The extensive and intensive trade-creation effects of business and social networks: evidence from Spanish industry-level data

Aitor Garmendia (Deusto Business School)

Carlos Llano (Universidad Autónoma de Madrid)

Asier Minondo (Deusto Business School)

Francisco Requena (Universidad de Valencia)

Abstract

This paper analyzes the effect of business and social networks on the extensive and intensive margins of trade. Using industry-level bilateral trade data for Spanish regions in the period 2004-2008, we show that both social and business networks have a very large trade-creating effect. We find that networks have a much stronger effect on the extensive than on the intensive margin of trade. This result points out that migrant and business ties mitigate particularly the fixed costs that firms have to incur when starting to trade with a new region. We show as well that migrants do not have to participate actively in the labor market to smooth the informal barriers to trade. However, when migrants participate in the labor market they help to mitigate particularly the information barriers in the industries they are employed. We also show that business groups created to diversify risks have a much lower trade-creation effect.

JEL Codes: F12, F15

Keywords: intra-national trade, regions, networks, business groups, trade costs, Spain.

Acknowledgements:

Carlos Llano and Asier Minondo acknowledge financial support from the Spanish Ministry of Science and Innovation (ECO2010-21643/ECON).

1. Introduction

Different studies have shown that social and business networks facilitate trade across and within nations. Regarding social networks, there is abundant evidence showing that both migrant communities and ethnic ties facilitate trade (Gould, 1994; Head and Ries, 1998; Rauch and Trindade, 2002). For business networks, although there are fewer studies, the evidence also points out to a positive link between networks and trade (Belberdos and Sleuwaegen, 1998; Head and Ries, 2001; Combes et al., 2005).

Networks can promote trade through two main mechanisms (Rauch, 2001). First, networks can mitigate the opportunistic behavior of partners, especially in those situations in which legal institutions are weak. Second, networks can provide information about market opportunities, such as finding the right distributor or supplier for a firm. The first trade-creation mechanism, the mitigation of opportunistic behavior, is related with the variable costs of trade. Each time a firm is considering to trade with another firm in a different country or region it has to evaluate whether its partner will meet its obligations. Networks can smooth this variable cost of trade facilitating information about the reliability of the partner; they can also lower the risks if the partner firm knows that it will be excluded from future operations with other firms belonging to the network if it behaves opportunistically. The second trade-creation mechanism, information about market opportunities, is more related with the fixed cost of trade. Firms considering starting operations in new regions or countries have to analyze the attractiveness of the markets, the features of customers, the most suitable distribution channels, or the supply conditions. Networks, having partners in these new regions or countries, can lower these fixed costs providing this strategic information.

The aim of this paper is to determine whether the trade-creation effect of networks stems from the first mechanism, the reduction of the variable costs of trade, or from the second mechanism, the reduction of the fixed-costs of trade. To do so we build on the insights of the new theoretical frameworks that incorporate firm heterogeneity to explain the trade status of firms (Melitz, 2003; Bernard et al., 2003). These models show that trade can increase by two different margins: the extensive margin of trade and the intensive margin of trade. The first margin captures the number of firms that participate in trade, and the second margin captures the value exported by each firm. Changes in the extensive margin are associated with the fixed costs of entering a new market, whereas changes in the intensive margin are associated

with the variable costs of trade (e.g. transport costs). If networks were associated with the extensive margin of trade, it would mean that business and social ties tend to mitigate the fixed costs of trade. In contrast, if networks were associated with the intensive margin of trade, it would point out that social and business ties tend to smooth the variable costs of trade. This approach represents an alternative strategy to that followed by Rauch and Trindade (2002) to identify whether networks facilitate trade deterring opportunistic behavior or providing information about market opportunities.

In this paper we use a unique database on shipments between Spanish provinces (NUTS-3) disaggregated by industries, which reports the number of transactions and the value per transaction, to analyze whether social networks and business networks facilitate trade at the extensive or the intensive margin. As far as we know, this is the first paper that analyses the impact of both social and business networks on the two margins of trade.[1] Our paper also contributes to the literature in other dimensions. First, there is only one previous paper that analyzes the impact of social and business networks on intra-national trade: Combes et al. (2005).[2] That paper, using data for French regions in the year 1993, shows that migrant and business networks facilitate intra-national trade. Our paper helps to test whether the results obtained by Combes et al. (2005) are robust to changes in country and time period. Second, we analyze whether some business-groups facilitate trade more than others. On the one hand, we divide business-groups into those whose principal shareholder is a holding company and the rest. We want to study whether business groups that are only created to diversify risks have a lower impact on trade than the rest. On the other hand, we measure the vertical integration between the firms that compose the business groups. We analyze whether business groups with a larger degree of inter-industry linkages have a stronger impact on trade. Third, regarding social networks, we study whether migrant workers have a larger impact on trade than migrant residents. Fourth, the use of data disaggregated by industry allows us to analyze whether industry-level trade is facilitated when migrants and firms belonging to a business group participate in the industry. Finally, we use a novel indicator to proxy transport costs between locations: the actual time spent by trucks. This measure improves on previous distance measure like geodesic distance or the actual distance travelled by a truck, as time, along with distance, captures the differences in orography and quality of infrastructure.

[1] Peri and Requena (2010) analyze the effect of immigrants on the extensive and intensive margin of Spanish international trade, but do not include business groups in their analysis.
[2] Millimet and Osang (2007) also analyze the impact of networks on trade across US states, but only include migrants in their analysis.

Our analyses conclude that networks have a strong positive impact on inter-regional trade, confirming the results obtained previously by Combes et al. (2005). We find that networks have a much stronger effect on the extensive than on the intensive margin of trade. This result points out that migrant and business ties mitigate particularly the fixed costs that firms have to incur when starting to trade with a new region. We show, as well, that migrants do not have to participate actively in the labor market to smooth the informal barriers to trade. However, when migrants participate in the labor market they help to mitigate particularly the information barriers in the industries they are employed. We also show that business groups created to diversify risks have a much lower trade-creation effect. In contrast, we do not find that vertically-integrated business groups have a larger trade-creation effect.

The rest of the paper is organized as follows. Section 2 explains the empirical model we use to evaluate the trade-creating effects of social and business networks. Section 3 describes the data used in the empirical analysis. Section 4 presents the results of the empirical analysis. Section 5 provides some concluding remarks.

2. Empirical model

We use the insights of the new-new trade theories to analyze whether networks facilitate the extensive or the intensive margin of trade. In particular, we draw on the extended gravity model developed by Chaney (2008). According to this model, which incorporates heterogeneity in labor productivity across firms, aggregated sales (X) from region i to region j are determined by:

$$ln(X_{ij}) = Const + ln(w_i^{-\gamma} Y_i) + ln(Y_j \theta_j^{\gamma}) - \gamma ln(\tau_{ij}) - \left(\frac{\gamma}{\sigma - 1} - 1\right) ln(f_{ij}) \quad (1)$$

The term $ln(w_{it}^{-\gamma} Y_i)$ captures the exporting region wages (w_i) and income (Y_i). The parameter γ denotes the degree of homogeneity in productivity across firms in the exporting region. The term $ln(Y_j \theta_j^{\gamma})$ is the income of the importing region and its remoteness relative to the rest of regions. The term τ_{ij} is the iceberg transport costs (per unit of exports) and σ the elasticity of substitution across goods. Finally, f_{ij}, denotes the fixed costs of exporting from region i to region j.

To estimate equation (1), the term $ln\left(w_{it}^{-\gamma}Y_i\right)$ is captured by a exporting region fixed effect (β_i), and the term $ln\left(Y_j\theta_j^{\gamma}\right)$ by a importing region fixed effect (β_i). We capture variable bilateral costs with distance between partners (d_{ij}), measured by the time used by trucks to travel from province *i* and province *j*, and a dummy variable that takes the value of one if region *i* and region *j* are adjacent and zero otherwise (C_{ij}).

Without prior knowledge on whether they smooth fixed or variable trade costs, we also introduce network variables in the estimating equation. Social networks are proxied by the number of workers born in region *i* that live in region *j* (mig_{ij}), and the number of workers born in region *j* that live in region *i* (mig_{ji}). The effect of business groups is proxied by the number of plant links between firms that belong to the same business group in region *i* and region *j* ($plant_{ij}$). Analytically:

$$ln(X_{ij}) = \beta_1 d_{ij} + \beta_2 \ln(1 + mig_{ij}) + \beta_3 \ln(1 + mig_{ji}) + \beta_4 \ln\left(1 + plant_{ij}\right) + \beta_5 C_{ij} + \beta_i + \beta_j \quad (2)$$

According to the Chaney model, the reduction of fixed costs foster trade through the extensive margin, that is, increasing the number of firms that participate in inter-regional exports. In particular, the reduction of fixed costs lowers the productivity threshold firms need to achieve to break into other markets. In contrast, the reduction of fixed costs does not have any effect on the intensive margin of trade. This outcome is a feature of models that incorporate CES utility functions and constant elasticity demand.

To analyze whether networks mitigate fixed or variable costs we estimate two variants of equation (2). In the first variant, the dependent variable measures the number of export-transactions from region *i* to region *j*: the extensive margin of trade. In the second variant, the dependent variable measures the average value of an export-transaction from region *i* to region *j*: the intensive margin of trade. If networks mainly mitigate the fixed costs of trade, we would expect larger coefficients for migrant workers and business groups in the first variant (extensive margin) than in the second variant (intensive margin).

3. Data

Data on trade between Spanish provinces comes from The Permanent Survey of Road Transport of Goods (EPTMC). It is collected and published by the Ministerio de Fomento (Ministery of Public Works) and it is included in the Spanish National Statistical Plan. The survey provides data on the number of operations performed by trucks between two Spanish provinces. Operation is defined as the displacement of a single class of goods from a place of origin (load) to a destination (unload). The shift of two different kinds of goods in the same vehicle is considered as two different operations, with only one "movement" made by the vehicle. The EPTCM also provides data on the tones transported in each operation. The survey does not include the economic value of the goods being transported. We use these data to proxy the extensive and intensive margins of trade between Spanish provinces. In particular, we use the number of operations as a proxy for the number of firms in the origin province that trade with the destination province (the extensive margin of trade); on its hand, we use the transported tones in the operation as a proxy for the value of the transaction (the intensive margin of trade). It is important to point out that operations might overestimate the extensive margin of trade, as a firm can ship more than once its products to another province. To avoid the presence of outliers, we average data for the period 2004-2008. Intra-province sales are not included in the sample.

We proxy transport costs by the time spend by a truck (in minutes) to travel from one Spanish province to another province. Data on the stock of people (occupied or not) born in a Spanish province that live in another Spanish province comes from the Spanish Statistical Institute's (INE) Census of Population. Data on business networks are computed from SABI. This dataset, produced by the private firm Bureau van Dijk, offers data on the accounts and balance sheets of Spanish firms. Following the norm established by the Spanish General Accounting Plan we consider that two firms belong to the same business-group if the same shareholder has at least a 20% participation in both firms, and the shareholder is the primary shareholder in both firms. We identify the firms that belong to the same group in the origin and destination region. Following Combes et al. (2005), for each business group we multiply the firms in the origin region by the firms in the destination region to proxy for plant links. Then we aggregate each business group's plant links to get the final origin-destination plant-link figure.

4. Estimation results

We start the empirical analysis estimating the role of business and social networks on aggregated inter-regional exports (Equation 2). As shown in Table 1 - Column 1, all the coefficients have the expected sign. Distance has a negative effect on trade and contiguity has a positive effect on trade. The distance coefficient, -0.89, is very close to the average found in previous studies, which lies around 0.90 (Disdier and Head, 2008). The table shows that both social and business networks have a positive effect on inter-regional trade. We can observe that the largest coefficient is obtained for immigrants workers: 0.23; it is followed by the business networks coefficient: 0.17, and the emigrant workers coefficient: 0.15. These results indicate that provinces tightly linked by social and business networks trade more than other provinces.

Our findings are in line with the conclusions of the previous study that analyzed the effect of networks on inter-regional trade: Combes et al. (2005). That study used data on bilateral trade among French regions for the year 1993. They proxied social networks with the stock of migrants working in one region that were born in another region; on its hand, they considered that two firms belonged to the same business group if the principal shareholder had, at least, 50% of the votes in the shareholder committee in both firms. If we compare the results reported in their Table 3-Column (6) with our results, we observe that the business group coefficient for Spain (0.17) is lower than the coefficient for France (0.23).[3] Their immigrant worker coefficient (0.26) is also larger than our coefficient; in contrast our emigrant worker coefficient (0.15) is slightly larger than their coefficient (0.14).[4]

In the second and third columns of Table 1, we report the results of estimating the effects of networks on the extensive and intensive margins of trade. We can see that networks have a positive and strong impact on the extensive margin of trade. The values of the emigrant and business network coefficients are the same to those reported in Column (1), and the coefficient for immigrant workers drops from 0.23 to 0.18. In contrast, we observe that networks do not have a statistically significant impact on the intensive margin of trade.

[3] The Spanish business coefficient drops to 0.13 when we establish the principal shareholder threshold at 50%. The conclusions of all empirical analyses are not altered when we use this more stringent threshold.

[4] Note that Combes et al. (2005) estimate the effect of networks on aggregated imports by region *i* from region *j*, whereas we estimate the effect of networks on aggregated exports from region *i* to region *j*. Hence their emigrant worker coefficient corresponds to our immigrant worker coefficient and vice versa.

It is interesting to note the large drop in the distance and contiguity coefficients when we analyze the intensive margin of trade. Results for distance are in line with a previous study by Hillberry and Hummels (2008) that analyzes the effect of distance and contiguity on the extensive and intensive value of shipments in the US. If we take their results for shipments between 3-digit zip codes, that have an average area similar to Spanish provinces, the distance coefficient drops from -1.292 in the extensive margin to -0.057 in the intensive margin.

The analyses with aggregated data show that social and business networks gently facilitate trade across Spanish provinces, reducing the fixed costs that firms had to incur when exporting to another Spanish province and, hence, enlarging the number of firms that participate in inter-regional trade. Although networks also reduce variable costs, this contribution is much smaller.

To calibrate the trade-creating effects of both social and business networks, following Rauch and Trindade (2002) and Combes et al. (2005), we compute the following equation:

$$\left(\overline{1 + z_{ij}}\right)^{\hat{\delta}} \qquad (3)$$

where $\overline{(1 + z_{ij})}$ is the average value taken by each network variable ($z_{ij} = plant_{ij}, mig_{ij,} mig_{ji}$) and $\hat{\delta}$ the estimated elasticities reported in Table 1. As shown in Table 2, occupied immigrants raise inter-regional trade by 425%, emigrants by 212% and business networks by 142%. These figures highlight that network connections have a very important positive impact on trade. In contrast to Combes et al. (2005), we find that social networks, and especially immigrants, have a stronger effect on trade than business groups. Part of the explanation may lie in the much lower average values that social networks have in Combes et al. (2005). As shown in Table 2, the average stock of workers born in a Spanish region that live in another Spanish region is 1566, whereas in Combes et al. (2005), which use a more disaggregated regional unit, the figure is less than 30. The table also shows that social and business networks gently enhance the number of export transactions between provinces. In contrast, the impact of networks on the value per transaction is very small.

Before we turn to empirical analyses based on industry-level data, we study whether the working status of migrants, the characteristics of the principal shareholder and the degree of

vertical integration among firms in business groups influence the trade-creation impact of networks. First, we re-estimate the empirical model using the total number of emigrants, occupied or not, as a proxy for social networks. We want to analyze whether migrants have to be occupied to facilitate the reduction of the informal costs of trade. As shown in Table 3, the coefficients for immigrants and emigrants are, in the majority of cases, similar to those reported in Table 1. With respect to aggregate trade, the coefficient for all immigrants, 0.25, is slightly larger than for occupied immigrants, 0.24. In contrast, the coefficient for all emigrants is slightly lower than for occupied migrants; moreover, the former coefficient is not statistically significant. With respect to the extensive margin of trade, there are no differences in the coefficients. Finally, the coefficients remain statistically not significant when analyzing the impact of networks on the intensive margin of trade. These results point out that migrants can mitigate the informal barriers to trade even when they do not participate actively in the labor market. As the group of non-occupied migrants is 25% larger than the group of occupied migrants, they also have a substantial trade-creating effect.

Second, we analyze whether the characteristics of the principal shareholder influence the strength of the ties within the business group. In particular, if the aim of the shareholder is to diversify risks, it might invest in different industries without seeking any collaboration among those firms. In these situations we would expect the business group network effect to be lower than in cases in which the business group is created seeking to exploit synergies among firms. We can proxy the motivation of the principal shareholder looking to its economic activity, and identifying those firms whose principal activity is to manage shares of different industries: holding companies. With that information we calculate two business group variables. The first variable is the number of links between the firms that belong to the same business group and whose principal shareholder is a holding company. The second variable is the number of links between firms that belong to the same group and whose principal shareholder is not a holding company. We expect the coefficient of the first variable to be lower than the coefficient for the second variable. The caveat of this analysis is that our database does not provide the economic activity for all principal shareholders and, hence, we cannot work with the whole business group sample. Our database identifies 767910 firm-links. From this total we can identify the principal shareholder for 508402 firm-links (66% of all trade links); in 223988 plant links the principal shareholder is a holding company (44% of all plant links where we can identify the principal shareholder).

The results presented in Table 4 confirm our expectations. Although both business network coefficients are positive, in Column 1 the size of the coefficient when the principal shareholder is not a holding company (0.12) is three times larger than the coefficient when the principal shareholder is a holding company (0.04). Moreover, the latter coefficient is not statistically significant. The difference is even larger when estimating the effect of networks on the extensive margin of trade. These results point out that not all business groups enhance trade by the same degree. In particular, if business groups are created to diversify risk, collaboration and information sharing across business group's firms will not be in the principal shareholder's agenda, leading to less trade creation opportunities. This result is important if we consider that business groups were the principal shareholder is a holding company represent a large percentage of all business groups.

Third, we analyze whether business networks that encompass industries that are related vertically are more trade-promoting. To measure vertical-relatedness between industries we use the Spanish Input-Output Table from INE for the year 2005 and calculate the share of sales from origin industry to destination industry in total origin industry's sales. Then we weight the plant links between two provinces by the vertical relatedness of the firms that are part of the business group. As shown, in Table 5 the business group coefficient only increases from 0.17 to 0.18 when we take vertical integration into account. This result points out that more vertically integrated business groups do not have a larger trade-creating effect.

To sum up, the analysis with aggregated data shows that both social and business networks have a strong trade-creating effect, especially on the extensive margin. We also observe that social networks, and in particular emigrants, have a larger positive impact on trade than business networks. Our results show, as well, that migrants do not have to participate in the labor market to reduce information barriers. On its hand, business networks whose principal shareholder is a holding company have a much lower positive effect on trade. Finally, more vertically integrated business-groups do not have a larger trade-creation effect.

Industry-level analyses

In the second part of this section, we take full advantage of our database's disaggregation level and estimate networks effect on trade using industry-level data. Now, the dependent variable

refers to inter-provincial exports in each of the 13 industries included in our database.[5] To control for business specific effects, we add dummy variables for each industry in equation (2). Due to the large number of zeros in the industry-level database OLS may lead to biased estimates. To control for zero observations we estimate the equation with a Poisson model (Silva and Tenreyro, 2006).[6]

Table 6 presents the results of the estimation. The use of industry-disaggregated data does not alter the main conclusions obtained with aggregated data. We still find that both social and business networks have a strong impact on inter-regional trade; the results also show that networks facilitate trade at the extensive margin rather than at the intensive margin.[7] However, we also observe some differences. First, the contiguity coefficient is substantially lower than in Table 1 in all estimations. Second, there is also a reduction in the immigrants' coefficient; moreover, this coefficient becomes statistically not significant when analyzing the impact of networks on the extensive margin of trade. Third, the effect of business networks on the extensive margin is much larger than in Table 1.

As explained in the introductory section, data disaggregated by industries allows a better identification of the channels by which networks facilitate trade. We start analyzing how business groups may spread information across its members. If business networks provide information on market opportunities, and this information helps the establishment of new trade relationships, we would expect a positive relationship between the number of firms that belong to a business group in an industry and the amount of trade in that industry. To capture the strength of this channel we compute the number of links between firms that belong to the analyzed industry in the exporting region and the firms that belong to the same business group in the importing region. Industry-level data also allows us to study more deeply how social networks facilitate inter-regional trade. In particular, we want to analyze whether migrants need to have special industry-level knowledge to be a valuable information source. To test this hypothesis, we build an industry level migrant variable, calculated as the stock of

[5] The industries are Food, beverages and tobacco; Textiles; Leather and footwear; Wood; Paper, printing and publishing; Chemicals; Rubber and plastics; Other non-metallic minerals; Basic and fabricated metals; Machinery; Electrical and Optical Equipment; Transport equipment; Other manufacturing.

[6] We estimate the Poisson model using the ppml command for Stata developed by Santos Silva and Tenreyro (http://privatewww.essex.ac.uk/~jmcss/LGW.html). This command overcomes the convergence problems that may arise with other algorithms when, as in our case, the dependent variable has many zeros and the model includes many dummy variables.

[7] We obtain similar results when estimating the model with simple OLS (results not reported).

migrants born in one region that live in another region and work in one of the 13 industries included in our sample.

Table 7 presents the results of the estimations when industry-level business and social network variables are introduced in the regression. With respect to social networks, we observe that the coefficient for industry-level immigrants is much larger than in Table 6, both when the dependent variable is value of trade and number of transactions. In the case of emigrants there are no significant changes when industry-level indicators are used. For business groups the industry-level coefficient is similar for aggregated trade, but lower for the extensive margin of trade. This result suggests that firms belonging to an industry can reap the trade-creating effects of business networks, even when they do not belong to the business group. This might be the case if business groups help in finding potential suppliers for member firms. It is interesting to observe, that for the first time, industry-level immigrants have a sizable positive effect on the intensive margin of trade.

5. Conclusions

This paper shows that social and business networks gently facilitate trade across Spanish provinces. According to our results, migrants multiply inter-province exports by seven and business groups by more than two. We also find that the trade-creation effect of networks stems from its impact on the extensive margin of trade. Networks are found to mitigate the fixed costs that firms have to incur when starting new transactions in other regions. The reduction of the fixed costs of trade allows more firms to sell in other Spanish regions, leading to an increase in overall inter-regional exports. In contrast, networks do not have a sizable effect on the intensive margin of trade.

We also show that different characteristics might influence the strength of networks in mitigating the informal barriers to trade. We find that business groups created with the only objective of diversifying risks have a much lower impact of trade. We also show that migrants do not have to participate in the labor market to smooth the informal barriers to trade. However, when migrants, and particularly immigrants, participate in the labor market they help to mitigate barriers for the industries in which they are employed. Finally, we also find that more vertically integrated business groups do not have a larger trade-creation effect.

References

Belderbos, R. and Sleuwaegen, L. (1998). "Tariff-jumping DFI and export substitution: Japanese electronics in Europe", *International Journal of Industrial Organization*, **16**, 5, 601-638.

Bernard, A.B., Eaton, J., Jensen, J.B. and Kortum S.S. (2003). "Plants and Productivity in International Trade", *American Economic Review,* **93,** 4, 1268-1290.

Chaney, T. (2008). "Distorted Gravity: the Intensive and Extensive Margins of International Trade", *American Economic Review*, **98**, 4, 1707-1721.

Combes, P.P., Lafourcade, M. and Mayer, T. (2005). "The trade-creating effects of business and social networks: evidence from France", *Journal of International Economics*, **66**, 1, 1-29

Disdier, A. and Head, K. (2008). "The puzzling persistence of the distance effect on bilateral trade", *Review of Economics and Statistics*, **90**, 1, 37-48.

Gould, D.M. (1994). "Immigrant Links to the Home Country: Empirical Implications for the U.S. Bilateral Trade Flows", *Review of Economics and Statistics*, **76**, 2, 302-316.

Head, K. and Ries, J. (1998). "Immigration and Trade Creation: Econometric Evidence from Canada", *Canadian Journal of Economics*, **31**, 1, 47-62.

Head, K. and Ries, J. (2001). "Overseas Investment and Firm Exports", *Review of International Economics*, **9**, 1, 108-122.

Hillberry, R. and Hummels, D. (2008). "Trade responses to geographic frictions: A decomposition using micro-data", *European Economic Review*, **52**, 3, 527-550.

Melitz, M. J. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, **71**, 6, 1695-1725.

Millimet, D.L. and Osang, T. (2007). "Do state borders matter for U.S. intranational trade? The role of history and internal migration", *Canadian Journal of Economics*, **40**, 1, 93-126.

Peri, G. and Requena, F. (2010). "The Trade Creation Effects of Immigrants: Testing the Theory on the Remarkable Case of Spain", *Canadian Journal of Economics*, forthcoming.

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

Rauch, J.E, and Trindade, V. (2002). "Ethnic Chinese Networks in International Trade", *The Review of Economics and Statistics*, **84**, 1, 116-130.

Silva, J. and Tenreyro, S. (2006). "The log of gravity", *Review of Economics and Statistics*, **88**, 4, 641-658.

Table 1. Effect of networks on trade. Aggregated data

	(1)	(2)	(3)
Dependent variable	Total exports	Extensive margin (Number of export transactions)	Intensive margin (value per transaction)
Distance	-0.89***	-0.81***	-0.08***
	(0.06)	(0.06)	(0.02)
Contiguity	0.66***	0.64***	0.02
	(0.07)	(0.07)	(0.04)
Immigrants	0.23**	0.18*	0.04
	(0.08)	(0.07)	(0.03)
Emigrants	0.15*	0.15*	0.01
	(0.07)	(0.06)	(0.03)
Business groups	0.17***	0.17***	0.01
	(0.03)	(0.03)	(0.02)
Nº of obs.	2101	2101	2101
Adj. R-square	0.81	0.84	0.17
Time period	Ave. 2004-2008	Ave. 2004-2008	Ave. 2004-2008

Note: OLS model estimations. All specifications include origin and destination specific dummies. All variables are in logarithms (except for Contiguity). Origin province clustered standard errors in parentheses. *** denotes significance at the 1-percent level, ** significance at the 5-percent level and * significance at the 1-percent level.

Table 2. Impact of networks on inter-regional trade

	Immigrants	Emigrants	Business groups
Average value	1567	1567	190
Aggregated trade			
Elasticity	0.23	0.15	0.17
Trade creation (%)	425	212	149
Extensive margin			
Elasticity	0.18	0.15	0.17
Number of transactions (%)	285	195	142
Intensive margin			
Elasticity	0.02	0.04	0.01
Value per transaction (%)	36	6	3

Note: trade creation computed as given in Eq. (2).

Table 3. Effect of networks on trade with all migrants (Aggregated data)

	(1)	(2)	(3)
Dependent variable	Total exports	Extensive margin (Number of export transactions)	Intensive margin (value per transaction)
Distance	-0.89***	-0.81***	-0.08***
	(0.06)	(0.06)	(0.02)
Contiguity	0.66***	0.63***	0.02
	(0.07)	(0.07)	(0.04)
All immigrants	0.24*	0.18*	0.06
	(0.09)	(0.08)	(0.03)
All emigrants	0.14	0.15*	-0.01
	(0.07)	(0.06)	(0.03)
Business groups	0.17***	0.17***	0.01
	(0.03)	(0.03)	(0.02)
Nº of obs.	2101	2101	2101
Adj. R-square	0.81	0.84	0.17
Time period	Ave. 2004-2008	Ave. 2004-2008	Ave. 2004-2008

Note: OLS model estimations. All specifications include origin and destination specific dummies. All variables are in logarithms (except for Contiguity). Origin province clustered standard errors in parentheses. *** denotes significance at the 1-percent level, ** significance at the 5-percent level and * significance at the 1-percent level.

Table 4. Effect of networks on trade distinguishing by type of principal shareholder (Aggregated data)

	(1)	(2)	(3)
Dependent variable	Total exports	Extensive margin (Number of export transactions)	Intensive margin (value per transaction)
Distance	-0.90***	-0.81***	-0.09***
	(0.06)	(0.06)	(0.02)
Contiguity	0.66***	0.64***	0.03
	(0.08)	(0.07)	(0.04)
Immigrants	0.23**	0.18*	0.04
	(0.08)	(0.07)	(0.03)
Emigrants	0.16*	0.15*	0.01
	(0.07)	(0.06)	(0.03)
Business groups. Holding	0.04	0.04	0.00
	(0.03)	(0.03)	(0.02)
Business groups. Not Holding	0.12***	0.14***	-0.02
	(0.02)	(0.02)	(0.01)
Nº of obs.	2101	2101	2101
Adj. R-square	0.81	0.84	0.17
Time period	Ave. 2004-2008	Ave. 2004-2008	Ave. 2004-2008

Note: OLS model estimations. All specifications include origin and destination specific dummies. All variables are in logarithms (except for Contiguity). Origin province clustered standard errors in parentheses. *** denotes significance at the 1-percent level, ** significance at the 5-percent level and * significance at the 1-percent level.

Table 5. Effect of networks on trade distinguishing by degree of vertical integration in business groups (Aggregated data)

	(1)	(2)	(3)
Dependent variable	Total exports	Extensive margin (Number of export transactions)	Intensive margin (value per transaction)
Distance	-0.92***	-0.83***	-0.09***
	(0.06)	(0.06)	(0.02)
Contiguity	0.67***	0.65***	0.02
	(0.08)	(0.07)	(0.04)
Immigrants	0.25**	0.20**	0.04
	(0.09)	(0.08)	(0.03)
Emigrants	0.18*	0.17**	0.01
	(0.07)	(0.06)	(0.03)
Business groups weighted by vertical integration	0.18***	0.18***	0.00
	(0.04)	(0.04)	(0.02)
Nº of obs.	2101	2101	2101
Adj. R-square	0.81	0.84	0.17
Time period	Ave. 2004-2008	Ave. 2004-2008	Ave. 2004-2008

Note: OLS model estimations. All specifications include origin and destination specific dummies. All variables are in logarithms (except for Contiguity). Origin province clustered standard errors in parentheses. *** denotes significance at the 1-percent level, ** significance at the 5-percent level and * significance at the 1-percent level.

Table 6. Effect of networks on trade. Industry-disaggregated data

	(1)	(2)	(3)
Dependent variable	Total exports	Extensive margin (Number of export transactions)	Intensive margin (value per transaction)
Distance	-0.96***	-0.88***	-0.29***
	(0.06)	(0.05)	(0.03)
Contiguity	0.37***	0.40***	-0.07
	(0.07)	(0.06)	(0.04)
Immigrants	0.18*	0.12	0.06
	(0.07)	(0.06)	(0.04)
Emigrants	0.15*	0.15*	0.05
	(0.07)	(0.06)	(0.04)
Business groups	0.18***	0.23***	0.00
	(0.03)	(0.03)	(0.02)
Nº of obs.	28106	28106	28106
Time period	Ave. 2004-2008	Ave. 2004-2008	Ave. 2004-2008

Note: Poisson Pseudo-Maximum Likelihood model estimations. All specifications include origin, destination and industry specific dummies. All variables are in logarithms (except for Contiguity). Origin province clustered standard errors in parentheses. *** denotes significance at the 1-percent level, ** significance at the 5-percent level and * significance at the 1-percent level.

Table 7. Estimation results with industry-level social and business networks. (Industry-disaggregated data)

	(1)	(2)	(3)
Dependent variable	Total exports	Extensive margin (Number of export transactions)	Intensive margin (value per transaction)
Distance	-0.87***	-0.83***	-0.30***
	(0.06)	(0.06)	(0.03)
Contiguity	0.18***	0.26***	-0.08
	(0.05)	(0.05)	(0.04)
Industry-immigrants	0.37***	0.32***	0.12***
	(0.04)	(0.04)	(0.02)
Industry-emigrants	0.14***	0.14***	0.01
	(0.03)	(0.03)	(0.01)
Industry business groups	0.19***	0.13***	-0.02
	(0.03)	(0.02)	(0.02)
Nº of obs.	28106	28106	28106
Time period	Ave. 2004-2008	Ave. 2004-2008	Ave. 2004-2008

Note: Poisson Pseudo-Maximum Likelihood model estimations. All specifications include origin, destination and industry specific dummies. All variables are in logarithms (except for Contiguity). Origin province clustered standard errors in parentheses. *** denotes significance at the 1-percent level, ** significance at the 5-percent level and * significance at the 1-percent level.