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Coughlin, Cletus C and Wall, Howard J.

13 January 2011

Online at <https://mpra.ub.uni-muenchen.de/30758/>  
MPRA Paper No. 30758, posted 06 May 2011 20:36 UTC

# **Ethnic Networks and Trade: Intensive vs. Extensive Margins<sup>\*</sup>**

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

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<sup>\*</sup> 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](mailto:coughlin@stls.frb.org)

Wall: Murus Research. E-mail [wall@murusearch.com](mailto:wall@murusearch.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.<sup>1</sup> 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

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

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<sup>1</sup> 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  $\alpha_{sc}$  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,  $\tau_c$ , 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

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

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

We estimate the intensive margin with

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

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.

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<sup>2</sup> 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.<sup>3</sup> 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 Bandyopadhyay, Coughlin, and Wall (2008), estimation without fixed effects yields larger estimates of the ethnic-network elasticity:

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<sup>3</sup> 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

Argentina  
Australia  
Brazil  
Canada  
Chile  
China  
Colombia  
Egypt  
France  
Germany  
Hong Kong  
India  
Indonesia  
Ireland  
Israel  
Italy  
Japan  
Malaysia  
Mexico  
Netherlands  
Philippines  
South Africa  
South Korea  
Spain  
Sweden  
Thailand  
Turkey  
United Kingdom  
Venezuela

### 19 SIC Industries

Food and Kindred Products  
Textile Mill Products  
Apparel and Other Textile Products  
Lumber and Wood Products  
Furniture and Fixtures  
Paper and Allied Products  
Printing and Publishing  
Chemicals and Allied Products  
Petroleum and Coal Products  
Rubber and Misc. Plastic Products  
Leather and Leather Products  
Stone, Clay, and Glass Products  
Primary Metal Industries  
Fabricated Metal Products  
Industrial Machinery, Computer Equipment  
Electronic, Electric Equip, Exc. Computers  
Transportation Equipment  
Instruments and Related Products  
Misc. Manufacturing Industries



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**Table 1. Estimation with State-Country Fixed Effects**

	Combined			Extensive Margin			Intensive Margin		
	Coeff.	S.E.	<i>t</i> -stat.	Coeff.	S.E.	<i>t</i> -stat.	Coeff.	S.E.	<i>t</i> -stat.
State-Country Fixed Effects (incl. Distance)	yes			yes			yes		
$\ln Y_i Y_j$	0.814	0.590	1.38	1.267†	0.662	1.91	1.433 *	0.383	3.74
$\ln N_i N_j$	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.	<i>t</i> -stat.	Coeff.	S.E.	<i>t</i> -stat.	Coeff.	S.E.	<i>t</i> -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
$\ln Y_i Y_j$	1.871 *	0.043	43.81	1.088*	0.048	22.55	0.931 *	0.026	35.16
$\ln N_i N_j$	-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.