Quantifying the trade-migration nexus of the enlarged EU

A Comedy of Errors or Much Ado About Nothing?

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Chris Parsons

Sussex Centre for Migration Research

Abstract

Gravity models, as applied in the growing number of immigrant-link studies, have revealed a robust and positive relationship between immigration and bilateral trade flows. This paper attempts to further the immigrant-link literature by applying, for the first time, this methodology to the European Union. Specifically the paper seeks to evaluate the robustness of the findings from this strand of literature; to quantify the impact upon EU-15 bilateral trade flows, of East-West European immigration, and to identify the underlying mechanisms underpinning this relationship. The results indicate that Eastern European immigrants exert a positive influence on both EU-15 imports and exports. It is predicted that a 10% rise in Eastern European immigration will increase EU-15 imports from these countries by 1.4% and EU-15 exports by 1.2%. These results indicate that immigrants' demand for native products outweighs the increase in trade associated with immigrants forming business-links between European trading partners.

nations, which, either by the lowering of transaction costs, or via preference effects, boost bilateral trade volumes. Positive results, which in light of previous work are anticipated, would further evidence the robust findings of the immigrant literature, and lend credence to further EU-expansion.

Section 2 provides a comprehensive review of the literature to date, highlighting the disparities between the various approaches, and the subsequent influence these have on the results obtained. Section 3 offers a discussion of the theoretical issues involved, a background to the theory, and commentary on the variables commonly used in gravity models. Section 4 describes the estimated empirical model. Section 5 provides a discussion of the data sources used, of the limitations of the data collected, and details of the analysed panel. Section 6 analyses the results in light of comparable studies, and quantifies the effects of immigration on EU bilateral trade flows, additionally investigating the

It is not difficult to envisage additional mechanisms via which immigrants may affect bilateral trade flows however; mechanisms absent from any of the literature to date. Remittances, for example, would likely exert influence on any model of bilateral trade and immigration. Consider an immigrant who sends remittances home to help support their family. If immigration takes place to a specific country it seems likely that their family may also have a bias for those countries' products. For example a Mexican, who aspires to working in the U.S. to share in the American dream, may well have a preference for American products and thus their family may well too. The increase in the families' disposable income from the addition of remittances would therefore likely raise imports of the home nation from the host nation, though this effect is likely to be small. The increased disposable income may also enable additional funds to be invested in domestic family firms boosting the home nations exports and thus possibly the imports of the host nation. Though encapsulating similar effects on bilateral trade flows to the immigrant-link hypothesis (i.e. effects both imports and exports); this mechanism does not work through the lowering of transaction costs via information gains, and thus remains separate. As the literature omits remittances, the analysis is not undermined; rather the inclusion of remittances would identify additional dynamic processes.

The literature correctly recognizes that immigrants will likely have a bias for home products, but fails to recognize that the immigrant-preference hypothesis will likely extend beyond the borders of the home country to neighbouring regions. For example, a migrant from France will no doubt have a preference for French-made items, but would also likely have a preference for other European products. They may prefer Belgium chocolate to chocolate produced in the U.K. or German wine over that produced in Australia. This effect, though small, will likely account for some of the additional host nation imports from the home region. The feasibility of testing for either of these additional hypotheses may be called into question though. It is likely that due to the data constraints faced by the authors that these mechanisms were omitted in their entirety from the literature. The very existence of additional mechanisms underlying the immigrant-trade relationship however, ensures that it is not as easy to distinguish between the two main hypotheses as the immigrant-link literature would imply. It is probable that there exist many different effects underlying the analysis. To differentiate between them accurately, within the confines of the data available is virtually impossible. For this reason, the focus of this paper is to investigate the

national trade flows, as opposed to international flows.

The multitude of results from those studies reviewed, though insightful, do not all lend themselves to direct comparison, as a whole range of estimates are obtained. The studies taken as a whole do provide evidence of a definitive and robust relationship between immigration and international trade for a wide variety of specifications. Gould reports a positive coefficient on his immigrant information variable. The largest coefficients he reports are on consumer-manufactured exports, with the smallest coefficients on aggregate and producer imports. This, Gould believes, is due to the homogenous nature of these products such that additional information about foreign markets does not substantially benefit trade flows. Generally, Gould finds immigration impacts upon exports the most, and Gould cites this as evidence in favour of the dominance of the immigrant-link hypothesis. Gould's inclusion of variables for the

The greatest disparities between the results in the papers under review, other than the different conclusions drawn with regard to the underlying hypotheses, is between the magnitudes of the export and import trade elasticities with respect to immigration. Wagner et al (2002) provide a useful summary of the import and export elasticities (with respect to immigration) observed in the papers under review, when the full sample is

discussion as to why particular variables are important, derive the basic gravity model of trade, and identify the reduced form to be estimated, a variant of the basic gravity approach - augmented to include additional dimensions necessary for the purposes of this paper.

Paas (2002a) provides a categorisation of the various theoretical backgrounds to the gravity model; those based in regional science or economic geography, those whose foundations lie in microeconomics, predominantly based on utility maximisation, and those that derive from trade theory. Krugman (1991a, 1991b) provides theoretical justification for how geographical proximity can lead to production agglomeration in the regionalisation process, thus biasing international trade flows. In

Where:

F_{ij} = Attractive force between two bodies, i and j.

G = Gravitational constant, a constant of proportionality.

M_i, M_j = Masses of bodies i and j respectively.

D_{ij} = Distance between i and j.

linguistically, culturally as well as legally. Leamer and Stern (1970) believe that any estimation of bilateral trade omitting transport costs is meaningless.

The main difference between equations (1) and (6) is the replacement of the gravitational constant with R_j, – a measure for the remoteness of a country from world markets. Head therefore believes this to be a core variable of the 'basic' gravity model and offers a poignant example to why this variable should be included. Consider trade between two pairs of countries, Australia and New Zealand, and Austria and Portugal. Both of these pairs have similar GDP products, differing by approximately 20% less in the case of Australia and New Zealand; with capital cities approximately the same distance apart. Without the inclusion of the remoteness variable the model would predict that the European pair would trade slightly more. In reality, trade between the two southern hemisphere nations is about nine times larger than between their northern counterparts. Just as the gravitational constant is often assumed constant in calculations using Newton's original equation when applied in international trade R_j is typically assumed constant. There is no justification for this however. One would anticipate the greater the accessibility of a trading nation has to the world markets, i.e. the less remote it is, the more it will trade with localised sources of goods, diverting trade away from more distant trading partners. Head criticises Helliwell's (1998) measure of remoteness believing coiw aarket fm8d(edtn)6c0o coitu74 Twi i0.0005 Tc0.biliteibicoitu7weeningC4h localisesing the

Language effects, and linguistic links, what Linnemman (1966) refers to as psychic links, are also commonly cited as significant in gravity models of bilateral trade, and immigrant-link studies alike. A higher proportion of residents in one nation that speak the language of one of its trading partners, ceteris parabus, the higher the volume of trade we would expect to observe between them. This is what previous research suggests being the case (Rauch and Trindade 2002), though Wagner et al's results evidence the contrary. A language variable could be deemed appropriate for estimation therefore.

The key variable of interest in any immigrant-link study is the stock of immigrants. In this paper this refers to the stock of immigrants from each of the EU-expansion countries residing within each EU-15 country. Of primary interest are the coefficients on this variable, for both import and export estimations; a comparison of which will highlight the prevalence of the relevant hypotheses. Most of the immigrant-link studies assume constant marginal returns from immigration, though this may not be a realistic description of reality. Gould first addressed this issue, by incorporating a function for decreasing returns to migrants. This reasoning, though intuitive, was not derived from theory. Wagner et al subsequently provided a theoretical justification for this, by implementing a random encounter specification. Whilst in the U.S. and Canada the proportion of immigrants to the native population is relatively high, the proportion of immigrants in the EU relative to the 370 million residents is small. Therefore it is assumed for the purposes of this paper, that the returns to immigrants are relatively constant.

The list of variables in the preceding discussion is by no means exhaustive. Many examples of different applications of the gravity model (as applied in international economics) were provided in the literature review. To list all the additional variables included in other authors regressions would be a hapless task. It is not the purpose of this paper to investigate the effects of regional

These authors, when studying Canada, exploited the significant variation in migrant stocks between observations of Canadian provinces, to quantify the effects of immigration from other countries on Canadian provincial trade. Notably, they used country level fixed effects to account for the unobservable effects which influence both trade

Table 2. Waves of EU expansion

Wave number	Countries involved
1	Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia
2	Romania, Bulgaria
3	Croatia
4	Macedonia
5	Turkey

The functional form estimated in this paper, similar to that of Wagner et al (2002) builds upon equation (6). It is additionally augmented for the inclusion of an alternative formulation of the remoteness variable, and an extra dimension to account for variations over time. The specific functional form estimated was:

Without country fixed effects:

$$\ln T_{pft} = {}_1\ln(MIG_{fpt}) + {}_2\ln(Y_{pt}*Y_{ft}) + {}_3\ln(D_{pf}) + {}_4\ln(R_f) + {}_5\ln((Y_{pt}/POP_{pt})*(Y_{ft}/POP_{ft})) + {}_{pft} + {}_{pft}$$

And with country fixed effects:

$$\ln T_{pft} = {}_1\ln(MIG_{fpt}) + {}_2\ln(Y_{pt}*Y_{ft}) + {}_3\ln(D_{pf}) + {}_4\ln(R_f) + {}_5\ln((Y_{pt}/POP_{pt})*(Y_{ft}/POP_{ft})) + {}_{pft} + FE_f + {}_{pft}$$

Where:

$\ln T_{pft}$ = either volume of exports from EU province p to country f or for estimation for imports the volume of imports from EU-expansion country f to EU province p.

$\ln(MIGf_{pt})$ = the natural log of the number of immigrants from EU-expansion country f, in each EU province (country) p.

$\ln(Y_{pt}*Y_{ft})$ = natural log of the product of trading pairs GDP

$\ln(D_{pf})$ = natural log Distance between country p and province f

$\ln(R_f)$ = natural log of measure of remoteness from Western European markets of country f

$\ln((Y_{pt}/POP_{pt})*(Y_{ft}/POP_{ft})$ = natural log of the product of trading pairs per capita incomes.

β = row vector of coefficients for λ_{pft}

λ_{pft}= vector of dummy variables for years, regions, country of origin and the constant

FE_f =fixed effects for country f

ε_{pft}= error term

5. Data

This section aims to address all the relevant data considerations for the estimated panel; to specify the sources, the units of measurement, and the constraints that the data imposed. The estimated panel, spanning 8 years, comprised of 1800 observations, which summarized trade (and the other core variables) between the 225 EU-15 and 15 EU-expansion country pairings[11]. The final panel covers the period 1994-2001, and contained complete data for all of the EU-15 countries and 15 EU-expansion countries, (with the exception of very few missing values). A panel spanning a longer period of time would have been favoured - observations every five years, for example would likely demonstrate greater variations between the observations. However, the utilisation of a short-fat panel circumvents some of the econometric problems associated with longer time-series studies. It is the belief of the author that the data used should represent a fairly typical period in EU history, fairly representative of the EU as a whole. Indeed if these are 'normal' years then any estimates should provide reasonable predictions as to future European immigrant-link effects.

The key variable of interest in the model, as in any immigrant-link study, is the stock of immigrants. Here this refers to the number of immigrants from each of the EU-expansion countries residing in each EU-15 country. The accuracy of this data is of critical importance. No data was able to be collected for the total number of migrants from EU-15 countries residing in expansion countries however. The data is therefore suitable for studying the bilateral effects of east-west EU migration, but will fall short of being able to explain the complementary migratory flows in the opposite direction. The technique commonly used when collecting data on the stock of immigrants is to collect data from the censuses of individual countries and to supplement this data with information on the flows of immigrants from various countries – data more commonly collated and easier to access. Typically, a migrant stock rule is implemented to calculate the annual stocks of migrants. A preliminary regression is then run to calculate the rate of attrition due to death and departures, which is commonly assumed constant. An example of this technique is provided by Head and Ries (1998) which is reproduced here for convenience:

(9) Migrant stock rule:

$$S_t = {}_1 S_{t-1} + F_{t-1}$$

[11] Summary statistics can be found in Appendix A.

(10) Annual stock formula:

$$S_t \quad \frac{S_{baseyear}}{1 \qquad baseyear \quad t} \qquad baseyear \quad t \; \frac{F_{t \; 1 \; i}}{1 \qquad i}$$

(11) Regression to estimate rate of attrition:

$$\hat{S}_t \quad 1 \qquad {}^{5}\hat{S}_{t \; 5} \quad 1 \qquad {}^{4}F_{t \; 5}$$
$$1 \qquad {}^{3}F_{t \; 4} \quad 1 \qquad {}^{2}F_{t \; 3} \quad 1 \qquad F_{t \; 2} \quad F_{t \; 1} \quad u_t$$

Where:

S_t = Immigrant Stock at time t

F_t = Flow of migrant at time t

U_t = error term

ς = Rate of attrition

This technique proved prohibitively time consuming within the constraints of the project however. It was thus necessary to obtain a ‘ready-made’ and complete migrants stock data series. There is a definite lack of availability of such series. The only institution that collates reliable data on European migration is Eurostat, who recently discontinued their main series due to the fact that they could no longer guarantee its accuracy. The only available way to model this variable was to use a proxy. The two series available most suited for use as a proxy; were the stock of immigrants in the EU-15 by ’workers by citizenship’Qnh04 Jg(2)Tj-6.3124sic0.1-0.000t2649couhip’Qnh6492e as600(4 Jg)6(two se0.0001 Tc0.238 Tw[94ready-mf

All income data was collected from the World Development Indicators 2004. It makes little difference whether one implements GDP or GNP (Linnemann 1966), though different definitions of GDP have been reported to influence results (Gros and Consiarz, 1996, Cornett and Iversen 1998). Arguments have arisen between those that argue that GDP (MER – market exchange rates) to be the correct measure, and those that cite GDP (PPP – purchasing power parity) as more suitable. However in view of the results of Paas (2001, 2002b) who finds in relation to both Baltic and European countries, GDP (PPP) to be a superior

expansion country is from European markets. This denies a direct comparison with previous studies. The further each of these countries is from European markets the less one would expect each of the EU-15 countries to trade with these nations. This is what the model suggests. Indeed the effects are particularly strong; a 10% increase in the remoteness of an EU-expansion country will decrease imports to the EU-15 countries by 5.4% and exports from the EU-15 by nearly 17%. This does not seem unreasonable as the majority of EU-15 countries trade between themselves.

The coefficient on the product of the national incomes of trading pairs is both highly significant and large in magnitude. Trade in exports increases almost exactly in proportion with bilateral economic mass, though trade increases more than proportionately in imports. A positive coefficient was anticipated as wealthier countries will likely have developed superior infrastructures relative to poorer countries, facilitating better-quality trade routes. This finding (for imports) contradicts Fr

0.373, not too dissimilar. These negative per capita income coefficients, Paas believes, is due to the expanding economic relations between nations at very different levels of development. If Paas had further disaggregated the trade data, it could be that the import elasticities with respect to per capita income were significantly negative, with the corresponding export elasticities smaller, though positive. This would yield consistent results to those obtained in this paper. The very fact that such a similar study though omitting immigrant-link effects, yields similar results adds credence to those estimates obtained in this paper.

Of principle interest is the coefficient on the

7. Conclusion

Motivated predominantly by Gould's (1994) original immigrant-link study, and Wagner et al (2002), this paper aimed to quantify the effects of East-West European immigration on EU-15 bilateral trade flows. In keeping with the literature, and due to its proven pedigree in international economics, a gravity model was implemented to analyze these effects. This represents, to the author's knowledge, the first time this methodology had been applied to either to the entire EU or to two sets of countries simultaneously before.

In light of the range of theoretical justifications for the gravity model, and the multitude of variables estimated, among both the immigrant-link, and base-line, gravity literature, this paper adopted an ad-hoc stance to estimation. Specifically, the model remained as simple as possible and tested core gravity variables, in conjunction with a variable for the stock of immigrants. This simple specification, it was hypothesised, should yield high quality and significant results, such that the effects from immigration on EU-15 trade could be accurately quantified. The most reliable bilateral data available were obtained for evaluation. Equations for both imports and exports were estimated, with a new variable for 'remoteness' being utilised, one more suited to the paper, within the constraints of the data available.

The model worked surprisingly well, with both a high R^2 and very significant coefficients. The results indicated that immigration from Eastern European countries positively affects both the imports and the exports of EU-15 nations. In light of Paas's comments on the inaccuracies of the results of gravity models this is perhaps the most significant conclusion that can be drawn from the paper. A 10% rise in immigration from EU-expansion countries into the EU-15, is predicted to increase EU-15 imports by 1.4% and EU-15 exports by 1.2%. In terms of the mechanisms underlying the immigration-trade nexus investigated in this paper, these results suggest that immigrant-taste effects are more important than immigrant-link effects, in terms of generating EU-15 bilateral trade. The results from the estimation of the dynamic model indicated a surprising lack of auto regression in the model, though this could be accounted for by the short period under study.

The greatest constraint on the project was with the lack of data available, which ensured that more conventional testing of immigrant-links was prohibited. Reliable data for many of the countries in question was simply unavailable. Specifically it would have been very interesting to have obtained data on trade barriers. This unavailability also prevented the proxy for the stock of immigrant's variable being subjected to a thorough sensitivity analysis. This could have serious repercussions for the results of this project; though the most likely effect is a scaling up of the magnitudes of the trade elasticities with respect to immigration, as the proxy was a fraction of the total stock of immigrants. With more time, and better access to data, the most reliable stock of immigrant's variable would have been constructed from census, and flow data, from individual countries in question.

Immigration remains a topical issue of growing importance. This paper was confined to the affects of immigrant-links, there are many additional avenues open for future research within this framework. Additional data would facilitate the investigation of the joint effects of immigration and remittances that the literature has shown to be of importance (Harrison 2003). Data on the stock of EU-15 immigrants residing in EU-expansion countries would facilitate investigation as to the opposite immigrant-link effects, to those examined here. Data on the length of stay, and permanence of immigrant's, would mean one could look at the effects of temporary migration, an issue of growing importance since the inclusion of mode 4 of GATS - to allow for the freedom of movement of temporary workers. Indeed, if one were to successfully obtain these variables, one could look beyond an immigrant-link study, and gravity modelling, to model the wider effects of immigration; using a General Equilibrium model for example. Looking at the effects of intra-EU rural-urban migration would be a particularly interesting line of inquiry.

For now, this paper would concur with Paas, and say there is a good potential for trade between Eastern and Western European states. Immigration will likely boost this further in the future. On the basis of expanding EU-1.4(o)Bthese0f39quT105

Baldwin, R. François, J.F. and Portes, R. (1997), 'The Costs and Benefits of Eastern Enlargement', Economic Policy 24.

Baltagi, B.H., Egger P. and Pfaffermayr, M. (2003), 'A generalized design for bilateral trade flow models', Economics Letters, September vol. 80, issue. 3, pp. 391-397(7) Elsevier Science.

Bergstrand, J. H. 'The Gravity Equation in International Trade - Some Microeconomic Foundations and Empirical Evidence', Review of Economics and Statistics,Vol.67, 1985, pp.474-481.

Boeri, T. and Brücker, H. (2000), 'The Impact of Eastern Enlargement on Employment and Labour Markets in the EU Member States', a study made for the Directorate General for Employment and Social Affairs, European Integration Consortium, Berlin and Milano.

Boisso, D. and Ferrantino, M. (1997) 'Economic Distance, Cultural Distance, and Openness in International Trade: Empirical Puzzles', Journal of Economic Integration 4, 12: 456-484.

Carey, H. C. (1888), 'Principles of Social Science'. Philadelphia.

Cernat, L. (2003), 'Assessing south-south regional integration: same issues, many metrics: The trade impacts of seven Regional Trade Agreements on developing countries', Conference on Trade and Development (UNCTAD).

Combes, P.-P., Lafourcade, M. and Mayer, T. (May 16th 2002 draught), 'Can business and social networks explain the border effect puzzle?'

Cornett, A. P. and Iversen, S. P. (1998) 'The Baltic State in a European and Baltic Perspective: Trade and Transition in the Baltic Rim' Materials of the Conference "Global-Local Interplay in the Baltic Sea Region", Pärnu, Estonia October 1-4.

Deadorff A. V. 'Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World', in

Head, K. and Ries, J. (1998), 'Immigration and trade creation: econometric evidence from Canada', Canadian Journal of Economics, pp. 47-

Wagner, D. Head, K. and Ries, J. (2002), 'Immigration and Trade in the Provinces', Scottish Journal of Political Economy, Vol. 49, No. 5, November.

Wooldridge, M. R. (2003), 'Introductory Econometrics – A Modern Approach', Thomson South-Western.

Zipf, G. (1946), 'The PHD Hypothesis: On the Intercity Movement of Persons', American Sociological Review 11: 677-686.

Appendix 2

Table 3. Regression results

	Imports	Exports

Appendix 3

Table 4. Elasticity comparison

Authors	Sample and period	Additional complexities of interest	Export Elasticity*	Import Elasticity*
Gould (1994)	U.S. & 47 partners, 1970-86	Differentiated products	0.02	0.01
Head & Ries (1998)	Canada & 136 partners, 1980-92	Canadian immigration policy – i.e. immigrant		

Appendix A – Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	Number of Observations
Log imports					
Overall	17.90594	2.352807	7.38	23.29	N = 1789
Within		1.295605	15.83132	19.86442	n = 15
Between		1.994145	9.454621	21.70462	T-bar = 119.267
Log Exports					
Overall	18.4772	2.045353	8.29	23.34	N = 1786
Within		1.085051	16.6631	20.36908	n = 15
Between		1.756751	10.1041	22.10913	T-bar = 119.067
Log Migrant Stock					
Overall	2.949933	2.285828	0	11.45	N = 1800
Within		1.41933	1.345917	6.193167	n = 15
Between		1.828597	-3.243233	8.206766	T = 120
Log Distance					
Overall	7.221244	.6149635	4.02	8.24	N = 1800
Within		.3128473	6.788667	7.879333	n = 15
Between		.5355192	4.395244	8.157244	T = 120
Log bilateral GDP					
Overall	50.72089	1.769691	45.58924	54.97686	N = 1800
Within		1.276867	48.73689	52.88894	n = 15
Between		1.268568	47.53506	52.90756	T = 120
Log Remoteness					
Overall	-8.603115	.3958092	-9.387489	-7.913832	N = 1800
Within		.4095876	-9.387489	-7.913832	n = 15
Between		0	-8.603115	-8.603115	T = 120
Log Per Capita Incomes					
Overall	18.99909	.4590815	17.93909	20.56837	N = 1800
Within		.3651795	18.56708	19.53945	n = 15
Between		.2936342	18.24395	20.131	T = 120

Appendix B

Diagnostic Results, Part 1, results from Import Estimation

Chart 2. Plot fitted values and Residuals

F-Test for overall significance of the model

Ho: All coefficients are equal to zero.
Ha: At least one coefficient is not equal to zero.

Appendix C

Results from Dynamic Estimation

	Static		Dynamic	
	Imports	Exports	Imports	Exports
Migrant Stock	0.141 (0.126)***	0.116 (0.010)***	0.133 (0.129)***	0.105 (0.010)***
Distance	-1.415 (0.047)***	-1.456 (0.057)***	-1.381 (.0477)***	-1.366 (0.062)***
GDP	1.110 (0.020)***	0.976 (0.015)***	0.999 (0.273)***	0.820 (0.22)***
Per capita GDP	-0.655 (0.126)***	0.282 (0.113)**	-0.659 (.0128)***	0.156 (0.111)
Remoteness	-0.540 (0.092)***	-1.693 (0.075)***	-0.257 (0.108)**	-1.281 (0.939)***
Lagged Dependent Variable	-	-	0.093 (0.019)***	0.150 (0.20)***
(Overall) R2	0.8567	0.8769	0.8589	0.8834
No. Observations	1789	1786	1777	1774

Notes:

Robust standard errors in parenthesis – to correct for heteroskedasticity

***, **, signify 99%, 95%, confidence intervals respectively