RESEARCH DIVISION

Working Paper Series

Ethnic Networks and Trade: Intensive vs. Extensive Margins

Cletus C. Coughlin
and
Howard J. Wall

Working Paper 2010-016B
https://doi.org/10.20955/wp.2010.016

January 2011

FEDERAL RESERVE BANK OF ST. LOUIS
Research Division
P.O. Box 442
St. Louis, MO 63166

Ethnic Networks and Trade: Intensive vs. Extensive Margins[*]

Cletus C. Coughlin

and

Howard J. Wall

January 13, 2011

Abstract

Ethnic networks—as proxies for information networks—have been associated with higher levels of international trade. Previous research has not differentiated between the roles of these networks on the extensive and intensive margins. The present paper does so using a model with fixed effects, finding that ethnic networks increase trade on the intensive margin but not on the extensive margin.

JEL Codes: F10, R10
Keywords: Ethnic Networks, State Exports, Intensive Margin, Extensive Margin

---

[*] The views expressed are those of the authors and do not necessarily represent official positions of the Federal Reserve Bank of St. Louis or the Federal Reserve System.

Coughlin: Federal Reserve Bank of St. Louis. E-mail: coughlin@stls.frb.org
Wall: Murus Research. E-mail wall@murusresearch.com

1. Introduction

Following Rauch (1999 and 2001), a literature has developed that looks at the effect of information networks on international trade. To date, empirical research on this question has not distinguished between the extensive margin (whether trade occurs) and intensive margins (the level of trade, given that trade already occurs). Typically, studies pool together observations of zero and positive trade into a single cross-section, thereby treating changes in two positive levels of trade the same as a change between not trading and trading. There is no reason to believe, however, that the effect of information networks on overcoming entry barriers would be the same as on expanding existing trading relationships. One might expect that information barriers are higher in markets in which a country's firms do not already have a presence, and, thus, that an information network would be more helpful on the extensive margin. On the other hand, because information is only one of many entry barriers in overseas markets, an information network might not be a particularly effective advantage in gaining entry into a market. The contribution of this paper is to examine the extensive and intensive margins separately and to show the different effects that information networks have on them.

The empirical application of the information-networks literature has focused on the role of ethnic networks. Because of data availability and comparability, much of the recent work has looked at the relationship between a U.S. state's exports and the state's number of foreign-born residents, finding ethnic-network elasticities ranging between 0.18 and 0.37 [Co, Euzent, and Martin, 2004; Dunlevy, 2006; and Herander and Saavedra, 2005]. All of the studies using U.S. state exports—and nearly all those that use country-to-country trade data—use a standard gravity model with a cross-section of data. As shown by Cheng and Wall (2005), however, such gravity models tend to be biased because of unobserved or incorrectly specified heterogeneity. In the context of ethnic networks, such bias can arise if there are, say, historical reasons for a high volume of trade between a state and a country as well as for a large number of migrants from the country to the state. It might also be that the measures of distance used in standard gravity models are biased measures of the distance-related costs of trade.

To remedy these problems, Bandyopadhyay, Coughlin, and Wall (2008) constructed a two-year panel of state exports to show that when the estimation controls for country-state fixed effects, the estimate of the ethnic-network elasticity falls by nearly half (from 0.27 to 0.14). This panel approach also allows for an examination of states entering overseas markets to see whether there is a relationship between entry into a market and an increase in the number of the state's residents who were born in that country. We exploit this feature below and use a fixed-effects logit to estimate the extensive margin of ethnic networks and to use OLS with fixed effects to estimate the intensive margin separately.

2. Estimation Alternatives

Our export data are from WISER for 1990 and 2000 and cover manufacturing exports from 48 states (Alaska and Hawaii are excluded) to 29 countries in 19 SIC industries.[1] We consider all industry-country combinations for which exports were positive for at least one of the years, yielding 47,776 observations. Data on the number of foreign-born residents from each country in each state are from the decennial census. A conventional fixed-effects gravity model estimating the link between F_{sct}, the number of residents in state s at time t born in country c, and x_{scit}, real exports from s to c of goods in industry i at time t, might look like

$$\ln(1+x_{scit}) = \alpha_{sc} + \tau_c + \beta \ln Y_{st} Y_{ct} + \gamma \ln N_{st} N_{ct} + \theta \ln F_{sct} + \varepsilon_{scit}, \tag{1}$$

[1] The countries and industries are listed in the appendix.

where Y_{it} and N_{it} ($i = s,c$) are real income and population, respectively. Here, the state-country intercept term α_{sc} controls for all variables that are constant over time and specific to the state and country pair, including distance. We also include a country-specific trend variable, τ_c, to control for changes in the level of import protection in each of the export markets. As is commonly (although not necessarily correctly) done to avoid taking the log of zero, we add 1 to every observation for the sake of comparison.

Alternatively, instead of combining the extensive and intensive margins, as in (1), we split the estimation into two parts: (1) the probability of entrance into or exit from a market and (2) the importance of ethnic networks in increasing exports to an already-served market. Our estimation of the extensive margin is

$$\Pr(x_{scit} > 0) = \tilde{\alpha}_{sc} + \tilde{\tau}_c + \tilde{\beta} \ln Y_{st} Y_{ct} + \tilde{\gamma} \ln N_{st} N_{ct} + \tilde{\theta} \ln F_{sct} \cdot \tilde{\varepsilon}_{scit}, \tag{2}$$

which is conditional on there being at least one entry or exit across the 19 industries for a state-country pair.[2]

We estimate the intensive margin with

$$\ln(1 + x_{scit}) = \underset{\sim}{\alpha}_{sc} + \underset{\sim}{\tau}_c + \underset{\sim}{\beta} \ln Y_{st} Y_{ct} + \underset{\sim}{\gamma} \ln N_{st} N_{ct} + \underset{\sim}{\theta} \ln F_{sct} + \underset{\sim}{\varepsilon}_{scit}, \tag{3}$$

for which x_{scit} is positive for both years. Note that, for consistency with the combined estimation, we have maintained the convention of adding 1 to every export observation even though we do not have any observations of zero exports. This has a very minor quantitative effect on the ethnic-network elasticity, which would be unchanged to the fifth decimal place if we dropped this convention.

[2] We should note the tendency for changes on this margin to be between smaller states and countries, and that these state-country pairs are also less likely to have traded in either period.

3. Results

As summarized in Table 1, estimation of (1) yields an ethnic-network elasticity of 0.192, which is in line with previous estimates. When we split the estimation into equations (2) and (3), however, the ethnic-network elasticity on the extensive margin is not statistically different from zero; but, the elasticity on the intensive margin is a statistically significant 0.139. In other words, we find that ethnic networks are associated with increased exports when a trading relationship already exists, but we find no association between ethnic networks and entry into an export market.

In a Melitz-type model of heterogeneous firms, such as Lawless (2010), a reduction in information costs is more likely to have an effect on the extensive margin, suggesting the opposite of our results. On the other hand, our results make more sense if we also consider exporting and foreign direct investment (FDI) as substitute strategies.[3] Specifically, assume that for every firm a larger ethnic network reduces the cost of becoming an exporter or of engaging in FDI. In such a scenario, some firms (and their states) will become exporters, others will switch from exporting to FDI, while others will switch to FDI from doing neither. On average, therefore, the effect on the intensive margin is ambiguous, although those states that do export will be exporting more.

It is worth pointing out the role that fixed effects have on our results, so we have also estimated (1) – (3) under the assumptions that all state-country pairs have the same non-distance-related intercept. These estimates include explicitly the distance between the states' and countries' largest cities, along with a dummy to indicate whether the state and country are contiguous. As summarized by Table 2 and consistent with Bandyopadhay, Coughlin, and Wall (2008), estimation without fixed effects yields larger estimates of the ethnic-network elasticity:

[3] Greenaway and Kneller (2007) survey this literature.

for the combined estimation, 0.335; on the extensive margin, 0.225; and on the intensive margin, 0.168.

4. Conclusions

A well-known empirical finding is that ethnic networks increase international trade flows by helping to reduce information barriers. Using data on U.S. state exports, we find that the effects differ on the intensive and extensive margins. When state-country fixed effects are included, the ethnic-network elasticity of trade on the intensive margin is positive and significant, but is statistically no different from zero on the extensive margin. In contrast, when fixed effects are not included, the effect is significant on both margins and is one-third higher on the extensive margin.

Appendix

29 Destination Countries	19 SIC Industries
Argentina	Food and Kindred Products
Australia	Textile Mill Products
Brazil	Apparel and Other Textile Products
Canada	Lumber and Wood Products
Chile	Furniture and Fixtures
China	Paper and Allied Products
Colombia	Printing and Publishing
Egypt	Chemicals and Allied Products
France	Petroleum and Coal Products
Germany	Rubber and Misc. Plastic Products
Hong Kong	Leather and Leather Products
India	Stone, Clay, and Glass Products
Indonesia	Primary Metal Industries
Ireland	Fabricated Metal Products
Israel	Industrial Machinery, Computer Equipment
Italy	Electronic, Electric Equip, Exc. Computers
Japan	Transportation Equipment
Malaysia	Instruments and Related Products
Mexico	Misc. Manufacturing Industries
Netherlands	
Philippines	
South Africa	
South Korea	
Spain	
Sweden	
Thailand	
Turkey	
United Kingdom	
Venezuela	

References

Cheng, I-Hui and Wall, Howard J. (2005) “Controlling for Heterogeneity in Gravity Models of Trade and Integration,” Federal Reserve Bank of St. Louis *Review*, 87(1), 49-63.

Co, Catherine Y.; Euzent, Patricia; and Martin, Thomas (2004) “The Export Effect of Immigration into the USA,” *Applied Economics*, 36, 573-583.

Bandyopadhyay, Subhayu; Coughlin, Cletus C.; and Wall, Howard J. (2008) “Ethnic Networks and State Exports,” *Review of International Economics*, 16(1), 199-213

Dunlevy, James 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), 182-186.

Greenaway, David and Kneller, Richard (2007) “Firm Heterogeneity, Exporting and Foreign Direct Investment,” *Economic Journal*, 117(517), F134-F161.

Herander, Mark G. and Saavedra, Luz A. (2005) “Exports and the Structure of Immigrant-Based Networks: The Role of Geographic Proximity,” *Review of Economics and Statistics*, 87(2), 323-335.

Lawless, Martina (2010) “Deconstructing Gravity: Trade Costs and Extensive and Intensive Margins,” *Canadian Journal of Economics*, 43(4), 1149-1172.

Rauch, James E. (1999) “Networks versus Markets in International Trade,” *Journal of International Economics*, 48, 7-35.

Rauch, James E. (2001) “Business and Social Networks in International Trade,” *Journal of Economic Literature*, 39(4), 1177-1203.

Table 1. Estimation with State-Country Fixed Effects

	Combined			Extensive Margin			Intensive Margin		
	Coeff.	S.E.	*t*-stat.	Coeff.	S.E.	*t*-stat.	Coeff.	S.E.	*t*-stat.
State-Country Fixed Effects (incl. Distance)	yes			yes			yes		
ln Y_iY_j	0.814	0.590	1.38	1.267†	0.662	1.91	1.433 *	0.383	3.74
ln N_iN_j	2.128 *	0.771	2.76	0.889	0.906	0.98	-0.264	0.497	-0.53
ln F_{ij}	0.192 †	0.098	1.95	0.002	0.097	0.02	0.139 *	0.061	2.27
Log-likelihood	-127,550.8			-7,449.6			-87,665.6		
R^2	0.402			-			0.400		
Number of Observations	47,776			30,824			40,480		
State-Country Pairs	1,391			942			1,385		

All standard errors are robust. Statistical significance at the 5 and 10 percent levels are denoted by * and †, respectively. Country-specific time dummies are included in the estimation but, due to space constraints, are not reported.

Table 2. Pooled Cross-Section Estimation

	Combined			Extensive Margin			Intensive Margin		
	Coeff.	S.E.	*t*-stat.	Coeff.	S.E.	*t*-stat.	Coeff.	S.E.	*t*-stat.
ln $Distance_{ij}$	-1.163 *	0.059	-19.75	-0.882 *	0.127	-6.96	-0.731 *	0.040	-18.22
$Contiguity_{ij}$	0.195 †	0.108	1.81	0.240	1.145	0.21	0.411 *	0.095	4.32
ln Y_iY_j	1.871 *	0.043	43.81	1.088*	0.048	22.55	0.931 *	0.026	35.16
ln N_iN_j	-0.455 *	0.044	-10.42	-0.354*	0.044	-8.09	0.010	0.026	0.39
ln F_{ij}	0.335 *	0.020	17.16	0.225 *	0.023	9.91	0.168 *	0.013	13.44
Log-likelihood	-129,604.6			-9,713.3 (pseudo)			-89,527.1		
R^2	0.348			0.246 (pseudo)			0.342		
Number of Observations	47,776			47,776			40,480		

All standard errors are robust. Statistical significance at the 5 and 10 percent levels are denoted by * and †, respectively. Country-specific time dummies are included in the estimation but, due to space constraints, are not reported.