It is apparent that estimation in such contexts requires some simplification of equation (11.1), resulting in a typical specification of the form

$$LX_{jt} = \phi_j + \phi_\tau + \phi_2 LY_{jt} + \phi_5 LN_{jt} + \mathbf{\Phi}' \mathbf{V}_{jt} + \varepsilon_{jt} \quad (11.3)$$

where LX_{jt} is the logarithm of exports either to or from partner j ; ϕ_j and ϕ_τ are fixed effects for the countries of immigrant origin and time periods respectively. The inclusion of any fixed effects representing the countries of origin necessitates omission of the distance and common-border variables from (11.1);⁸ time fixed effects require omission of the OECD host's income levels. On the other hand, the omission of emigrant stock from the OECD country in its trading partners is typically forced by lack of data.

Naturally, contributions to this literature have included variations on this basic model. Some have included partner fixed effects; others have relied entirely on a vector of controls instead, particularly when only cross-section data are available.⁹ The treatments of both zero migration and zero trade have also differed. Simply omitting observations on zero introduces the potential for selection bias from censoring. A number of alternatives have therefore been considered to address the fact that the logarithm of zero (trade or migration) is not defined, and a few notes on these are presented in the Appendix to this chapter. The treatment of zero-migration outcomes has typically either used a scaling approach, adding one to the number of migrants, or inserted a dummy for zero migration, though a few studies simply omit such instances. A couple of analysts also extend the term $\phi_3 LN_{jt}$ in (11.3) to permit the elasticity of trade to vary with the level of immigration, while others introduce various interactions in one of three generic forms:

$$\gamma_1 LN_{jt} + \gamma_2 G_{jt} \tag{11.4i}$$

$$\gamma_1 LN_{jt} + \gamma_2 G_{jt} * LN_{jt} \tag{11.4ii}$$

$$\gamma_1 \log(N_{jt} * G_{jt}) + \gamma_2 \log(N_{jt} *(1 - G_{jt})) \tag{11.4iii}$$

where G_{jt} represents the fraction of immigrants from j possessing some characteristic and \log indicates a natural logarithm. Both these latter extensions will be discussed in some detail in the following section. Meanwhile it will be useful to note that the alternative specifications in (11.4) have somewhat different implications.¹⁰

In comparison, the fresh evidence presented in this chapter adopts a basic specification:

$$LX_{ijt} = \theta_{ij} + \theta_t + \Theta_1'N_{ijt} + \Theta_2'N_{jit} + \Theta_3'LN_{ijt}*G_{ijt} + \Theta_4'LN_{jit}*G_{jit} + \theta_1LP_{it} + \theta_2LP_{jt} + \theta_3LY_{it} + \theta_4LY_{jt} + \Theta_5'V_{ijt} + \epsilon_{ijt} \tag{11.5}$$

This includes fixed effects for each country dyad (θ_{ij}) and time period (θ_t).¹¹ The vector N_{ijt} is composed of five terms: LN_{ijt} , LN_{ijt}^2 , LN_{ijt}^3 , LN_{ijt}^4 and Z_{ijt} , where Z_{ijt} is a dummy variable for zero bilateral emigration from i to j (in which event LN_{ijt} is set to zero). N_{jit} encompasses the counterpart five terms. The logarithms of migration in both directions are also interacted with a vector of terms (G_{ijt} and G_{jit}) that comprise the following elements:

A common language spoken in the two countries

The two countries either had a colonial link at some stage or had a common colonizer

If the two countries are signatories of a mutual trade agreement
 Fraction of the migrants that are refugees
 Fraction of the migrants that is female.

The first two of these elements are time invariant and hence encompassed in the dyad fixed effects; the remaining three are, however, incorporated into the vector of controls (\mathbf{V}_{ijt}) so as not to compromise the interaction terms. The interaction terms in (11.5) thus nest both (11.4i) and (11.4ii). \mathbf{V}_{ijt} also includes the incidence of war in both i and j at time t . Other terms are as previously defined.

Estimation of (11.5) draws on cross-country, bilateral trade and migration data between 36864 dyads of 192 countries from 1960 to 2000. Annual data are available for all time-varying terms in (11.5), with the exception of migrant stocks, which are available at the turn of each decade. For years between the decennial points, the migrant stocks are therefore interpolated linearly here to be commensurate with the trade data. Tests on the restriction that all migration terms in (11.5) differ between the decades and in the intervening years fail to reject these restrictions. In other words, interpolating the migration data between census years to preserve continuity appears to have little bearing on the results. Equation (11.5) is estimated separately for each of four country-dyad groups. Each of the four groups is defined by whether the country of export (and hence of emigrant origin and of immigrant residence) is a developing or higher-income country and whether the bilateral partner is a developing or higher-income country. For present purposes, developing (or lower-income) countries are defined as those with a GDP per capita, at the time, below US\$4035 in 2000 prices; higher-income countries are those above this cut-off. This corresponds to developing countries including all Low and Lower-Middle Income countries on the current World Bank definitions; the Upper-Middle and High Income countries are in our higher-income group.¹² Table 11.1 presents the patterns of export flows and of migrant stocks between these sets of countries as of 2000.

2. EXISTING AND FRESH EVIDENCE ON THE BILATERAL MIGRATION–TRADE LINK REFERRING TO DEVELOPING REGIONS

Rather than attempting to summarize the existing evidence separately from any fresh results, I present the two here in tandem, distinguishing particular elements within these results.

Table 11.1 Bilateral exports and migrant stocks as of 2000

	Total bilateral exports of goods (million US\$)			
	Importing countries			
	Low-income	Lower-middle	Upper-middle	High-income
Exporting countries				
Low-income	565	2708	2448	13 584
Lower-middle	8453	47 451	65 661	524 980
Upper-middle	6139	81 154	130 498	675 679
High-income	18 103	362 742	599 644	3 511 102
	Migrant stocks			
	Host countries			
	Low-income	Lower-middle	Upper-middle	High-income
Home countries				
Low-income	2 488 611	8 578 473	2 026 359	3 224 232
Lower-middle	3 258 727	9 111 873	12 480 349	27 201 890
Upper-middle	492 704	7 371 815	12 069 357	39 007 523
High-income	345 442	1 624 417	3 365 820	26 923 264

2.1 Migrant Elasticities of Trade by Level of Development

Given the reliance on personal deals in doing business in many developing countries, one might presume that both the contract-enforcement and information-bridging opportunities afforded by migrants would assume particular importance. Yet the vast bulk of prior evidence refers exclusively to OECD countries' trade and there is little emphasis on the development status of their trading partners. The prior literature on this issue is consequently sparse, but falls into four types:

1. Single OECD country analyses that distinguish between developing and developed partners.
2. OECD studies adopting development-related surrogates.
3. Applications to single developing countries.
4. Cross-country studies that distinguish developing regions.

Studies under the first heading have appeared for three OECD countries: the USA, New Zealand and Spain. The two US analyses reach opposing results.¹³ Co et al. (2004) find that exports by US states exhibit an elasticity with respect to immigrant stock that is greater in the case of

high-income partner countries than for lower-income partners, though the absolute difference is slight and probably insignificant statistically. In contrast, White (2007a) estimates that immigrants from high- and middle-income countries have no significant effect on either US national exports or imports; on the other hand, immigrants from low-income countries have positive effects on both US exports and imports, and especially on the latter. Qian (2008) supports White's position, finding that New Zealand's imports have by far the greatest elasticity with respect to immigrants from lower-middle-income countries, while exports respond most to immigrants from the low-income countries (see also Law et al., 2009). In the analysis of exports from the provinces of Spain by Peri and Requena-Silvente (2010), immigrants from Africa have the biggest effect overall on highly, moderately and less differentiated goods, though immigrants from the Middle East have an even larger association in the specific case of moderately differentiated goods.

Developing countries are commonly characterized as having weak institutions, which result in a lack of transparency and laxity in the rule of law. Accordingly, Dunlevy (2006) shows that US state exports are particularly enhanced by immigrants if the migrants come from countries in which transparency of institutions is weak, a finding supported by Briant et al. (2009) for the case of French regions using an index of rule of law in the partner countries.¹⁴

In contrast to the plethora of studies of immigrant effects on trade of the OECD countries, only two papers have appeared examining the parallel case for developing countries. Unfortunately, neither study offers convincing evidence of whether immigrants in developing countries have comparable effects on trade as in the case of their OECD counterparts.¹⁵

With the advent of several bilateral migration matrices, four recent papers examine the role of migration in cross-country trade patterns among multiple countries, distinguishing developing regions in the process. Two of these focus exclusively on migration to the OECD countries. Felbermayr and Jung (2009) adopt the migrant stock matrices, for 1990 and 2000, compiled by Docquier and Marfouk (2004) to examine OECD immigration from, and trade with, the 'south', where the south is defined as countries with a GDP per capita below the sample eightieth percentile (which actually includes some eurozone countries). In the context of a gravity model, with country and time fixed effects as well as some dyad controls, the authors estimate an elasticity of 0.22 on immigrants from the south on the geometric mean of OECD imports and exports exchanged with their countries of origin. Bettin and Turco (2012) merge the Docquier–Marfouk data with the bilateral migrant stock matrix for 2005 prepared by Ratha and Shaw (2007). Again the focus is

the effect of emigration from developing countries (here defined to include several OECD countries: the Czech Republic, Hungary, Mexico, Poland, Slovenia, South Korea and Turkey) to the remaining 21 OECD countries. Bettin and Turco estimate the elasticity of OECD exports to the ‘developing’ countries at 0.11 with respect to the stock of emigrants from the developing countries, but that for developing-country exports to the OECD at a value not significantly different from zero.

Two multiple-country studies are able to take a broader look at developing countries. White and Tadesse (2013) use the Ratha–Shaw 2005 matrix, which allows them to look, in the cross-section, at the influence on African trade of African emigration, from 43 nations to 110 host countries. Pooling the cross-sectional data and including a vector of various controls for the host and home countries as well as the dyad, the average emigrant elasticity is estimated at 0.132 for African imports and 0.259 for African exports. However, White and Tadesse go on to emphasize that these averages hide a good deal of variation with respect to both the African states of origin and the host countries.¹⁶ Parsons (2012) appears to be the first to use the Global Bilateral Migration Database (GBMD), also used in the fresh evidence in the present chapter, to examine the migration–trade link.¹⁷ Parsons adopts the bilateral trade data from Feenstra et al. (2005), which are based on the UN Comtrade, resulting in trade between 68 countries and 178 partners. In repeated cross-sections on the pooled data, Parsons finds results in line with those from prior studies; however, on introducing dyad fixed effects in the panel data the associations between bilateral trade and migration prove indistinguishable from zero. Parsons then partitions his data into four groups defined by the intersections of North and South¹⁸ and finds that migrants positively affect only exports from North to South.¹⁹

The evidence on any migrant–trade link for the developing countries is thus fairly limited, particularly with respect to South–South links, and the findings are certainly mixed. Against this background, Figure 11.1 depicts the patterns emerging from the polynomial estimates on migration levels obtained here by scaled least squares estimates of (11.5), as reported in Table 11A.1 of the Appendix. These refer to elasticities of bilateral trade with respect to male, non-refugee migrants, when no common language, colonial link or regional trade agreement exists. Each of these refers to exports, but note that, given the symmetry in these estimates, the elasticity of higher-income countries’ exports with respect to immigrants from lower-income countries is also the elasticity of lower-income countries’ imports with respect to their emigrants to the higher-income countries, for example. At the sample mean levels of migration for all four of the respective country groups, the elasticities of exports with respect to both

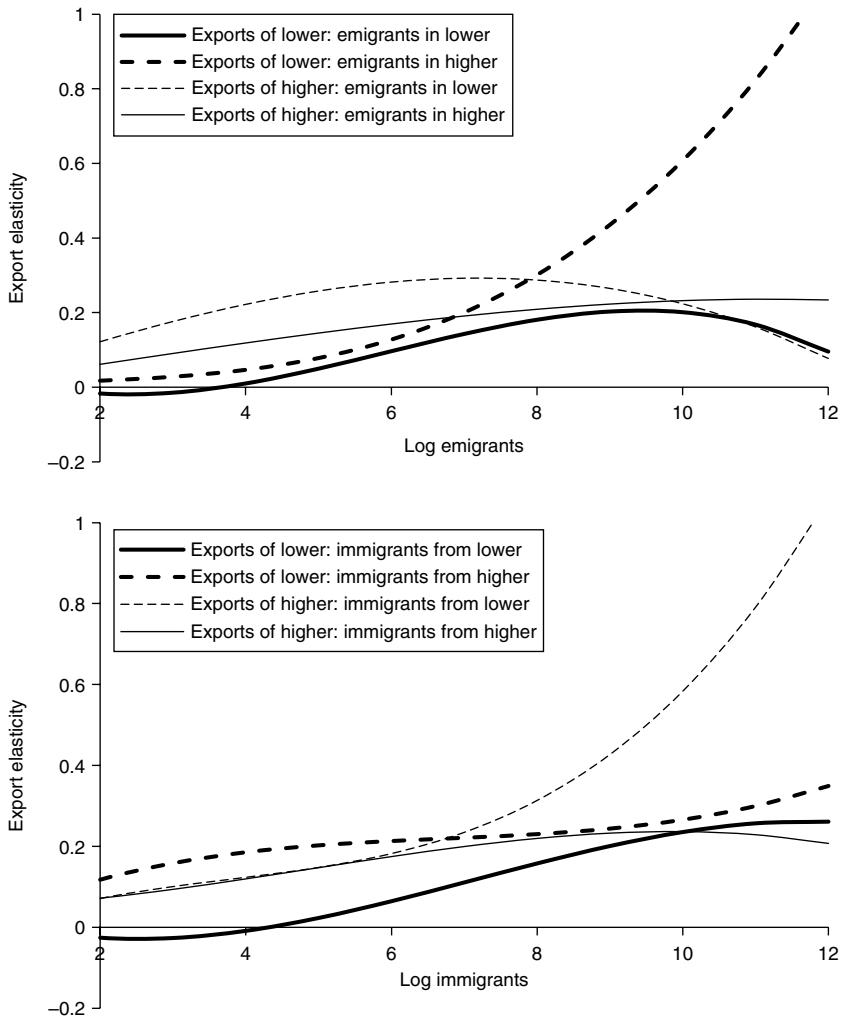


Figure 11.1 Migrant elasticities of home countries' exports

emigrants and immigrants prove significantly greater than zero with more than 99 percent confidence. At low levels of movement, migration from the higher- to lower-income countries has the largest impact on their bilateral trade in both directions. However, at higher levels of movement the reverse holds: emigration from lower- to higher-income countries has the largest effect on bilateral trade in both directions.

Summing up, much of the prior evidence on migration links with

developing-country trade has been severely limited by data availability. Almost all of the evidence is confined to distinguishing developing-country immigrants in the OECD states, and some of these analyses have adopted rather liberal definitions of developing countries. Although not unanimous, most of this evidence points to larger bilateral trade elasticities of migrants from lower-income countries than of immigrants from higher-income nations, though hardly any prior evidence exists on South–South migrant–trade links. The complementary fresh evidence indicates that emigration from developing to higher-income countries has a particularly strong association with bilateral trade in both directions at higher levels of migration. Nonetheless, South–South migration in both directions is also significantly associated with greater bilateral trade flows among these lower-income states.

2.2 On the Constancy of Migrant Elasticities of Trade

A couple of prior papers delve into the presumption of a constant elasticity of trade with respect to immigration. Bryant et al. (2005) add a term in the squared logarithm of the number of immigrants in New Zealand; Gould (1994) for the USA and Wagner et al. (2002) for Canadian provinces adopt more complex functions, the latter requiring iterative estimation. All three find declining export and import elasticities as the levels of immigration increase.²⁰

The squared, cubic and quartic terms in the logarithms of emigrants and immigrants prove, jointly, significantly different from zero, with high levels of confidence, in all four estimates in Table 11A.1. A presumption of a constant elasticity is almost ubiquitous in the prior literature, but may not be warranted.

A glance at Figure 11.1 establishes that, in contrast to the few prior findings addressing the issue, the elasticities of trade with respect to migration do not all decline with the level of migration: the patterns are somewhat mixed. However, the elasticities of export actually rise monotonically and with greater than 99 percent confidence, in seven of the eight cases illustrated, over a range of the logarithm of bilateral migration increasing from 4 through 10, an increase in the migrant stock from about 50 to 20 000. The only exception is for the elasticity of exports with respect to emigrants from the higher- to lower-income countries, where the rise is smaller and statistically weaker. Indeed, most of the elasticity profiles continue to rise even beyond 20 000 migrants. This is clearly particularly true with respect to trade in both directions as emigration from the lower- to higher-income countries rises.

2.3 Immigrants and Emigrants

Seven existing studies have managed to look at both immigrants and emigrants simultaneously, though two of these exclude any developing countries completely. Some, but not all, find positive associations of trade with both immigrants and emigrants.²¹ More typically, data on emigrants are not available. However, if all measures on emigrants are omitted from the results in Table 11A.1, any change in the immigrant profiles depicted in Figure 11.1 is negligible, so perhaps prior studies that have omitted emigrants may still be representative. On the other hand, a joint test on whether the terms including emigrant stocks are all zero in Table 11A.1 is resoundingly rejected, as is a comparable test on the immigrant vector. Both immigrants and emigrants are indeed significantly associated with trade. Moreover, the trade elasticities in Figure 11.1 prove almost entirely positive over the entire range of migrant levels for both emigrants and immigrants for all four bilateral groups.

2.4 On Refugees and Gender of Migrants

As of 2000, the percentages of emigrants that were refugees and that were female are as shown in Table 11.2.

Not only are refugees a high fraction of migrants from one lower-income country in another lower-income country, but this movement between lower-income countries actually represents almost two-thirds of the world's refugees at the time. Despite this concentration, the only context in which the role of refugees in the migrant–trade link has been examined has been in two high-income countries. Head and Ries (1998) examine Canadian immigrants by class of admission, adopting a specification of type (11.4ii); White and Tadesse (2010) look at the numbers of US refugee and non-refugee immigrants, adopting approach (11.4iii).

Table 11.2 Percentage of migrants by refugee status and gender, 2000

	As percentage of emigrants in	
	lower-income	higher-income
Emigrants from	Refugees	
Lower-income	27.03	5.46
Higher-income	0.30	1.37
	Female	
Lower-income	47.54	48.59
Higher-income	55.33	50.46

Table 11.3 Marginal trade effects of refugee composition and gender of migrants

	Marginal effect on log exports of			
	Lower-income		Higher-income	
	Emigrants in/immigrants from			
	Lower	Higher	Lower	Higher
Fraction of refugees among				
Emigrants	-0.103 (58.91)	-0.150 (55.69)	-0.162 (16.41)	-0.159 (8.16)
Immigrants	0.045 (11.35)	-0.091 (5.37)	-0.040 (3.74)	-0.206 (13.78)
Fraction of females among				
Emigrants	0.084 (24.29)	0.173 (93.84)	-0.230 (71.91)	0.193 (28.42)
Immigrants	-0.066 (259.77)	-0.042 (128.43)	-0.002 (1.36)	-0.041 (18.16)

Note: F-statistics in parentheses.

Both conclude that refugees have no significant effect on trade with their country of origin, whereas other immigrants do. Perhaps this is to be expected, given refugees’ presumed association with their original country.

If refugees have no significant effect on bilateral trade, this would have particularly important implications for some of the developing countries where refugee flows are far greater than for any high-income countries. Towards examining this issue, the specification in Table 11A.1 adopts a format that nests approaches (11.4i) and (11.4ii). Table 11.3 presents estimates of the resulting marginal effect of increasing the fraction of refugees among migrants, evaluated at the sample means of the log migrant stock.

Across the board, the higher the fraction of migrants that are refugees, the lower is the proportional increase in exports. Among immigrants, the same effect holds, with the exception of refugees from lower-income countries in lower-income countries (the dominant case), wherein a higher fraction of refugees is actually associated with an increase in the country of asylum’s exports.²² Does this imply that refugees do nothing to expand trade? To investigate this, turn to formula (11.4iii), in which the logarithms of refugee and non-refugee migrant stocks are included separately, each to the fourth power. Figure 11.2 depicts the resulting profiles for lower-income country exports. All three profiles (with respect to refugees fleeing to other lower-income countries and to higher-income countries,

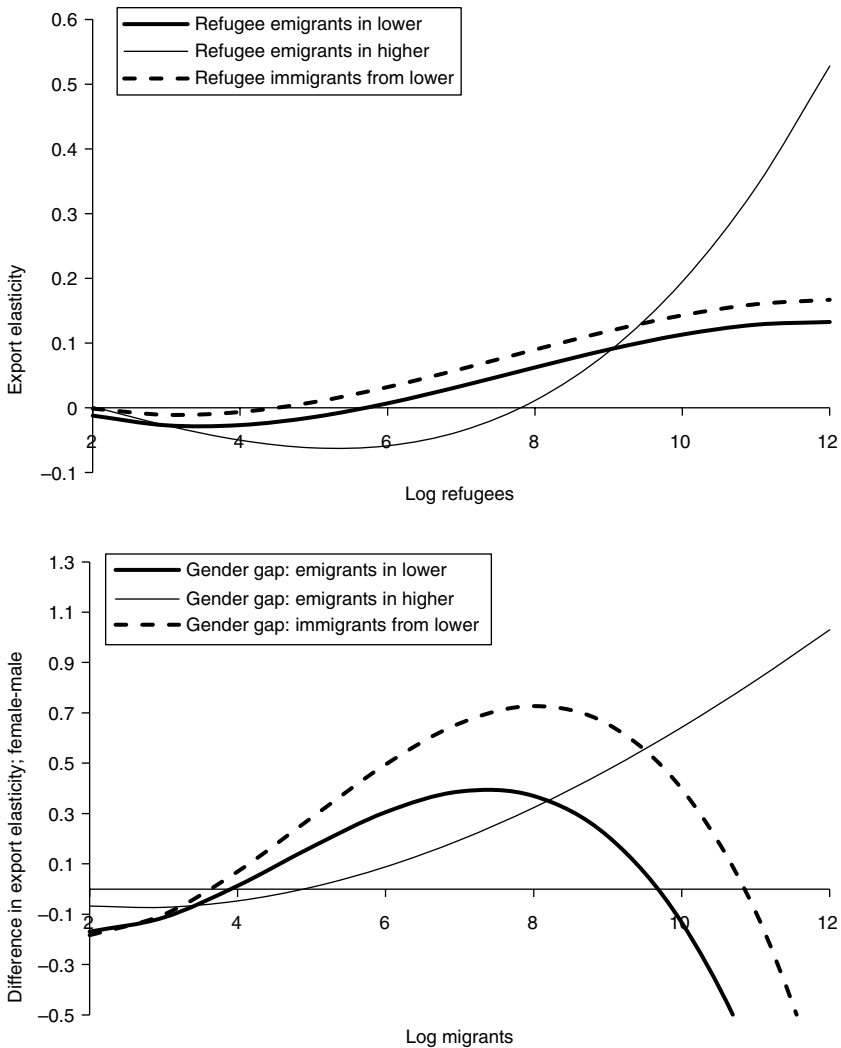


Figure 11.2 Elasticities of lower-income countries' exports: refugees and gender gap

as well as people from other lower-income countries taking refuge in the exporting country) rise with the stocks of refugees, becoming significantly positive at higher levels. Again the elasticity of lower-income countries' exports is particularly high with respect to refugees in the higher-income countries, though less so than for emigrants more generally over this cor-

ridor. Moreover, the profile (not shown in Figure 11.2) of imports by the lower-income countries from the higher-income countries proves very similar to that for exports over this same set of dyads. Although a higher fraction of refugees among migrants is associated with less bilateral trade, trade rises with the number of refugees given the number of non-refugee migrants.²³

It is less apparent what to expect with respect to the role of migrants' gender; whether females or males are better placed to enforce contracts or to bridge information gaps; whether men or women are more likely to possess a preference for home goods or to pass that preference along to others. There appear to be no precedents in the literature, perhaps in part because the variation in the fraction of females among migrants across different corridors is generally small.²⁴ Table 11.3 again presents the results from the estimates of (11.5) evaluated at the mean of log migration. The higher the fraction of emigrants that is female from the lower-income states, the greater are bilateral exports, though the reverse is true with respect to the fraction of immigrants that is female.²⁵ The lower panel in Figure 11.2 shows estimates of the elasticity of exports with respect to number of female migrants minus that for males if specification (11.4iii) is adopted instead. Clearly, over most of the range of migration levels, the elasticity with respect to female migration proves larger than with respect to movement of men.²⁶ Note that since these results are obtained using dyad fixed effects, any differences in the role of females does not simply reflect differences in openness to trade being associated with differences in the stigma attached to women migrating in particular contexts. Certainly, given the significance of the estimated effects, this neglected topic would seem to warrant closer attention.

2.5 Dyad Links: Common Language, Colonial Heritage and Regional Trade Agreements

It is commonplace to augment gravity models of trade with indications of links between the trading partners, such as whether they speak a common language, share some form of colonial history or are signatories to a regional trade agreement. A number of contributions from the subset of these bilateral trade models that include migrant stocks also include dummy variables for such links within the vector of controls \mathbf{V}_{ijt} . The notion is that such links render trade simpler, given the ease of communication and familiarity with the setting.²⁷ By extension, this should leave migrants less essential in providing such bridges. Yet only a few studies have examined an interaction between the log of immigrants and whether the country of origin has a common language or colonial link with an

Table 11.4 *Differences in migrant elasticities of exports under a common language, colonial link and regional trade agreement*

	Difference in elasticity of exports by			
	Lower-income		Higher-income	
	Of emigrants in/immigrants from			
	Lower	Higher	Lower	Higher
<i>Common language *</i>				
Log(emigrants)	-0.021 (6.22)	-0.029 (6.94)	0.000 (0.01)	-0.053 (7.30)
Log(immigrants)	-0.033 (9.90)	-0.021 (3.74)	-0.037 (8.76)	-0.008 (1.13)
<i>Colonial link *</i>				
Log(emigrants)	-0.025 (7.10)	-0.038 (7.71)	-0.003 (0.44)	0.025 (2.53)
Log(immigrants)	-0.027 (7.57)	-0.007 (1.01)	-0.018 (3.54)	-0.034 (3.46)
<i>Regional trade agreement *</i>				
Log(emigrants)	0.004 (0.94)	0.043 (4.17)	0.018 (1.72)	0.028 (4.45)
Log(immigrants)	0.056 (14.10)	0.002 (0.18)	0.056 (5.27)	0.054 (8.66)

Note: t-statistics for a zero null hypothesis in parentheses.

OECD host. Dunlevy (2006), for example, finds a lower immigrant elasticity of US bilateral exports if immigrants are from either English- or Spanish-speaking countries; other results are more mixed, and none seems to differentiate with respect to levels of development involved.²⁸

Table 11.4 reproduces the estimates from the Appendix for the interaction terms between the logarithms of migrants and whether a common language, colonial link or regional trade agreement exists.²⁹ Almost all of the migrant elasticities of developing countries' exports are significantly diminished where either a common language is spoken or a colonial link exists; the only exception is with respect to immigrants from higher-income countries, where the difference is indistinguishable from zero. The patterns with respect to higher-income countries' exports are a little more mixed, though imports by the lower-income from the higher-income countries are less elastic with respect to lower-income emigrants where either a common language or colonial link exists. These results thus tend to support the hypothesis that migrants play a less significant role in bridg-

ing trade gaps where familiarity is less of an issue. However, none of the differences is very large.³⁰

Regional trade agreements are most common among the high-income countries, though some also exist among the developing countries; agreements involving both higher-income and developing countries are scant. Where two countries are part of a regional trade agreement, the elasticity of exports with respect to migration is estimated to be larger than where no agreement exists, though this positive association is statistically significant for migration in both directions only between higher-income partners. Quite why a positive association emerges is unclear. Many trade agreements also include clauses easing labor movement too.³¹ One possibility is that freer migration and freer trade are then introduced simultaneously, resulting in a positive association. In future work it would be of interest to distinguish cases where effective labor mobility is a part of the regional trade agreement.

2.6 Education Levels of Migrants

Do highly skilled emigrants from the developing regions stimulate bilateral trade with high-income partners by more than do their less-well-trained counterparts? Do the lesser-skilled migrants offer a preference effect but prove ineffective in information bridging and contract enforcement? A small subset of existing analyses has begun to disaggregate immigrants' effects on trade by education or skill level of the migrants, offering potentially important insights into such questions and hence into any brain-gain calculus. To date, such studies seem confined to the contexts of Canadian, US and Spanish immigration, with rather mixed approaches and answers.

Head and Ries (1998) distinguish Canadian immigrants by category of visa, adopting a specification of type (11.4ii); those designated 'Independent' visa recipients tend to be the most highly skilled and have the largest, positive impact on both import and export elasticities. Herander and Saavedra (2005) instead define skill by the fraction of US immigrants in a skilled occupation, again applying this to specification (11.4i).³² This follows a similar approach to that of Gould (1994), who finds the fraction deemed skilled among US immigrants from each country to be very weakly negatively associated with both exports and imports to that country. In sharp contrast, Herander and Saavedra find a positive association, at least with exports from various US states. In their cross-sectional analysis, Jansen and Piermartini (2009) explore both approaches to measuring skill, either by occupation or on the basis of receiving an H1B visa to enter the USA (reserved for those with special skills). Exploring both (11.4i) and (11.4ii) as specifications, Jansen and Piermartini find that

neither measure of the fraction of US immigrants that is skilled has any clear positive effect on bilateral trade.³³ Blanes (2008) distinguishes four levels of education among immigrants in Spain: no education, primary, secondary and tertiary and estimates a form of type (11.4iii). In his results, the number of migrants with no or primary education has no effect on either imports or exports; more migrants with secondary education are significantly associated with both larger imports and exports, and more tertiary-educated migrants have a weak positive association with exports to their home country but not with imports from home.³⁴

The international data on education of migrants remain very limited; nonetheless, the foregoing can be extended in a couple of directions. Two data sources on bilateral migration by education and gender are merged here for this purpose: one reports the immigrant stocks in most of the OECD countries as of 1990 and 2000 (see Docquier and Marfouk, 2004); the other extends the 2000 data to cover 32 OECD member countries and 68 non-members.³⁵ Despite the latter extension, insufficient observations are available to examine bilateral migration into the lower-income countries by education.³⁶ The present analysis is therefore confined to looking at emigrants in the higher-income countries from the lower-income countries. Four specifications are reported in Table 11.5, adopting each of the three alternatives presented in (11.4), plus a hybrid including both of the first two options. Otherwise, the specification is kept as in (11.5), again with dyad and year fixed effects. Table 11.5 displays only the relevant coefficients for education, estimated on 3600 observations for 2518 dyads.

No matter which specification is used, the association between trade in both directions and tertiary-educated migrants proves largest,³⁷ moreover, these effects are significantly larger than the estimated association with secondary-educated migrants (though there is less than 99 percent confidence in this difference for imports in the first specification). In each of the first three specifications, the association between bilateral exports and secondary-educated migration also tends to be larger than an association with primary-educated migrants (the omitted category), though this latter difference is statistically weaker for exports than imports. The last specification says that, given the number of emigrants without a tertiary education, the more tertiary-educated migrants, the greater is bilateral trade in both directions, but the converse does not hold, suggesting that lower-skilled emigrants have no significant effect on trade in either direction.

A viable interpretation is that the bridging roles played by migrants from the lower-income countries to their higher-income trade partners increase with the level of education of the migrants. To the extent that this represents an efficiency gain in trade, it potentially offers an important

Table 11.5 *Logarithm of bilateral exports and imports of lower-income countries with respect to education of emigrants*

	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Fraction emigrants with secondary education	0.607 (1.97)	0.965 (3.52)	0.087 (0.17)	0.938 (2.12)				
Fraction emigrants with tertiary education	1.643 (5.30)	1.650 (6.01)	0.718 (1.36)	0.779 (1.67)				
Fraction secondary * Log(emigrants)			0.102 (1.96)	0.107 (2.32)	0.096 (1.15)	-0.013 (0.17)		
Fraction tertiary * Log(emigrants)			0.262 (5.57)	0.262 (6.27)	0.174 (2.17)	0.163 (2.29)		
Log(primary emigrants)							0.021 (0.81)	-0.011 (0.46)
Log(secondary emigrants)							-0.011 (0.15)	0.101 (1.53)
Log(tertiary emigrants)							0.315 (5.19)	0.278 (5.15)

Note: t-statistics for a zero null hypothesis in parentheses.

mitigating factor in any costs incurred with emigration of the highly skilled.

In subsequent work, as more complete data become available, it may be important to examine this trade link with migrant skill level including both immigrants and emigrants, and to look at bilateral exchange between lower-income states in relation to migrants' skill levels, neither of which the present data permit.

2.7 Exports, Imports and the Balance of Trade

Within the extensive literature on the OECD countries, attention has been directed toward whether the elasticity of exports or imports with respect to immigration proves larger. In part, this reflects efforts to distinguish the preference effect of migrants on trade, which is commonly assumed confined to imports. The evidence proves mixed. In their survey, Genç et al. (2011, abstract) note that 'The migrant elasticity of imports is larger than that of exports in about half the countries considered.'

Despite this attention to the relative effects on exports versus imports, the net effect on the balance of trade has been largely neglected. For the low-income countries in particular, this balance has been a chronic concern.³⁸ Note, though, that which elasticity is bigger, exports or imports, only gives the balance of trade effect if trade is initially balanced. Consider, instead, the marginal effects of migration on the balance of trade. These may be derived for each country and year by multiplying the respective migrant elasticities of trade, evaluated at the observed migration level, by the ratio of observed exports or imports to the stock of migrants. Table 11.6 sets out the resultant means for the marginal effect of emigration on both the sum of bilateral exports and imports (openness

Table 11.6 Marginal effects of emigration on openness to trade and balance of trade

	Emigrants from			
	Lower-income in		Higher-income in	
	Lower	Higher	Lower	Higher
$\partial(\text{exports} + \text{imports})/\partial \text{ emigrants}$	0.0056 (2.08)	0.0916 (50.10)	0.4526 (41.25)	0.8210 (56.38)
$\partial(\text{exports} - \text{imports})/\partial \text{ emigrants}$	0.0003 (0.28)	-0.0370 (27.86)	0.0234 (4.39)	-0.0806 (8.60)

Note: t-statistics for a zero null hypothesis in parentheses.

to trade) and the difference between exports and imports (the balance of merchandise trade effect). For each of the four country-dyad groups the marginal effect on openness to trade is positive. The absolute magnitude of the effect is smallest and statistically weakest for emigration from one lower-income country to another, though this margin is added to a much smaller base of trade than for the other groups.

This migration between lower-income countries is estimated to have no significant effect on the bilateral balance of trade between these countries. On the other hand, emigration on the margin from lower-income to higher-income states results in a worsening of the balance of trade for the lower-income countries on average; in other words, this movement is estimated to do more to stimulate imports from the higher-income partner than to promote exports to that partner. In contrast, emigration from the average higher-income country to a developing country serves to improve the balance of trade for the wealthier country. Stated otherwise, immigration into the average lower-income country from a wealthier state does more to promote exports to the developing country than to help the latter’s export performance, deteriorating the balance of trade for the lower-income partner.

Whereas migration is thus estimated to expand trade of the lower-income countries, potentially lowering trade barriers in the process, migration does not serve to improve the balance of trade but rather the opposite.

2.8 An Extension: Two Third-Party Effects

Rauch and Trindade (2002) introduce the notion that the presence of common, third-country ethnic networks in two trading partners may also serve to enhance bilateral trade between these partners. At least five variants on measuring such networks have now appeared in the literature:

$$\eta \sum_k \log[(N_{kit} * N_{kjt}) / (P_{it} * P_{jt})] \quad (11.6i)$$

$$\eta \sum_k \log(N_{kit} * N_{kjt}) \quad (11.6ii)$$

$$\eta \sum_k [(N_{kit} * N_{kjt}) / (P_{it} * P_{jt})] \quad (11.6iii)$$

$$\sum_k [\eta_k (N_{kit} * N_{kjt}) / (P_{it} * P_{jt})] \quad (11.6iv)$$

$$\sum_k [\eta_k \log(N_{kit} * N_{kjt})] \quad (11.6v)$$

where N_{kit} (N_{kjt}) is the number of persons from country k in country i (j) at time t ; P_{it} and P_{jt} are the populations of i and j , as before, and

$k \neq i, k \neq j$. Rauch and Trindade consider only a single third country, China, adopting both (11.6i) and (11.6ii), noting that ‘The first is the probability that, if we select an individual at random from each country, both will be ethnic Chinese. The second is the number of potential international connections between the ethnic Chinese populations of the trading partners.’³⁹ Rauche and Trindade estimate a large positive value for η on the ethnic Chinese network, distinguishing between direct effects (in which one of the trading partners is China itself) and indirect effects; though no other migration terms are included in their analysis. Felbermayr et al. (2010) introduce the linear variants (11.6iii) and (11.6iv), denoting the former, which constrains $\eta_k = \eta$ for all k , the average network effect. Felbermayr and his co-authors apply both form (11.6iii) and (11.6iv) to a cross-section of the bilateral volume of trade and migration amongst 63 countries in 2000, inserting dummies for each country. The average (indirect) network coefficient, η , proves significantly positive; the direct network effect also proves positive, but only once the indirect migrant networks are included. In other words, exclusion of these third-country migrant networks biases downward estimates of the link between bilateral trade and migration between these partners according to these results. Estimation of the heterogeneous network model, (11.6iv), in Felbermayr et al. points to a wide spread in values for η_k .⁴⁰ Parsons (2012) also explores heterogeneity in the indirect network effect but for 178 third-party countries and adopting the logarithmic form (11.6v). Inserting these indirect network terms into an equation that also includes the direct emigration and immigration terms from (11.1), $\phi_5 LN_{ji}$ and $\phi_6 LN_{ji}$, Parsons finds not only a very wide spread of effects, from positive to negative, but that these effects are quite sensitive to inclusion of dyad fixed effects.

None of the prior studies of third-country networks distinguishes between effects on lower-income versus higher-income countries’ trade. Moreover, while the effects of third-country immigrants in the bilateral trading pair have received some attention, the effects of emigration from the trading pair to third countries have been universally neglected. Does emigration to one country result in less trade with others – an effect that might be dubbed trade diversion? Diversion may, for instance, occur because of supply constraints in producing exports, dilution of information flows, or competition in contract enforcement.

Following Parsons (2012), the third-party potential effects are here inserted into the basic equation (11.5) rather than representing the direct effects as in Rauch and Trindade, given the significant polynomial form estimated for our direct effects. Specifically, the additional terms may be written:

Table 11.7 Third-party effects

	Bilateral exports of			
	Lower-income to		Higher-income to	
	Lower-income	Higher-income	Lower-income	Higher-income
Average indirect network	0.508 (41.86)	0.744 (53.70)	0.859 (61.40)	0.840 (50.33)
Log emigrants elsewhere				
From origin in lower-income third countries	-0.042 (36.69)		-0.002 (1.19)	
From origin in higher-income third countries		-0.007 (2.49)		-0.013 (2.70)
From partner in lower-income third countries	-0.028 (24.23)		-0.048 (26.89)	
From partner in higher-income third countries		-0.043 (14.02)		0.053 (10.67)

Note: *t*-statistics for a zero null hypothesis in parentheses.

$$\eta \sum_k \log(N_{kit} * N_{kjt})/1000 + \alpha \log(\sum_{\kappa} N_{i\kappa t}) + \beta \log(\sum_{\kappa} N_{j\kappa t}) \quad (11.7)$$

where *k* indexes all countries $k \neq i$ and $k \neq j$; $k\kappa$ indexes all lower-income (higher-income) countries within *k* when examining exports to lower-income (higher-income) countries.⁴¹ Estimates of the additional terms are reported in Table 11.7.

The results in Table 11.7 indicate that the presence of third-country nationals, in common in both the home and partner country, is strongly positively associated with bilateral trade between the home and partner countries, no matter whether these trading countries are lower- or higher-income states.

Moreover, with respect to exports from the developing countries both to other lower-income states as well as to richer countries, having more emigrants in third countries, both from the home and trade partner, is associated with diminished bilateral trade. In other words, this supports the notion of trade diversion occurring through emigration elsewhere.

In contrast to some prior results, inclusion of these additional terms hardly alters the profiles with respect to direct migration shown in Figure 11.1. Together with the extent to which bilateral trade is diverted by migration elsewhere but enhanced by third-country migrant networks, this raises the issue of the net trade-creating effects of migrants. Given the positive signs on third-country immigrant networks, the question of net direction of effect arises only with respect to emigrants. One way to

examine this is to consider the marginal effect of an additional emigrant on total exports, which can be derived from the expanded estimates of (11.5) as

$$\frac{\partial X_i}{\partial N_{ij}} = \frac{X_{ij}}{N_{ij}} \sum_{\chi=1}^4 \chi \delta_{\chi} L N_{ij}^{\chi-1} + \alpha \frac{\sum_{\kappa} X_{i\kappa}}{\sum_{\kappa} N_{i\kappa}} \quad (11.8)$$

where δ_{χ} , $\chi = 1, 4$, are the coefficients on the polynomial emigrant terms from vector Θ_1 in (11.5). The first term on the right of (11.8) represents the direct effect of a marginal emigrant upon exports; the second term adds in the indirect consequence of this emigration upon bilateral exports to other countries.

Figure 11.3 displays the resulting net marginal effects of emigration on exports.⁴² The marginal effect on exports from lower-income to other lower-income partners is small, but is adding to a very low base. Each of the four marginal effects initially rises with the level of bilateral migration and at least by a level of 175 migrants ($LN_{ij} \approx 5.2$) there is greater than 99 percent confidence that all four marginal effects are positive. Thus significant trade-diverting, indirect effects are estimated as a result of emigration to third countries, but these effects are dominated by the trade-creating direct effects of bilateral emigration.

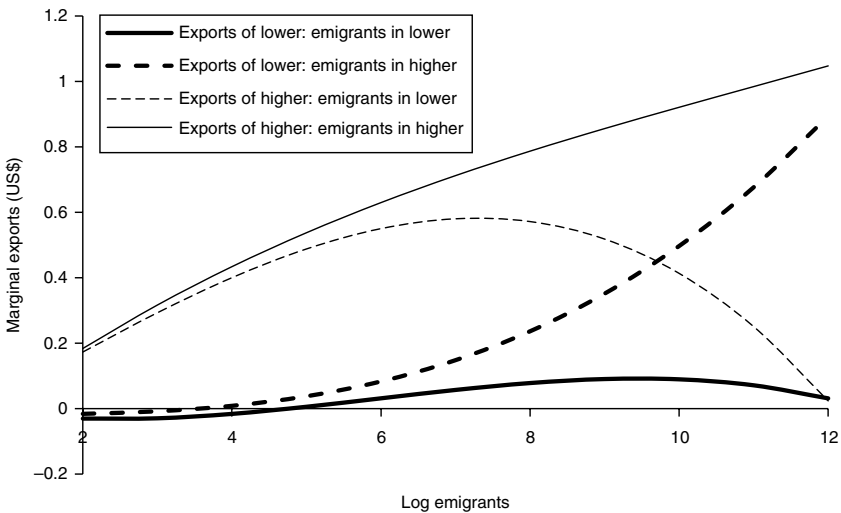


Figure 11.3 *Marginal exports with respect to emigrants: direct and indirect effects combined*

3. LESSONS TO BE DRAWN

The purpose of this chapter has been to look at the nature of the migrant–trade link, with particular reference to the developing countries. The extant literature on this topic is both sparse and riddled with contradictory results. Inevitably the fresh evidence presented here therefore disagrees with at least portions of this literature. Accordingly, any conclusions should be drawn guardedly.

Nonetheless, some patterns begin to emerge. Although the prior evidence is not unanimous, it seems fair to say that the elasticity of bilateral trade in both directions is particularly high with respect to migration from the developing to the industrialized countries. This makes sense to the extent that migrants play a role in information bridging and contract enforcement, both of which are likely to be especially important for lower-income countries. Given such roles, the migrant–trade link also proves significant across South–South corridors (though again not all observers agree). In a related vein, networks of third-country nationals also prove significantly related to bilateral trade, which holds for South–South and South–North pairings of trade as well as North–North. Our findings, that the migrant–trade link is less where trade partners have a common language or colonial heritage, may also support the notion that migrants are more critical where familiarity with the trade partner is less (though, once more, not all prior studies support this result).

The bulk of prior evidence is confined to looking at the link between immigrants and trade of OECD countries. Yet the results presented here indicate that both emigrants and immigrants are significantly associated with expanded trade for both lower- and higher-income countries. Only a couple of these earlier OECD studies examine whether the elasticity of trade varies with the level of immigration, and these uniformly find a declining association. In stark contrast, the fresh results here find a significant rise in the trade elasticities of both emigrants and immigrants for most cases. The facts that emigrants as well as immigrants can positively affect trade and that this responsiveness may rise with the levels of migration could have important implications for any consideration of the net benefits from migration in both directions.

The composition of migration clearly matters too. Refugee flows are a particularly important part of migration among the low-income countries, especially within Africa. The only previous evidence refers to refugees given asylum in Canada and the USA, concluding that refugees do nothing to expand trade with their countries of origin. The evidence presented here agrees that the larger the fraction of migrants who are refugees, the lower

the impact on trade. However, at least in the context of refugees from and in the lower-income countries, who are the vast majority of refugees, trade with their home country is greater, the larger the number of refugees. This suggests some degree of continued ties with the country from which refugees have fled, though there may be complex issues of timing of flight that remain to be investigated. The availability of annual data on bilateral refugee stocks should permit more dynamic investigations of these links in future work.

The role of gender of migrants has been utterly neglected in prior work. Here it is shown that, over substantial ranges of migration levels, the elasticity of developing countries' exports is greater for female than for male emigrants and immigrants. There has been a growing trend of women from lower-income countries migrating alone. Whether the higher elasticity of exports with respect to female migration reflects this growing tendency or reflects, instead, a greater trade impact where couples migrate jointly remains to be disentangled. It is not clear that the data yet exist to separate these possibilities on a systematic basis.

The data on education levels of international migrants remain very limited and the literature on the influence of skill composition on trade remains accordingly thin with overtly conflicting findings, ranging from negative effects of the highly skilled, to no differences by skill level, to more positive effects at higher education levels. Our own evidence pertains only to immigration into the OECD states from lower-income countries. The results are quite unequivocal: it is only the movement of tertiary-educated adults from the lower-income countries into the OECD members that is associated with expanded trade in both directions. To the extent that this holds up as more data become available, it would have important implications. First, on average it seems that the less-educated developing-country emigrants could not be anticipated to help stimulate their home-country trade. Second, to the extent that trade expansion is beneficial to the home country, this adds a potentially important component to brain-gain as opposed to brain-drain. Third, apart from developing countries that are close to industrialized partners, few lower-income countries send large numbers of low-skill migrants to OECD states, so it is the influence of the tertiary-educated that is likely to dominate. Fourth, this may well reinforce the importance of information transmission by migrants, at which the highly educated may be more adept.

The evidence thus points to positive associations between bilateral migration and trade for the developing countries, and perhaps particularly so if the migrants are highly educated and female. Whether such associations are causal might be disputed; few studies have explored the use

of instrumental variables, which is unsurprising given the difficulties of picking instruments that are correlated with migration but not with trade with the same partner. Meanwhile, the fairly universal contention that the association is recursive, combined with dyad fixed effects, perhaps reinforces a sense of causality. This is perhaps further buttressed by the demonstration in Artal-Tur et al. (2012) that the migrant–trade link is strongest for in-province immigrants in Italy, Spain and Portugal, weaker for immigrants in adjacent provinces and non-existent for other immigrants. Few micro-level studies have yet appeared, but in related fashion Hiller (2013) finds that Danish firms that employ foreign workers export more to these workers' home countries and that immigrants in the region have only a much smaller impact.

Several indications emerge from our results to suggest that migration plays an important role in breaking down information barriers to trade. The strong associations with highly educated migrants, the lesser role of migrants where common languages are spoken or a colonial heritage exists, all speak to such a role. In turn, overcoming information barriers in promoting openness to trade should represent an efficiency gain for both partners. On the other hand, it seems that developing countries probably should not hope for improvements to their trade balance as a result of migrant flows: the positive associations exist for both exports and imports and the two offset each other.

Much remains to be done in future work. Perhaps the largest lacuna in our present understanding is with respect to the education levels of migrants outside of corridors leading into the OECD countries. The dynamics of some of these processes certainly merit close attention, as does the modeling and alternative estimation of zero bilateral migration and trade. Much of the work at this point addresses averages; reasons for departures from these averages must remain of considerable interest. The present discussion has not touched on merchandise trade in different categories of goods, which has preoccupied substantial portions of the literature but has hardly been touched on in the context of developing countries. Meanwhile investigation of links between migration and trade in services remains in its infancy. And certainly more could be done to disaggregate the average effects observed for third-party networks. The current constraints on these varied extensions are both methodological and imposed by lack of migration data, though both aspects continue to make progress.

NOTES

1. See Greif (1993, 2012) and Rauch (2001). Gaston and Nelson (2013) offer an excellent survey in their section 4.3. White and Tadesse (2011) also offer a useful account in chapter 1 and add the potential for migrant remittances to expand spending and hence trade, plus any stimulus by the diaspora to direct investments in their state of origin, resulting in additional imports and exports by the multinational. A related literature presents estimates of gravity models of foreign direct investments, though this topic is beyond the scope of the present chapter. An example is provided in de Mello-Sampayo (2009).
2. Reductions in information and contract enforcement barriers to trade are tantamount to the lowering of protectionist policy barriers, and indeed the efficacy of the migrant-induced barrier reductions are occasionally depicted numerically as tariff-equivalent reductions (Anderson and van Wincoop, 2003).
3. For surveys of gravity trade models see Anderson and van Wincoop (2004), and Bergstrand and Egger (2011).
4. Among applications to international migration, see Borjas (1987), Karemera et al. (2000), Clark et al. (2007), Lewer and Van Den Berg (2008), Letouzé et al. (2009), Ortega and Peri (2009), Mayda (2010), Beine et al. (2011), Grogger and Hanson (2011) and Lucas (forthcoming).
5. However, to the extent that trade affects real incomes it may also have an effect on migration. In addition, some limited migration may be entailed in the execution of trade deals (see Peng and Ilinitich, 1998).
6. There seems some agreement that such fixed effects also provide a viable alternative to the far more complex, multilateral-resistance, iterative approach in Anderson and van Wincoop (2003). In panel data, country-by-year fixed effects are typically recommended to correct for such multilateral resistance. See Feenstra (2004), and Baldwin and Taglioni (2006). Stouffer (1940) discusses a related concept, intervening opportunities, in migration. Indeed, in their recent empirical work on Spanish immigration, Bertoli and Fernandez-Huertas Moraga (2013) apply the term multilateral resistance to migration and explore its importance. Head et al. (2010) develop a 'tetrad' approach, taking the ratio of ratios of trade among four countries to eliminate both exporter and importer fixed effects, taking advantage of the multiplicative form of the gravity model.
7. Gould (1994), Head and Ries (1998), White (2007a, 2007b) and Hatzigeorgiou (2010a) also add a Koyck lag structure. Mundra (2005) develops a semi-parametric, dynamic panel estimator and applies it to a gravity trade equation incorporating migration. See also Ghatak and Piperakis (2007), Faustino and Leitão (2008), Partridge and Furtan (2008) for other dynamic explorations. Behrens et al. (2012) add an examination of the potential for spatial correlation in errors.
8. Adoption of random effects estimation permits retention of country-specific terms but provides inconsistent estimates if the fixed terms are correlated with the disturbances. Bryant et al. (2005) and Law et al. (2009) adopt, instead, correlated random effects, which permit retention of such variables as distance and the common-border dummy while avoiding assumption of lack of correlation with the disturbance term. See Mundlak (1978).
9. Examples of cases forgoing partner fixed effects include Piperakis et al. (2003) on Greece, Bruder (2004) on Germany, Co et al. (2004) on the USA, and Blanes (2008) on Spain.
10. In particular, the elasticity of trade with respect to the extent of migration depends on G_{jt} in (11.4ii) and (11.4iii) but not in (11.4i), and the marginal effect on the logarithm of trade with respect to G_{jt} depends upon the extent of migration, LN_{jt} , in (11.4ii) and on G_{jt} itself in (11.4iii).
11. To include country-by-year fixed effects to further represent multilateral-resistance terms would require insertion of 15744 additional dummy variables, which is almost infeasible. Note that if it were feasible to insert such fixed effects, the terms in popula-

- tion and GDP in (11.5) would need to be excluded. Interestingly, however, Parsons, who uses portions of these same data, finds that inclusion of such additional fixed effects has little effect on his estimates, noting that ‘there seems to be little bias resulting from failing to account properly for multilateral resistance’ (Parsons, 2012, p. 19).
12. The data are for GDP per capita (in constant 2000 US\$), drawn from the World Development Indicators at the World Bank. This measure is available over a wider range of observations than are measures in purchasing power parity. Nonetheless, data are unavailable for about 16 percent of country time periods included in the estimation sample. In most cases the missing observations are for earlier years, in which case these early observations are here assigned to the income-level category in which GDP per capita is first observed. For 15, mostly very small, countries, no data on GDP per capita in constant prices are available, in which case these economies are assigned their current status (4 low-income, 7 high-income and 4 upper-middle). See the Appendix for more detail on sources and measurement of other variables.
 13. The opposing results may well stem, in part, from the fact that the set of developing countries available to Co and her co-authors is not very representative; the data incorporate only 18 non-OECD countries, and 13 of these are in the Latin-America-Caribbean region.
 14. Data on transparency and rule of law are available only for a small portion of the sample considered in the current chapter, and consequently these measures are not investigated here. Several papers focus, instead, on the cultural gap separating the partners from the OECD state. See Girma and Yu (2002) on the UK, White and Tadesse (2007b) on Australia, and White and Tadesse (2008) on the USA. Since a wide cultural gap can prevail between high-income countries, these papers are more tangential to the present, development, focus.
 15. Hong and Santhapparaj (2006) examine, from 1998 to 2004, the effect on Malaysia’s trade of skilled immigration into Malaysia from eight ASEAN countries and the eight non-ASEAN countries that represent Malaysia’s most active trading partners. Their results prove extremely sensitive to alternative specifications, ranging from strong positive associations to no short-run effect at all, rendering interpretation difficult. Canavire Bacarreza and Ehrlich (2006) find a positive elasticity relating Bolivian bilateral exports, imports and intra-industry trade to both Bolivia’s stocks of immigrants and of their emigrants, albeit treating immigration and emigration separately (which is necessitated by the lack of a unified sample). However, these positive associations may be biased, reflecting omission of either any vector of partner-country characteristics or fixed effects.
 16. The authors re-estimate the gravity trade equations in two variants, both including fixed effects for the home and host countries: in one variant the emigrant stocks are interacted with dummies for each host; in the other variant they are interacted with dummies for the African country of origin. In both forms the elasticities still generally prove positive but of widely differing magnitudes. Moreover, White and Tadesse point out that the level and dispersal of emigrant stock differs substantially across the African nations, as does the level of their exports; these are combined with the differences in estimated elasticities, and the authors thus compile and note the very large differences in the linear, per emigrant effect on exports depending on the migrants’ country of origin.
 17. <http://data.worldbank.org/data-catalog/global-bilateral-migration-database>.
 18. Here North is defined as the OECD countries minus the Czech Republic, Hungary, Korea, Mexico, Poland, the Slovak Republic and Turkey.
 19. Felbermayr et al. (2012) also adopt the GBMD but combine this with the IMF Direction of Trade Statistics, also used in the present context, and find positive migrant–trade associations on the pooled data in first-difference form, though developing regions are not distinguished within this latter study. See also Hatzigeorgiou (2010b), who includes but does not distinguish some developing countries, using the bilateral migrant matrix from Parsons et al. (2007), a precursor to the GBMD.

20. Of the 47 partner countries in the analysis for the USA by Gould (1994), more than half were high-income at the time and only three were low-income. This is not the case, however, for either Wagner et al. (2002), which encompassed some 160 Canadian trade partners, or for Bryant et al. (2005), which included 179 partners of New Zealand.
21. Helliwell (1999), in his study of trade between Canadian provinces and US states, finds that emigrants affect exports from the locale whereas immigrants do not. Bruder (2004) looks at Germany's trade with Spain, Portugal, Greece, Italy and Turkey, finding that emigrants from Germany have no effect on bilateral trade with these partners, and immigrants affect only German exports, not imports. Murat and Pistoiesi (2009) consider a wider set of 51 countries, using Italian registry data on Italians abroad; whereas Italian emigrants boost trade, Italian immigrants have only a weak effect on Italian exports and even a negative effect on imports. Tai (2009) finds that the stocks of both emigrants and immigrants affect Swiss imports and exports positively. Law et al. (2009) manage to assemble estimates of New Zealand's diaspora in 205 countries in 2000: immigrants have positive effects on both exports and imports; the diaspora has a positive effect on whether merchandise exports occur but not the amount of exports, while the opposite is found for imports. Hatzigeorgiou (2010b) finds that trade is positively affected by both emigrant and immigrant stocks in a single-time-period, cross-country analysis of patterns among 75 countries (13 of which are low-income). With more complete panel data, Parsons (2012) finds that both emigrants and immigrants positively affect bilateral trade when dyad fixed effects are omitted, but including these fixed effects wipes out both positive associations.
22. This is not a consequence of having included both the refugee fraction and its interaction with the logarithm of migrant stock; if either is inserted separately, exactly the same pattern emerges.
23. Note that wars at home, which generate these refugees, serve to diminish significantly the exports of lower-income countries, though the incidence of wars in partners has no significant impact.
24. A notable exception is with respect to migration to the Persian Gulf states. I am grateful to Çağlar Özden for a discussion on this point.
25. In this context the results are driven largely by the interaction terms denoted $\gamma_3 G_{ji} * LN_{ji}$ in (11.4). If these are omitted, the terms $\gamma_2 G_{ji}$ prove insignificantly different from zero for the fraction of emigrants that is female in each case.
26. At least by a level of about 400 migrants (log migrant stock = 6) for each gender, this gap is statistically significant at greater than a 99 percent confidence level for the three cases depicted in Figure 11.2. More generally, the estimated gap is positive both for emigrants and immigrants for all four dyad groups where migration levels reach 3000 for each gender (log migrant stock = 8).
27. The signs of estimates reported in the prior literature are not all consistent with such a hypothesis. Note, however, that inclusion of such terms also necessitates exclusion of dyad (or partner) fixed effects, which may bias the estimates. Among this class of estimates, see Dunlevy and Hutchinson (1999) for an historical study of the USA; Blanes (2005) on Spain; Herander and Saavedra (2005) on trade by US states; Faustino and Leitão (2008) on Portugal; Jansen and Piermartini (2009) on the USA; and Artal-Tur et al. (2012) on Portugal and Spain.
28. On a common language interaction, see also Bryant et al. (2005), Qian (2008) and Law et al. (2009) on New Zealand and Peri and Requena-Silvente (2010) on Spain. Blanes (2008) actually finds a positive interaction between having a colonial link and the log of immigrants in examining Spanish exports and imports.
29. Common language and a colonial link are time-invariant within our sample; regional trade agreements are not. Data on possession of a common legal structure are available only for a small portion of our sample and are consequently not deployed.
30. Colonial links are defined to include two countries having shared a specific colonial power. As a result, colonial links are common even between low-income countries.
31. See the examples catalogued in Handjiski et al. (2010).

32. See, however, Mattoo et al. (2008) on the prevalence of highly educated US immigrants in low-skill occupations.
33. Interestingly, Jansen and Piermartini (2009) also distinguish permanent residents from those on temporary visas and find that temporary migrants actually have a slightly stronger effect on trade with the countries of origin; whether this would hold up if it were possible to introduce fixed effects for the countries of origin remains to be explored. Note, also, that in the US context a substantial portion of permanent residents has previously been on temporary stay visas, raising issues about the dynamics of effects.
34. Blanes also finds that more migrants in managerial positions in Spain are positively associated with greater trade in both directions.
35. This is the DIOC-E version 3 database prepared by the OECD. See the description at <http://www.oecd.org/migration/48431754.pdf>.
36. This is true also of the more recently available matrices for 1990 and 2000, discussed in Artuc et al. (2013), if only actual observations are included (as opposed to projected values).
37. Evaluated at the sample mean for the logarithm of emigrants, the third specification presents results quite close to the first specification.
38. During 1960–2000, the deficit on the merchandise trade balance amounted to more than 21 percent of GDP for the average low-income country.
39. Rauch and Trindade (2002, p. 119). Whereas Rauch and Trindade deploy data on the number of persons of Chinese ethnic origin, the subsequent papers by Felbermayr et al. (2010) and Parsons (2012) both use migrant stocks. Parsons notes that adopting country fixed effects (by time) in cross-section (panel) contexts, (11.6i) and (11.6ii) become identical since the population terms are collinear with the fixed effects.
40. The ranking of values for tariff-equivalent network effects of these η_k terms is rather curious, the five largest being for Morocco, Ghana, Denmark, Israel and Iceland. China proves among the lowest. Felbermayr and his co-authors also repeat Rauch and Trindade's estimates for a Chinese network alone and find that inclusion of a set of country dummies substantially lowers, but does not eliminate, the associated estimate of η .
41. Since (11.5) already incorporates the logarithms of populations in both i and j , (11.6ii) rather than (11.6i) is adopted here. In the very few instances in which no emigrants elsewhere are reported these terms are set to zero. A dummy variable is also included to represent these cases.
42. These are evaluated at the sample means for X_{ij}/N_{ij} and $\sum_k X_{ik}/\sum_k N_{ik}$. If the cross-terms on emigrants elsewhere, such as emigrants from lower-income countries in higher-income third countries, are inserted into the specifications in (11.7), the estimates reported in Table 11.7 are little changed, though calculation of the derivative in (11.8) is clearly more complex, requiring cross-equation testing.

REFERENCES

- Anderson, J.E. and E. van Wincoop (2003), 'Gravity with gravitas: a solution to the border puzzle', *American Economic Review*, **93**(1), 170–92.
- Anderson, J.E. and E. van Wincoop (2004), 'Trade costs', *Journal of Economic Literature*, **42**(3), 691–751.
- Artal-Tur, A., V.J. Pallardo-Lopez and F. Requena-Silvente (2012), 'The trade-enhancing effect of immigration networks: new evidence on the role of geographic proximity', *Economics Letters*, **116**(3), 554–7.
- Artuc, E., F. Docquier, Ç. Özden and C. Parsons (2013), 'A global assessment of human capital mobility: the role of non-OECD destinations', <http://perso.uclouvain.be/frederic.docquier/oxlight.htm> (accessed 11 November 2013).

- Baldwin, R. and D. Taglioni (2006), 'Gravity for dummies and dummies for gravity equations', NBER Working Paper No. 12516, National Bureau of Economic Research, Cambridge, MA.
- Behrens, K., C. Ertur and W. Koch (2012), "'Dual" gravity: using spatial econometrics to control for multilateral resistance', *Journal of Applied Econometrics*, **27**(5), 773–94.
- Beine, M., F. Docquier and Ç. Özden (2011), 'Diasporas', *Journal of Development Economics*, **95**(1), 30–41.
- Bergstrand, Jeffrey H. and Peter Egger (2011), 'Gravity equations and economic frictions in the world economy', in Daniel M. Bernhofen, Rod Falvey, David Greenaway and Udo Krieckemeier (eds), *Palgrave Handbook of International Trade*, New York: Palgrave-Macmillan, pp. 532–70.
- Bertoli, S. and J. Fernandez-Huertas Moraga (2013), 'Multilateral resistance to migration', *Journal of Development Economics*, **102**, 79–100.
- Bettin, G. and A.L. Turco (2012), 'A cross-country view on south-north migration and trade: dissecting the channels', *Emerging Markets Finance and Trade*, **48**(4), 4–29.
- Blanes, J.V. (2005), 'Does immigration help to explain intra-industry trade? Evidence for Spain', *Weltwirtschaftliches Archiv*, **141**(2), 244–70.
- Blanes, J.V. (2008), 'Characteristics of immigrants and bilateral trade', *Revista de Economía Aplicada*, **16**(3), 133–59.
- Borjas, G.J. (1987), 'Self-selection and the earnings of immigrants', *American Economic Review*, **77**(4), 531–53.
- Briant, A., P.-P. Combes and M. Lafourcade (2009), 'Product complexity, quality of institutions and the pro-trade effect of immigrants', CEPR Discussion Paper No. 7192, London: Centre for Economic Policy Research.
- Bruder, J. (2004), 'Are trade and migration substitutes or complements? The case of Germany, 1970–1998', unpublished paper, Department of Economics, University of Rostock. <http://www.etsg.org/ETSG2004/Papers/Bruder.pdf> (accessed 2 February 2013).
- Bryant, J., M. Genç and D. Law (2005), 'Trade and migration to New Zealand', paper presented at the 45th Congress of the Regional Science Association in Amsterdam. <http://www.sre.wu-wien.ac.at/ersa/ersaconfs/ersa05/papers/192.pdf> (accessed 31 January 2013).
- Canavire Bacarreza, G.J. and L. Ehrlich (2006), 'The impact of migration on foreign trade: a developing country approach', *Latin American Journal of Economic Development*, **6**, 125–46.
- Clark, X., T.J. Hatton and J.G. Williamson (2007), 'Explaining US immigration, 1971–1998', *Review of Economics and Statistics*, **89**(2), 359–73.
- Co, C., P. Euzent and T. Martin (2004), 'The export effect of immigration into the USA', *Applied Economics*, **36**(6), 573–83.
- Coughlin, C.C. and H.J. Wall (2011), 'Ethnic networks and trade: intensive versus extensive margins', *Economics Letters*, **113**(1), 73–5.
- de Mello-Sampayo, F. (2009), 'Competing-destinations gravity model: an application to the geographic distribution of FDI', *Applied Economics*, **41**(16–18), 2237–53.
- Docquier, F. and A. Marfouk (2004), 'Measuring the international mobility of skilled workers (1990–2000): release 1.0', Policy Research Working Paper Series no. 3381, World Bank, Washington, DC.
- Dunlevy, J.A. (2006), 'The influence of corruption and language on the protrade effect of immigrants: evidence from the American states', *Review of Economics and Statistics*, **88**(1), 182–6.
- Dunlevy, J.A. and W.K. Hutchinson (1999), 'The impact of immigration on American import trade in the late nineteenth and early twentieth centuries', *Journal of Economic History*, **59**(4), 1043–62.
- Eaton, J. and A. Tamura (1994), 'Bilateralism and regionalism in Japanese and U.S. trade and direct foreign investment patterns', *Journal of the Japanese and International Economies*, **8**(4), 478–510.
- Eichengreen, B. and D.A. Irwin (1995), 'Trade blocs, currency blocs and reorientation of world trade in the 1930s', *Journal of International Economics*, **38**(1–2), 1–24.

- Faustino, H.C. and N.C. Leitão (2008), 'Immigration and trade in Portugal: a static and dynamic panel data analysis', Department of Economics Working Paper No. 31/2008, Lisbon: Instituto Superior de Economia e Gestão.
- Feenstra, Robert C. (2004), *Advanced International Trade: Theory and Evidence*, Princeton, NJ: Princeton University Press.
- Feenstra, R.C., R.E. Lipsey, H. Deng, A.C. Ma and H. Mo (2005), 'World trade flows: 1962–2000', NBER Working Paper No. 11040, National Bureau of Economic Research, Cambridge, MA.
- Felbermayr, G.J., V. Grossmann and W. Kohler (2012), 'Migration, international trade and capital formation: cause or effect?' IZA Discussion Paper No. 6975, Bonn. First draft of a chapter forthcoming in Barry R. Chiswick and Paul W. Miller (eds), *Handbook on the Economics of International Migration*, Amsterdam: Elsevier Science.
- Felbermayr, G.J. and B. Jung (2009), 'The pro-trade effect of the brain drain: sorting out confounding factors', *Economics Letters*, **104**(2), 72–5.
- Felbermayr, G.J., B. Jung and F. Toubal (2010), 'Ethnic networks, information, and international trade: revisiting the evidence', *Annales d'Économie et de Statistique*, **97–8**, 41–70.
- Gaston, N. and D.R. Nelson (2013), 'Bridging trade theory and labour econometrics: the effects of international migration', *Journal of Economic Surveys*, **27**(1), 98–139.
- Genç, M., M. Gheasi, P. Nijkamp and J. Poot (2011), 'The impact of immigration on international trade: a meta-analysis', IZA Discussion Paper No. 6145, Bonn: Institute for the Study of Labor.
- Ghatak, S. and A.S. Piperakis (2007), 'The impact of Eastern European immigration to UK trade', Kingston University Economic Discussion Paper No. 2007-03, London: Kingston University.
- Girma, S. and Z. Yu (2002), 'The link between immigration and trade: evidence from the United Kingdom', *Weltwirtschaftliches Archiv*, **138**(1), 115–30.
- Gould, D.M. (1994), 'Immigrant links to the home country: empirical implications for U.S. bilateral trade flows', *Review of Economics and Statistics*, **76**(2), 302–16.
- Greif, A. (1993), 'Contract enforceability and economic institutions in early trade: the Maghribi traders' coalition', *American Economic Review*, **83**(3), 525–48.
- Greif, A. (2012), 'The Maghribi traders: a reappraisal?', *Economic History Review*, **65**(2), 445–69.
- Grogger, J. and G.H. Hanson (2011), 'Income maximization and the selection and sorting of international migrants', *Journal of Development Economics*, **95**(1), 42–57.
- Handjiski, B., R.E.B. Lucas, P. Martin and S. Sarisoy Guerin (2010), 'Enhancing regional trade integration in Southeast Europe', World Bank Working Paper No. 185, World Bank, Washington, DC.
- Hatzigeorgiou, A. (2010a), 'Does immigration stimulate foreign trade? Evidence from Sweden', *Journal of Economic Integration*, **25**(2), 376–402.
- Hatzigeorgiou, A. (2010b), 'Migration as trade facilitation: assessing the links between international trade and migration', *B.E. Journal of Economic Analysis and Policy: Topics in Economic Analysis and Policy*, **10**(1), 1–33.
- Head, K., T. Mayer and J. Ries (2010), 'The erosion of colonial trade linkages after independence', *Journal of International Economics*, **81**(1), 1–14.
- Head, K. and J. Ries (1998), 'Immigration and trade creation: econometric evidence from Canada', *Canadian Journal of Economics*, **31**(1), 47–62.
- Helliwell, J.F. (1999), 'National borders, trade and migration', NBER Working Paper No. 6027, Cambridge, MA: National Bureau of Economic Research.
- Helpman, E., M. Melitz and Y. Rubinstein (2008), 'Estimating trade flows: trading partners and trading volumes', *Quarterly Journal of Economics*, **123**(2), 441–87.
- Herander, M.G. and L.A. Saavedra (2005), 'Exports and the structure of immigrant-based networks: the role of geographic proximity', *Review of Economics and Statistics*, **87**(2), 323–35.
- Hiller, S. (2013), 'Does immigrant employment matter for export sales? Evidence from Denmark', *Weltwirtschaftliches Archiv*, **149**(2), 369–94.

- Hong, T.C. and A.S. Santhapparaj (2006), 'Skilled labor immigration and external trade in Malaysia; a pooled data analysis', *Perspectives on Global Development and Technology*, **5**(4), 351–66.
- Jansen, M. and R. Piermartini (2009), 'Temporary migration and bilateral trade flows', *World Economy*, **32**(5), 735–53.
- Karemera, D., V.I. Oguledo and B. Davis (2000), 'A gravity model analysis of international migration to North America', *Applied Economics*, **32**(13), 1745–55.
- Law, D., M. Genç and J. Bryant (2009), 'Trade, diaspora and migration to New Zealand', NZIER Working Paper No. 2009/4, New Zealand Institute of Economic Research, University of Otago.
- Letouzé, E., M. Purser, F. Rodríguez and M. Cummins (2009), 'Revisiting the migration–development nexus: a gravity model approach', Human Development Research Paper No. 2009/44, New York: United Nations Development Program. http://hdr.undp.org/en/reports/global/hdr2009/papers/HDRP_2009_44.pdf (accessed 12 April 2013).
- Lewer, J.J. and H. Van Den Berg (2008), 'A gravity model of immigration', *Economics Letters*, **99**(1), 164–7.
- Lucas, Robert E.B. (forthcoming), 'African migration', in Barry R. Chiswick and Paul W. Miller (eds), *Handbook on the Economics of International Migration*, Amsterdam: Elsevier Science.
- Martin, W. and C.S. Pham (2008), 'Estimating the gravity model when zero trade flows are frequent', Economics Series 2008_03, Faculty of Business and Law, Deakin University.
- Mattoo, A., I.C. Neagu and Ç. Özden (2008), 'Brain waste? Educated immigrants in the US labor market', *Journal of Development Economics*, **87**(2), 255–69.
- Mayda, A.M. (2010), 'International migration: a panel data analysis of the determinants of bilateral flows', *Journal of Population Economics*, **23**(4), 1249–74.
- Mundlak, Y. (1978), 'On the pooling of time series and cross-section data', *Econometrica*, **46**(1), 69–85.
- Mundra, K. (2005), 'Immigration and international trade: a semiparametric empirical investigation', *Journal of International Trade and Economic Development*, **14**(1), 65–91.
- Murat, M. and B. Pistoiesi (2009), 'Migrant networks: empirical implications for the Italian bilateral trade', *International Economic Journal*, **23**(3), 371–90.
- Ortega, F. and G. Peri (2009), 'The causes and effects of international migrations: evidence from OECD countries 1980–2005', NBER Working Paper No. 14833, Cambridge, MA: National Bureau of Economic Research.
- Özden, Ç., C.R. Parsons, M. Schiff and T.L. Walmsley (2011), 'Where on earth is everybody? The evolution of international bilateral migration stocks 1960–2000', *World Bank Economic Review*, **25**(1), 12–56.
- Parsons, C.R. (2012), 'Do migrants really foster trade? The trade–migration nexus, a panel approach 1960–2000', Policy Research Working Paper No. 6034, Trade and Integration Team, Development Research Group, World Bank, Washington, DC.
- Parsons, C.R., R. Skeldon, T.L. Walmsley and A.L. Winters (2007), 'Quantifying the international bilateral movements of migrants', in Çağlar Özden and Maurice Schiff (eds), *International Migration, Economic Development and Policy*, New York: Palgrave Macmillan, pp. 17–58.
- Partridge, J. and H. Furtan (2008), 'Immigration wave effects on Canada's trade flows', *Journal of Canadian Public Policy*, **34**(2), 193–214.
- Peng, M.W. and A.Y. Ilinitch (1998), 'Export intermediary firms: a note on export development research', *Journal of International Business Studies*, **29**(3), 609–20.
- Peri, G. and F. Requena-Silvente (2010), 'The trade creation effect of immigrants: evidence from the remarkable case of Spain', *Canadian Journal of Economics*, **43**(4), 1433–59.
- Piperakis, A.S., C. Milner and P.W. Wright (2003), 'Immigration, trade costs, and trade: gravity evidence for Greece', *Journal of Economic Integration*, **18**(4), 750–62.
- Qian, M. (2008), 'The economic relationship between trade and immigration in New Zealand', Integration of Immigrants Programme Working Paper No. 1, Albany, NY: Massey University and University of Waikato.

- Ratha, D. and W. Shaw (2007), 'South–south migration and remittances', World Bank Working Paper No. 102, World Bank, Washington, DC.
- Rauch, J.E. (2001), 'Business and social networks in international trade', *Journal of Economic Literature*, **39**(4), 1177–203.
- Rauch, J.E. and V. Trindade (2002), 'Ethnic Chinese networks in international trade', *Review of Economics and Statistics*, **84**(1), 116–30.
- Santos Silva, J.M.C. and S. Tenreyro (2006), 'The log of gravity', *Review of Economics and Statistics*, **88**(4), 641–58.
- Santos Silva, J.M.C. and S. Tenreyro (2011), 'Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator', *Economics Letters*, **112**(2), 220–22.
- Stouffer, S.A. (1940), 'Intervening opportunities: a theory relating mobility and distance', *American Sociological Review*, **5**(6), 845–67.
- Tai, S. (2009), 'Market structure and the link between migration and trade', *Weltwirtschaftliches Archiv*, **145**(2), 225–49.
- Wagner, D., K. Head and J. Ries (2002), 'Immigration and the trade of provinces', *Scottish Journal of Political Economy*, **49**(5), 507–25.
- Wang, Z.K. and L.A. Winters (1991), 'The trading potential of Eastern Europe', CEPR Discussion Paper No. 610, London: Centre for Economic Policy Research.
- Wang, Z.K. and L.A. Winters (1992), 'The trading potential of Eastern Europe', *Journal of Economic Integration*, **7**(2), 113–36.
- White, R. (2007a), 'Immigrant–trade links, transplanted home bias and network effects', *Applied Economics*, **39**(7–9), 839–52.
- White, R. (2007b), 'An examination of the Danish immigrant–trade link', *International Migration*, **45**(5), 61–86.
- White, R. and B. Tadesse (2007), 'Immigration policy, cultural pluralism and trade: evidence from the white Australia policy', *Pacific Economic Review*, **12**(4), 489–509.
- White, R. and B. Tadesse (2008), 'Cultural distance and the US immigrant–trade link', *World Economy*, **31**(8), 1078–96.
- White, R. and B. Tadesse (2010), 'The effects of refugee and non-refugee immigrants on US trade with their home countries', *Journal of International Trade and Economic Development*, **19**(2), 289–317.
- White, Roger and Bedassa Tadesse (2011), *International Migration and Economic Integration: Understanding the Immigrant-Trade*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.
- White, R. and B. Tadesse (2013), 'Do African immigrants enhance their home nation's trade with their hosts?', *Journal of Developing Areas*, **47**(2), 199–228.

APPENDIX

Notes on the Data

The annual, bilateral trade data are from the IMF Direction of Trade Statistics Database, encompassing 208 countries from 1960 through 2000. Following Head et al. (2010, Appendix A.1), exports from country i to j are here measured by whichever is the larger of exports reported by i going to j or 90 percent of imports reported by j entering from i , assuming a 10 percent gap between f.o.b. and c.i.f. valuation. The migration data are provided by the Global Bilateral Migration Database, which reports the stock of persons born in country i and residing in country j at the turn of each decade from 1960 through 2000.¹ For years between the decennial points, these migrant stocks are interpolated linearly to be commensurate with the trade data. F -tests on the restriction that all migration terms in Table 11A.1 differ between the decades and in the intervening years fail to reject these restrictions in all four cases. Data on nominal GDP for each country are drawn from the World Bank's World Development Indicators. Almost all of the missing data are for GDP. No GDP data at all are available for 12 of the smaller and newly formed countries among the original 208 in the sample. For 93 other countries GDP data are missing for some years, such as in the case of the new countries of the former Soviet Union and of Yugoslavia, resulting in a loss of about 22 percent of the remaining sample. Whether states speak a common language or share a colonial link are taken from the CEPII Gravity Data Set.² Common language is defined to equal 1 if at least 9 percent of the populations in both countries speak the same language as their mother tongue or as a second language. The colonial link dummy equals one if the two countries ever had a direct colonial link or if they shared a common colonizer after 1945. Observations on gender of migrant stocks are from the Global Bilateral Migration Database and those on refugees from the UNHCR Online Statistical Database. The time-varying data on regional trade agreements between dyads of countries are from a data set prepared by Keith Head and his colleagues.³ A war is defined to occur if there are at least 1000 battle-related deaths in a given year.⁴ After subtracting cases in which data are missing, the sample has 1 141 798 observations on 36 864 dyads of 192 countries. Of these 192 countries, 28 were low-income in 2000, 55 lower-middle-income, 52 upper-middle-income and 57 high-income.

The estimates of equation (11.5), based on these data, are presented in Table 11A.1. These estimates include both dyad and time fixed effects, which are not shown. T -statistics for a zero null hypothesis are displayed in parentheses.

Table 11A.1 Fixed-effects estimates of bilateral exports equation

	Exports from			
	Low to low	Low to high	High to low	High to high
Log(emigrants)	0.0781 (11.22)	-0.0001 (0.01)	-0.0044 (0.37)	0.0028 (0.20)
Log(emigrants) ²	-0.0440 (16.27)	0.0064 (1.93)	0.0336 (6.02)	0.0144 (2.78)
Log(emigrants) ³	0.0076 (21.53)	-0.0012 (2.75)	-0.0005 (0.57)	0.0001 (0.22)
Log(emigrants) ⁴	-0.0003 (21.76)	0.0002 (11.07)	-0.0001 (1.67)	0.0000 (0.89)
Zero emigrants dummy	0.0153 (3.04)	0.0244 (3.63)	-0.0084 (1.11)	0.0456 (3.85)
Log(immigrants)	0.0498 (7.15)	-0.0193 (1.64)	-0.0410 (4.64)	0.0500 (3.55)
Log(immigrants) ²	-0.0334 (12.32)	0.0454 (8.29)	0.0410 (12.21)	0.0009 (0.17)
Log(immigrants) ³	0.0053 (15.06)	-0.0041 (4.79)	-0.0052 (11.70)	0.0018 (2.66)
Log(immigrants) ⁴	-0.0002 (12.67)	0.0002 (3.51)	0.0003 (17.72)	-0.0001 (3.20)
Zero immigrants dummy	-0.0113 (2.23)	-0.0371 (5.01)	0.0181 (2.64)	0.0317 (2.68)
Fraction emigrants refugees	-0.0421 (1.94)	0.1205 (3.63)	-0.0612 (0.91)	0.2475 (2.33)
Fract refugees *log(emig)	-0.0167 (4.98)	-0.0696 (11.70)	-0.0319 (2.10)	-0.0882 (4.79)
Fract immigrants refugees	0.0015 (0.07)	0.2625 (3.99)	0.1670 (4.93)	0.3245 (3.05)
Fract refugees *log(immig)	0.0120 (3.57)	-0.1116 (7.49)	-0.0532 (8.75)	-0.1153 (6.26)
Fraction emigrants female	-0.0854 (6.17)	-0.0822 (5.22)	0.1046 (4.81)	-0.0630 (2.36)
Fract female *log(emig)	0.0465 (7.98)	0.0657 (11.71)	-0.1057 (9.59)	0.0555 (5.73)
Fract immigrants female	-0.1547 (11.19)	0.1045 (4.91)	-0.0550 (3.42)	-0.1400 (5.24)
Fract female *log(immig)	0.1178 (20.23)	-0.1281 (11.86)	0.0087 (1.52)	0.0639 (6.59)
Common lang*log(emig)	-0.0206 (6.22)	-0.0288 (6.94)	0.0001 (0.01)	-0.0526 (7.30)
Common lang*log(immig)	-0.0327 (9.90)	-0.0206 (3.74)	-0.0372 (8.76)	-0.0081 (1.13)

Table 11A.1 (continued)

	Exports from			
	Low to low	Low to high	High to low	High to high
Colonial	-0.0250	-0.0381	-0.0030	0.0250
link*log(emig)	(7.10)	(7.71)	(0.44)	(2.53)
Colonial	-0.0267	-0.0066	-0.0179	-0.0342
link*log(immig)	(7.57)	(1.01)	(3.54)	(3.46)
Regional trade	-0.2537	0.0918	-0.0226	0.3615
agreement	(10.58)	(1.62)	(0.39)	(9.07)
RTA*log(emigrants)	0.0038	0.0429	0.0178	0.0275
	(0.94)	(4.17)	(1.72)	(4.45)
RTA*log(immigrants)	0.0559	0.0018	0.0557	0.0536
	(14.10)	(0.18)	(5.27)	(8.66)
Log(population) home	0.0394	-0.0211	-0.0620	-0.0682
	(4.74)	(1.68)	(8.57)	(5.85)
Log(population)	0.0943	-0.0687	0.0443	0.2860
partner	(11.35)	(9.70)	(3.45)	(24.52)
Log(GDP) home	0.0442	0.0760	0.0575	0.0726
	(37.95)	(43.62)	(35.28)	(28.63)
Log(GDP) partner	0.0322	0.0476	0.0541	0.0709
	(27.62)	(29.88)	(30.40)	(27.94)
War at home	-0.0113	-0.0519	-0.0130	0.0279
	(4.63)	(14.18)	(2.15)	(2.98)
War in partner	-0.0033	0.0243	-0.0283	0.0275
	(1.35)	(4.10)	(7.57)	(2.94)
Number of observations	279 284	284 576	284 576	293 362
R-squared	0.095	0.166	0.204	0.230

Notes on the Treatment of Zero Bilateral Trade

For simplicity, the estimates in Table 11A.1 are obtained by 'scaled' least squares, which replaces LX_{ijt} with $\log(1 + X_{ijt})$.⁵ Eaton and Tamura (1994) pioneer an alternative in which an additive intercept, α , is introduced to the exponential form of the gravity equation; on taking logs, the dependent variable in the trade equation becomes $\log(\alpha + X_{ijt})$ and α is estimated along with other parameters by maximum likelihood applied to the nonlinear equation. Santos Silva and Tenreyro (2006) advocate use of a pseudo-maximum-likelihood Poisson estimator.⁶ Helpman et al. (2008) offer a theoretical model leading to a two-part estimate, on the intensive and extensive trade margins, instead. Each of these has been

applied to equations such as (11.3) though the scaled approach is the most common.⁷

Trade between each dyad of countries falls into three categories: trade is positive in each year; occasionally zero; or always zero. For reasons discussed in the text, it is highly desirable to include the dyad fixed effects. To do so, applying a Poisson estimator, excludes the last category of dyads where trade is never observed. Applying a logit or probit in a two-part approach with fixed effects drops both the first and third category. An Eaton–Tamura estimator is not simple to apply with a very large number of fixed effects, as in our fresh evidence, given the general lack of a fixed-effects, nonlinear estimator. Besides simplicity and comparison with the majority of estimates, the scaling approach adopted in the fresh evidence presented here has the advantage of incorporating cases in which exports are either always zero or always positive within the dyad.

Space limitations preclude a full exploration of other estimation techniques within this chapter. However, Figure 11A.1 compares select results on the migrant trade elasticity profiles for three alternative approaches to estimation: the intensive margin components of a two-part estimator; Poisson estimates; and the scaled estimates from the body of the text. Comparable estimates using the Eaton–Tamura estimator proved intractable given the large number of dyad fixed effects. Although the magnitudes of elasticity estimates differ somewhat in Figure 11A.1, no doubt in part because of the differences in samples entailed, the broad patterns are not dramatically dissimilar at least for these cases. Nonetheless, further work on the differences in these alternative estimators is clearly warranted.

Appendix Notes

1. For an account of the construction of the GBMD, see Özden et al. (2011).
2. <http://www.cepii.fr/anglaisgraph/bdd/gravity.htm>.
3. See supplemental material for papers co-authored by Keith Head at <http://strategy.sauder.ubc.ca/head/sup/>.
4. Data are from the Uppsala Conflict Data Program at <http://www.ucdp.uu.se>.
5. See Wang and Winters (1991, 1992), Eichengreen and Irwin (1995). A Tobit estimator is sometimes preferred to estimate such cases. However, Tobit with random effects is currently available but not with fixed effects.
6. See also Martin and Pham (2008), Santos Silva and Tenreyro (2011).
7. Within the literature on migration–trade links, examples of applying the Eaton–Tamura approach include Head and Ries (1998), Herander and Saavedra (2005), Jansen and Piermartini (2009); Briant et al. (2009) apply the Poisson quasi-maximum likelihood; Law et al. (2009) and Coughlin and Wall (2011) distinguish the intensive and extensive margins in a two-part estimation.

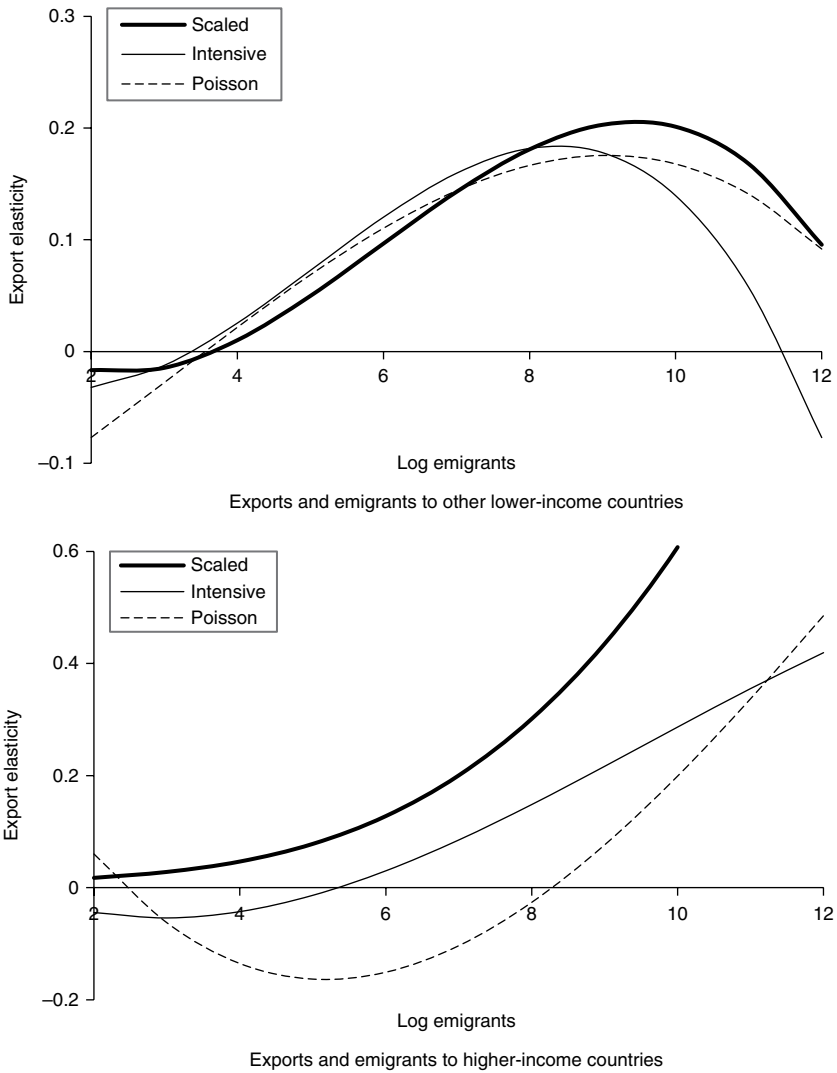


Figure 11A.1 Emigrant elasticities of lower-income countries' exports: alternative estimators