

Do industries' average firm size, productivity and skill-intensity explain the border effect?

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Abstract

In this paper we analyse whether industries' average firm size, apparent labour productivity and skill content of the labour force influence the border effect. We show that a country has a lower border effect in those industries that are characterised by a larger average firm size, by a higher apparent labour productivity and by a more skilled labour force. According to our findings these characteristics can explain more than one third of the differences across country specific industry border effects. These results are robust to the introduction of other variables that may also explain the differences in the border effect across countries and across industries.

JEL classification: F14; F15

Keywords: International trade; Border effect; EU countries; Gravity equation; exports

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* *Acknowledgments: I would like to thank Patricia Canto, Aitor Garmendia, Juanjo Gibaja, Rafael Llorca and Francisco Requena for their helpful comments.

1. Introduction

In a seminal paper, McCallum (1995) showed that Canadian provinces trade 22 more times among themselves than with US states, once differences in distance and economic size were controlled for. McCallum's extraordinary finding motivated a large number of studies in order to confirm this large border effect and to explain its likely causes.

A conclusion that is drawn from those studies is that there are large differences in the border effect across countries and across industries. Authors put forward different reasons to account for those differences. For countries, Anderson and van Wincoop (2003) point out that high GDP countries have a smaller border effect than low GDP countries; these authors show that as small countries are more open to trade, the introduction of a trade barrier leads, in relative terms, to a higher reduction in international trade and to a larger increase in intra-national trade in small countries, leading to a higher border effect. Helliwell (1997) and Nitsch (2000) show, as well, that high GDP per capita countries report smaller border effects than low GDP per capita countries; as explained by Baldwin (1994) and Frankel and Wei (1995), a country's specialisation level increases as they become richer, which leads to more international trade and to a smaller border effect. Other studies, such as Evans (2003), show that a larger number of links among a country's citizens (national networks) and a higher level of trust among them (social capital) facilitate domestic trade and, hence, could lead to a higher border effect. Different factors, as well, can explain the variation of the border effect across industries. For example, Rauch (1999) argues that it is more costly to obtain information on differentiated products and, hence, such goods show larger border effects. Head and Mayer (2000) and Chen (2003) point out that differences in non-tariff barriers and technical barriers to trade across industries may explain the variation in border effects. Hillberry (1999), Hillberry and Hummels (2002) and Wolf (2000) stress that border effects may arise endogenously, if firms reap advantages from clustering. Finally, Evans (2003) shows that differences in the elasticity of substitution may also explain the variation in the border effect across industries.

In this paper we argue that firms' characteristics, which vary across countries and across industries, can also explain the border effect. Previous studies have shown that certain properties, such as the average size, the level of productivity and the skill content of the labour force determine firms' entry into international markets (Aitken et al., 1997; Bernard

and Jensen, 1997, 1999 and 2004; Roberts and Tybout, 1997; Bernard and Wagner, 2001)¹. In particular, those studies show that larger, more productive and more skill-intensive firms have less difficulties to cope with exports' sunk costs and to break into foreign markets. Our intuition is that if larger, more productive and more skill intensive firms can break more easily into international markets, they will have a higher preference to deal with foreign firms and, hence, their "firm-level" border effect will be lower. If this intuition is correct, we would expect a lower border effect for larger, more productive and more skill-intensive firms. In order to test this hypothesis, ideally, we would like to have firm level data on size, apparent labour productivity and skill content of the labour force for a large sample of countries. Since we do not have firm level data, we use European Union (EU) countries' industry level-data for our analysis. The contribution of this paper is, therefore, to analyse whether industries' average size of firms, apparent labour productivity and the skill content of the labour force influence the border effect. As data on these variables vary across countries and industries, we also study to what extent they can explain the differences across country specific industry border effects.

The remainder of the paper proceeds as follows. Section 2 presents the model we apply in the empirical analysis. Section 3 explains the data we use in the study. Section 4 discusses the results of the regression analyses. Finally, Section 5 presents the main conclusions of our research.

2. The Model

In order to estimate the influence of industries' characteristics on the border effect we use the following gravity model:

$$\ln X_{ij,k} = \beta_1 + \beta_2 \ln Y_{i,k} + \beta_3 \ln Y_j + \beta_4 D_{ij} + \beta_5 Border + \beta_6 Lang + \beta_7 adj + \beta_8 P_i^{xk} + \beta_9 P_j^{mk} + \sum_a \varphi_a (Border \times \alpha_{i,k}^a) + \varepsilon_{ij,k} \quad (1)$$

¹ Some of these studies show, as well, that the structure of ownership and the age of the plant may also play a role in firms' decision to export.

$X_{ij,k}$ indicates i country's exports of industry k to country j ; $Y_{i,k}$ denotes i country's production in industry k and Y_j the importing country's GDP. D_{ij} denotes the distance between country i and country j . $Border$ is a dummy variable which takes the value of one if i and j belong to the same country and zero otherwise; $Lang$ is a dummy variable which takes the value of one if country i and country j speak the same language and zero otherwise; finally, Adj is another dummy variable which takes the value of one when country i and country j are adjacent and zero otherwise. As explained in Anderson and van Wincoop (2003), the gravity equation should control for differences in product prices in the exporting and the importing country. In order to control for these differences in prices, and other country-specific idiosyncrasies, following previous studies (Hummels, 1999; Rose and van Wincoop, 2001; Feenstra, 2002), we include industry-specific origin and destination fixed effects in the gravity equation (P_i^{xk} and P_j^{mk})

In order to analyse the effect of industries' average firm size, apparent labour productivity and skill intensity on the border effect, following Evans (2003) and Chen (2004), we introduce an interaction term between the border dummy variable and the exporting country's industry's characteristic ($\alpha_{i,k}^a$) in the gravity equation. The sign of the interaction term, ϕ_a , informs us whether the industrial characteristic increases or reduces the border effect.

3. Data

Most of the data we use in the empirical analysis are obtained in the Eurostat's database (<http://epp.eurostat.ec.eu.int>). The Annual detailed enterprise statistics on industry and construction database offers different indicators in the NACE classification for EU countries. From this database we extract data on industries' turnover, number of firms per industry, average number of employees per industry, apparent labour productivity (value added per employee) and labour costs per employee. We proxy the average size of firms dividing the number of employees by the amount of firms; on the other hand, we proxy industries' average skill intensity by the labour cost per employee.

In order to increase the amount of observations in our sample, we transform current values into constant values. For turnover and value added per employee we use output price data as

deflator. When available, we use total output price data, which is a weighted average of the price of the purchases done by residents in the country and by non residents in the country. When this deflator is not available, we use the domestic price index, which only takes into account the prices of the purchases done by residents in the country. We use the consumer price index to deflate the labour cost per employee data.

Countries' GDP and GDP per capita data, in constant prices, are also obtained from Eurostat's database (National Accounts database). Distances between countries are taken from Chen (2004). Trade data are obtained in Eurostat's external trade database. Trade data follows the 2002 Harmonised System (HS2002) classification. In order to match this classification with the NACE industrial classification, we establish a correspondence in three steps. First, we match the HS2002 classification with the CPC1.1 classification. Then, we match the CPC 1.1 classification with the ISIC Rev. 3.1 classification, and finally, the ISIC Rev. 3.1 classification is matched with the NACE classification. These correspondences were obtained in the United Nations Statistical Division web page: <http://unstats.un.org/unsd/cr/registry/regdnld.asp?Lg=1>. In order to transform current export values into constant export values, when available, we use the non-domestic price index, which averages the prices of the purchases done by non residents in the country. If this deflator was not available we use the total price index, and if this latter deflator was not available either we use the domestic price index.

Finally, as we do not have real data on the amount of intra-national trade, as previous studies (Wei, 1996; Nitsch, 2000; Evans, 2003; Chen, 2004), we calculate intra-national trade as the difference between turnover and total exports. In fact, we have to stress that previous studies calculate intra-national trade as the difference between production and exports. We prefer to use the turnover value, because exports can be sourced from current production or from production that was stocked in previous years.

With these data we obtain a balanced sample of seven EU countries and twelve industries for the 1999-2003 period². The countries are Austria, Denmark, Finland, Germany, Italy, Spain and the United Kingdom; the industries are: Textiles, Wearing apparel, Wood and wood

² In fact, in order to achieve a balanced sample we had to estimate the average size of firms and the apparent labour productivity for Other non-metallic mineral products for the UK in 1999. These figures were obtained as the simple average of the 1998 and the 2000 figures.

products, Paper and paper products, Publishing and printing, Chemicals, Rubber and plastic products, Other non-metallic mineral products, Manufacture of basic metals, Fabricated metal products, Machinery and equipment and Electrical machinery. The amount of domestic trade observations is 7 countries x 5 years x 12 industries = 420; the amount of international trade observations is 7 countries x 6 partners x 12 industries x 5 years = 2520. Hence, the sample covers the total amount of 2940 observations.

4. Results of the empirical analyses

We use equation (1) to analyse whether a larger average size of firms, a higher apparent productivity and a more skill intensive labour force depress the border effect³. It should be noted that industries' characteristics are introduced one by one in the regression equation, due to the very high correlation among them.

Table 1 (columns 1-3) presents the results of the analyses. As can be seen in the table, the interaction coefficients for the average size of firms, apparent labour productivity and labour cost per employee are negative and statistically significant. These results confirm our theoretical expectation: a country will have a lower border effect in those industries that are characterised by a larger firm size, a higher apparent productivity and a more skilled labour force.

However, the coefficients of some of the remaining variables are at odds with the results obtained by previous studies. Firstly, exporter turnover and importer GDP coefficients have the correct sign but their values are strange: exporter turnover's coefficient is lower than in previous studies and importer GDP's coefficient is much larger than in previous studies; secondly, adjacency's coefficient has the negative sign and is statistically significant. The reason of these odd results seems to be related with the use of industry-specific origin and destination fixed effects in the model. When we drop these control variables (Columns 4-6), all coefficients have the correct sign and report values that are in line with those obtained by previous studies. We have to stress that the interaction coefficients for the average size of

³ In order to take into account the differences in transport costs across industries we interact the distance coefficient with industries' dummies.

firms, apparent labour productivity and labour costs remain negative and statistically significant when we remove the industry-specific origin and destination fixed effects.

As the removal of the fixed effects yield estimates that are more in line with previous studies, for the remaining empirical analyses will present the value of coefficients estimated without fixed effects. In any case, the conclusions of these empirical analyses do not change if fixed effects are introduced.

To what extent differences in industries' characteristics alter the border effect? In order to answer this question we calculate for each industrial characteristic, based on the border and the interaction term coefficients presented in Table 1 (Columns 4-6) and the samples' values, the average value border effect, the one-standard deviation value (up and down) border effect, the minimum value border effect and the maximum value border effect. As can be seen in Table 2, differences in industries' characteristics can produce substantial shifts in the border effect. For example, a one standard deviation increase in the value of the average size of firms lowers the border effect by 15 per cent; a one standard deviation increase in the apparent labour productivity lowers the border effect by 16% and by 20% in the case of the labour cost per employee. For the three characteristics, there are very large differences between the border effects calculated with the maximum and the minimum value.

In order to test the robustness of our results, we introduce in the regression equation other variables that may also influence the border effect. Firstly, we introduce the variables that may contribute to the differences in the border effect across countries: exporter country's GDP, GDP per capita, national networks and social capital. Following Evans (2003), the density of national networks is proxied with the density of national transport networks (railroad and roadways kilometres per thousand of population) and the density of national informal networks (percentage of the population that belongs to a social, religious, sports or another kind of voluntary organisation)⁴; social capital is proxied with an indicator of trust⁵. Secondly, we introduce the variables that may contribute to differences in the border effect across industries. We proxy the spatial clustering of firms with the Ellison and Glaeser (1997) Table 3's percentage of four-digit sub-industries that fall in the not very localised range. In

⁴ Infrastructure data are obtained from CIA's Word Factbook, 2007 and informal network data from the World Values Survey, 1999-2004 Wave.

⁵ Trust is measured by the percentage of people that answers Yes to the question of whether most people can be trusted. These data are obtained from the World Values Survey, 1999-2004 Wave.

order to determine industries' differentiation level we use the Rauch (1999) index; this index distinguishes between differentiated products, reference priced products and homogeneous goods in the four digit STIC classification. We match this classification with the NACE classification we use in our study. In order to determine the categorisation that corresponds to our 2 digit NACE industries, we analyse how many sub-industries are classified as differentiated, referenced price and homogeneous in Rauch's liberal index; we choose the classification that has the largest number of sub-industries. When we perform this process there are no industries in our sample that fall into the homogenous group. Data on the level of non-tariff barriers across industries are obtained from European Commission (1997); we calculate NACE 2 digit industries' non-tariff barriers as a simple average of sub-industries non-tariff barriers⁶.

Table 3a, 3b and 3c present the results of the robustness checks for the average size of firms, apparent labour productivity and labour cost per employee respectively. As can be seen in the tables, industries' characteristics interaction coefficients are robust to the introduction of other variables that may also influence the border effect. When we introduce the control variables in the regression equation one by one most of the interaction coefficients have the correct sign and are statistically significant. As expected, the interaction coefficients for GDP and GDP per capita are negative, denoting that larger and richer countries have a lower border effect. The interaction coefficients for the density of national networks (railroad, roadway and informal) and social capital (trust) are positive; these coefficients confirm that more integrated countries facilitate intra-national trade, leading to a larger border effect. The interaction coefficient for the spatial clustering of firms is negative: the higher the index of spatial dispersion the lower the border effect; this result supports the argument that the border effect may arise endogenously due to firm clustering. Contrary to expectations, the interaction coefficient for differentiated products, those that involve larger information costs, is not larger than the interaction coefficient for price referenced products. Finally, and contrary to expectations as well, the interaction coefficient for non-tariff barriers is negative and statistically significant; according to this result, industries that are affected by higher non-

⁶ We do not control for differences in technical barriers to trade across industries. The source of these data is a report published by the European Commission in 1998 (European Commission, 1998). In this report 13 products were selected to analyse the persistence of technical barriers to trade in the European Union. These products were defined at the 3 digit NACE classification; due to the small size of the sample and the disaggregation level of the selected products it was not possible to extrapolate the results of the study to the 2 digit NACE classification we use in this paper. On the other hand, as explained in Chen (2004), we cannot estimate the influence of the elasticity of substitution either because we do not have a component of trade costs, such as tariffs, that is observable.

tariff barriers have lower border effects. When we introduce all control variables in the regression some of the interaction coefficients lose the correct sign and become statistically not significant.

Following previous studies (Hillberry, 1999; Head and Mayer, 2000; Chen, 2004), we perform an additional robustness check regressing the country specific industry border coefficients against the variables that may influence the border effect. The 84 country specific border coefficients (7 countries x 12 industries) are estimated with a modified version of equation (1). On the one hand, we introduce a border dummy variable for each (country, industry) pair and industry specific distance interaction terms; on the other hand, we remove the fixed effects⁷.

Table 4a-4c present the results of the robustness check. As can be seen in the tables, in all cases, the average size of firms, apparent labour productivity and labour cost per employee coefficients are negative and statistically significant. On the other hand, the regression analyses show that differences in the average size of firms explain around 20 per cent of the variation in country specific industry border effects; differences in apparent labour productivity explain 24 per cent of the variation and, finally, labour cost per employee explains 37 per cent of the variation.

5. Conclusions

In this paper we analyse whether industries' characteristics such as the average size of firms, apparent labour productivity and the skill content of the labour force may influence the border effect. We test this hypothesis with a sample of seven EU countries and 12 industries and find that a country has a lower border effect in those industries that are characterised by a larger firm size, by a higher apparent labour productivity and by a more skilled labour force. We also show that these characteristics can explain more than one third of the differences across country specific industry border effects. These results are robust to the introduction of other variables that may also explain the border effect.

⁷ As the significance level of the 84 country specific industry specific border effects are almost equal, we do not need to use, as in Head and Mayer (2000) and Chen (2004), weighted least squares in the robustness check regressions.

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Table 1. Border effects interacted with industries' characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Log Exporter Turnover	0.50 (2.84)a	0.54 (3.06)a	0.52 (3.03)a	0.77 (59.35)a	0.77 (58.44)a	0.77 (60.16)a
Log Importer GDP	1.98 (2.60)a	1.99 (2.62)a	2.05 (2.73)a	0.83 (54.84)a	0.81 (54.06)a	0.81 (55.09)a
Log Distance	-1.11 (-17.28)a	-1.11 (-18.66)a	-1.12 (-19.00)a	-0.87 (-16.25)a	-0.88 (-16.49)a	-0.95 (-18.13)a
Language	0.91 (16.02)a	0.93 (16.85)a	0.90 (16.69)a	0.97 (16.09)a	0.97 (16.39)a	0.97 (16.41)a
Adjacency	-0.40 (-7.87)a	-0.44 (-8.71)a	-0.45 (-9.16)a	0.08 (1.23)	0.07 (1.17)	0.01 (0.12)
Border	3.44 (17.46)a	8.86 (13.45)a	11.06 (14.85)a	5.35 (20.93)a	10.43 (12.57)a	14.55 (18.77)a
Border x Log Average size of firms	-0.48 (-8.43)a			-0.63 (-7.97)a		
Border x Log Apparent labour productivity		-1.81 (-10.69)a			-1.81 (-8.41)a	
Border x Log Labour cost per employee			-2.54 (-12.42)a			-3.14 (-14.55)a
Fixed-effects	Yes	Yes	Yes	No	No	No
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940	2940
R square	0.96	0.96	0.96	0.90	0.90	0.91

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%.

Table 2. Variations in the border effect

	Average size of firms		Apparent labour productivity		Labour cost per employee	
	Value (employees per firm)	Border effect	Value (000s € per employee)	Border effect	Value (000s € per employee)	Border effect
Average	34.6	3.12	52.0	3.28	37.5	3.17
One standard deviation +	73.9	2.64	70.0	2.74	46.1	2.52
One standard deviation -	-4.7		34.0	4.05	28.9	3.99
Minimum	3.5	4.56	17.7	5.23	16.0	5.84
Maximum	217.6	1.96	134.2	1.56	61.4	1.62

Note: The values are 1999-2003 period's averages. Apparent labour productivity and labour cost per employee are expressed in 2000 constant euros. The border effects are calculated from the border and the interaction term coefficients that appear in Table 1, Columns 3-4.

Table 3a. Regression results with average size of firms and additional independent variables

	(1)	(2)	(3)	(4)	(5)
Log GDP Turnover	0.83 (58.32)a	0.77 (57.80)a	0.81 (61.98)a	0.81 (60.07)a	0.81 (58.39)a
Log GDP importer	0.89 (53.05)a	0.82 (52.63)a	0.87 (57.71)a	0.87 (55.54)a	0.86 (54.12)a
Log Distance	-0.74 (-12.73)a	-0.95 (-16.28)a	-0.85 (-16.06)a	-0.82 (-15.10)a	-0.80 (-14.37)a
Language	0.95 (15.73)a	0.97 (16.09)a	0.95 (15.72)a	0.95 (15.82)a	0.96 (15.87)a
Adjacency	0.19 (2.80)a	0.01 (0.10)	0.09 (1.45)	0.12 (1.86)c	0.13 (2.01)b
Border	10.96 (14.17)a	13.89 (5.96)a	4.70 (19.39)a	4.45 (15.53)a	4.29 (13.71)a
Border * Log Average size of firms	-0.63 (-9.03)a	-0.63 (-9.28)a	-0.73 (-10.80)a	-0.58 (-7.81)a	-0.62 (-8.25)a
Border * Log GDP exporter	-0.41 (-7.37)a				
Border * Log GDP per capita exporter		-0.87 (-3.61)a			
Border * Railway			1.74 (9.26)a		
Border * Roadways				0.07 (6.86)a	
Border * Informal network					0.02 (6.12)a
R-square	0.91	0.90	0.91	0.91	0.91
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 3a (cont.). Regression results with average size of firms and additional independent variables

	(6)	(7)	(8)	(9)	(10)
Log GDP Turnover	0.80 (56.08)a	0.78 (60.69)a	0.78 (59.70)a	0.78 (59.49)a	0.82 (58.37)a
Log GDP importer	0.85 (51.77)a	0.83 (55.44)a	0.83 (54.92)a	0.83 (55.37)a	0.88 (52.29)a
Log Distance	-0.80 (-13.37)a	-0.86 (-16.23)a	-0.88 (-16.46)a	-0.86 (-16.37)a	-0.91 (-14.81)a
Language	0.96 (15.97)a	0.97 (16.40)a	0.97 (16.11)a	0.97 (15.80)a	0.94 (15.68)a
Adjacency	0.14 (2.03)b	0.08 (1.33)	0.06 (0.98)	0.08 (1.20)	0.03 (0.40)
Border	4.79 (15.23)a	6.01 (21.72)a		6.50 (23.23)a	
Border * Log Average size of firms	-0.62 (-8.07)a	-0.57 (-7.76)a	-0.78 (-8.48)a	-0.65 (-8.92)a	-0.75 (-8.33)a
Border * Log GDP exporter					0.74 (2.03)b
Border * Log GDP per capita exporter					2.35 (5.92)a
Border * Railway					0.13 (2.52)b
Border * Roadways					0.00 (0.42)
Border * Informal network					0.02 (0.78)
Border * Trust	0.02 (3.47)				-0.02 (-8.25)a
Border * Spatial concentration		-0.02 (-6.99)a			-5.80 (-0.95)
Border * Differentiated goods			5.65 (20.27)a		-5.38 (-0.88)
Border * Reference priced goods			6.08 (18.51)a		-0.66 (-6.90)a
Border * NTBs				-0.67 (-6.11)a	
R-square	0.90	0.91	0.90	0.91	0.91
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 3b. Regression results with apparent labour productivity and additional independent variables

	(1)	(2)	(3)	(4)	(5)
Log GDP Turnover	0.83 (58.52)a	0.76 (57.23)a	0.80 (61.38)a	0.80 (59.88)a	0.80 (58.61)a
Log GDP importer	0.89 (53.27)a	0.81 (52.33)a	0.86 (57.26)a	0.86 (55.21)a	0.85 (54.13)a
Log Distance	-0.72 (-12.52)a	-0.94 (-16.05)a	-0.86 (-16.41)a	-0.82 (-15.34)a	-0.81 (-14.55)a
Language	0.95 (15.94)a	0.97 (16.38)a	0.95 (15.98)a	0.96 (16.07)a	0.96 (16.16)a
Adjacency	0.20 (3.07)a	0.02 (0.32)	0.08 (1.35)	0.12 (1.83)c	0.13 (1.98)b
Border	18.23 (17.93)a	16.46 (7.74)a	11.11 (16.14)a	9.37 (11.58)a	9.33 (11.01)a
Border * Log Apparent labour productivity	-2.01 (-10.74)a	-1.69 (-7.41)a	-2.29 (-12.77)a	-1.76 (-8.73)a	-1.81 (-8.74)a
Border * Log GDP exporter	-0.51 (-9.56)a				
Border * Log GDP per capita exporter		-0.66 (-2.77)a			
Border * Railway			2.13 (11.61)a		
Border * Roadways				0.08 (8.21)a	
Border * Informal network					0.02 (6.53)a
R-square	0.91	0.90	0.91	0.91	0.91
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 3b (cont.). Regression results with apparent labour productivity and additional independent variables

	(6)	(7)	(8)	(9)	(10)
Log GDP Turnover	0.79 (57.10)a	0.77 (59.31)a	0.77 (58.44)a	0.77 (58.58)a	0.82 (58.60)a
Log GDP importer	0.85 (52.62)a	0.82 (54.57)a	0.81 (53.90)a	0.81 (54.44)a	0.88 (52.44)a
Log Distance	-0.78 (-13.35)a	-0.86 (-16.37)a	-0.89 (-16.62)a	-0.87 (-16.62)a	-0.90 (-14.75)a
Language	0.97 (16.23)a	0.97 (16.59)a	0.97 (16.46)a	0.97 (16.05)a	0.95 (15.70)a
Adjacency	0.15 (2.30)b	0.08 (1.34)	0.06 (1.01)	0.07 (1.09)	0.04 (0.51)
Border	9.97 (12.09)a	9.98 (12.72)a		12.27 (15.52)a	
Border * Log Apparent labour productivity	-1.89 (-9.07)a	-1.54 (-7.47)a	-2.08 (-8.34)a	-1.95 (-9.64)a	-2.21 (-11.71)a
Border * Log GDP exporter					1.40 (4.85)a
Border * Log GDP per capita exporter					
Border * Railway					3.33 (9.34)a
Border * Roadways					0.24 (6.26)a
Border * Informal network					-0.03 (-4.21)a
Border * Trust	0.02 (4.87)				0.07 (4.85)a
Border * Spatial concentration.		-0.01 (-5.00)a			-0.01 (-6.03)a
Border * Differentiated goods			11.35 (12.11)a		-10.61 (-2.19)b
Border * Reference priced goods			11.68 (11.65)a		-10.33 (-2.13)b
Border * NTBs				-0.80 (-7.54)a	-0.80 (-9.12)a
R-square	0.91	0.91	0.90	0.91	0.91
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 3c. Regression results with average size of firms and additional independent variables

	(1)	(2)	(3)	(4)	(5)
Log GDP Turnover	0.82 (59.53)a	0.77 (59.26)a	0.80 (63.04)a	0.81 (58.39)a	0.80 (60.37)a
Log GDP importer	0.88 (53.34)a	0.81 (53.68)a	0.86 (58.31)a	0.86 (54.12)a	0.85 (54.90)a
Log Distance	-0.80 (-14.26)a	-0.94 (-16.23)a	-0.94 (-18.07)a	-0.80 (-14.37)a	-0.88 (-16.25)a
Language	0.95 (15.98)a	0.97 (16.41)a	0.95 (15.98)a	0.96 (15.87)a	0.96 (16.18)a
Adjacency	0.13 (1.98)b	0.02 (0.25)	0.01 (0.18)	0.13 (2.01)b	0.06 (0.98)
Border	21.62 (21.37)a	13.48 (6.61)a	15.50 (23.02)a	13.21 (15.56)a	13.46 (16.75)a
Border * Log Labour cost per employee	-3.29 (-16.05)a	-3.19 (-12.77)a	-3.74 (-19.39)a	-2.93 (-13.02)a	-3.14 (-14.38)a
Border * Log GDP exporter	-0.48 (-9.44)a				
Border * Log GDP per capita exporter		0.12 (0.51)			
Border * Railway			2.18 (13.10)a		
Border * Roadways				0.06 (6.16)a	
Border * Informal network					0.02 (7.19)a
R-square		0.91	0.91	0.91	0.91
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 3c (cont.). Regression results with average size of firms and additional independent variables

	(6)	(7)	(8)	(9)	(10)
Log GDP Turnover	0.79 (58.56)a	0.78 (60.97)a	0.76 (60.18)a	0.77 (60.18)a	0.82 (59.04)a
Log GDP importer	0.85 (53.15)a	0.81 (55.46)a	0.81 (54.99)a	0.81 (55.53)a	0.88 (52.49)a
Log Distance	-0.85 (-14.90)a	-0.93 (-18.00)a	-0.96 (-18.27)a	-0.94 (-18.19)a	-0.90 (-14.73)a
Language	0.96 (16.23)a	0.97 (16.55)a	0.97 (16.46)a	0.97 (16.10)a	0.95 (15.75)a
Adjacency	0.09 (1.37)	0.02 (0.32)	0.00 (-0.03)	0.00 (0.07)	0.04 (0.53)
Border	14.16 (18.27)a	14.00 (19.35)a		15.97 (20.13)a	
Border * Log Labour cost per employee	-3.26 (-15.10)a	-2.87 (-14.28)a	-3.36 (-14.71)a	-3.22 (-14.77)a	-3.62 (-15.48)a
Border * Log GDP exporter					0.00 (-0.02)
Border * Log GDP per capita exporter					
Border * Railway					1.92 (5.83)a
Border * Roadways					0.01 (0.32)
Border * Informal network					0.01 (0.78)
Border * Trust	0.02 (5.56)a				0.00 (0.04)
Border * Spatial concentration.		-0.01 (-3.85)a			-0.01 (-4.61)a
Border * Differentiated goods			15.23 (18.87)a		16.33 (3.33)a
Border * Reference priced goods			15.48 (18.33)a		16.54 (3.37)a
Border * NTBs				-0.71 (-7.26)a	-0.70 (-8.12)a
R-square	0.91	0.91	0.91	0.91	0.92
Time period	1999-2003	1999-2003	1999-2003	1999-2003	1999-2003
Number of observations	2940	2940	2940	2940	2940

Notes: industry-specific distance interaction terms and year coefficients included in all equations (they are not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 4a. Additional robustness check for average size of firms. Dependent variable: estimated country specific industry coefficients

	(1)	(2)	(3)	(4)	(5)	(6)
Log Average size of firms	-0.65 (-3.45)a	-0.66 (-3.93)a	-0.69 (-3.36)a	-0.74 (-4.70)a	-0.61 (-3.49)a	-0.65 (-3.64)a
Log GDP		-0.34 (-3.03)a				
Log GDP per capita			0.32 (0.66)			
Railway				1.74 (3.99)a		
Roadways					0.09 (3.01)a	
Informal network						0.02 (2.75)a
R-square	0.20	0.28	0.21	0.33	0.28	0.27
Number of observations	84	84	84	84	84	84

Notes: average size of firms, apparent labour productivity, labour cost per employee, GDP and GDP per capita values are 1999-2003 period's averages. All regressions are estimated with a constant term (not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 4a (cont.). Additional robustness check for average size of firms. Dependent variable: estimated country specific industry coefficients

	(7)	(8)	(9)	(10)	(11)
Log Average size of firms	-0.65 (-3.56)a	-0.59 (-3.39)a	-0.82 (-3.71)a	-0.67 (-3.85)a	-0.75 (-3.16)a
Log GDP					-7.37 (-0.25)
Log GDP per capita					-7.21 (-0.28)
Railway					-2.91 (-0.15)
Roadways					-1.11 (-0.25)
Informal network.					0.15 (0.28)
Trust	0.02 (1.69)c				-0.31 (-0.26)
Spatial concentration		-0.02 (-3.03)a			-0.02 (-3.46)a
Differentiation			-0.48 (-1.87)c		-0.42 (-1.39)
NTB				-0.67 (-2.71)a	-0.65 (-3.16)a
R-square	0.23	0.29	0.22	0.26	0.55
Number of observations	84	84	84	84	84

Notes: average size of firms, apparent labour productivity, labour cost per employee, GDP and GDP per capita values are 1999-2003 period's averages. All regressions are estimated with a constant term (not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 4b. Additional robustness check for apparent labour productivity. Dependent variable: estimated country specific industry coefficients

	(1)	(2)	(3)	(4)	(5)	(6)
Log Apparent labour productivity	-1.86 (-3.67)a	-2.11 (-4.70)a	-1.97 (-3.60)a	-2.37 (-5.70)a	-1.86 (-3.96)a	-1.90 (-3.93)a
Log GDP		-0.45 (-4.16)a				
Log GDP per capita			0.38 (0.85)			
Railway				2.18 (5.28)a		
Roadways					0.08 (3.83)a	
Informal network						0.02 (3.06)a
R-square	0.23	0.37	0.24	0.43	0.34	0.32
Number of observations	84	84	84	84	84	84

Notes: average size of firms, apparent labour productivity, labour cost per employee, GDP and GDP per capita values are 1999-2003 period's averages. All regressions are estimated with a constant term (not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 4b (cont.). Additional robustness check for apparent labour productivity. Dependent variable: estimated country specific industry coefficients

	(7)	(8)	(9)	(10)	(11)
Log Apparent labour productivity	-1.99 (-4.03)a	-1.58 (-3.29)a	-2.17 (-3.66)a	-2.00 (-4.20)a	-2.28 (-5.05)a
Log GDP					-19.67 (-0.76)
Log GDP per capita					-18.45 (-0.82)
Railway					-10.43 (-0.61)
Roadways					-2.98 (-0.75)
Informal network					0.34 (0.75)
Trust	0.02 (2.35)b				-0.78 (-0.74)
Spatial concentration		-0.02 (-2.16)b			-0.01 (-2.73)a
Differentiation			-0.37 (-1.30)		-0.32 (-1.47)
NTB				-0.81 (-3.41)a	-0.80 (-4.38)a
R-square	0.29	0.27	0.25	0.31	0.62
Number of observations	84	84	84	84	84

Notes: average size of firms, apparent labour productivity, labour cost per employee, GDP and GDP per capita values are 1999-2003 period's averages. All regressions are estimated with a constant term (not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 4c. Additional robustness check for labour cost per employee. Dependent variable: estimated country specific industry coefficients

	(1)	(2)	(3)	(4)	(5)	(6)
Log Labour cost per employee	-3.20 (-6.36)a	-3.04 (-5.94)a	-3.99 (-6.79)a	-3.83 (-8.79)a	-3.04 (-5.94)a	-3.27 (-6.03)a
Log GDP		-0.44 (-4.44)a				
Log GDP per capita			1.40 (2.97)a			
Railway				2.23 (6.03)a		
Roadways					0.07 (3.20)a	
Informal network						0.02 (3.57)a
R-square	0.37	0.50	0.43	0.58	0.44	0.46
Number of observations	84	84	84	84	84	84

Notes: average size of firms, apparent labour productivity, labour cost per employee, GDP and GDP per capita values are 1999-2003 period's averages. All regressions are estimated with a constant term (not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.

Table 4c (cont.). Additional robustness check for labour cost per employee. Dependent variable: estimated country specific industry coefficients

	(7)	(8)	(9)	(10)	(11)
Log Labour cost per employee	-3.40 (-6.78)a	-2.91 (-6.24)a	-3.43 (-6.48)a	-3.27 (-6.44)a	-3.73 (-6.71)a
Log GDP					-30.93 (-1.39)
Log GDP per capita					-26.92 (-1.39)
Railway					-18.35 (-1.25)
Roadways					-4.71 (-1.38)
Informal network					0.55 (1.41)
Trust	0.03 (2.90)a				-1.26 (-1.39)
Spatial concentration		-0.01 (-1.63)			-0.01 (-2.01)b
Differentiation.			-0.26 (-1.14)		-0.23 (-0.45)
NTB				-0.71 (-3.33)a	-0.70 (-3.89)a
R-square	0.44	0.39	0.38	0.43	0.67
Number of observations	84	84	84	84	84

Notes: average size of firms, apparent labour productivity, labour cost per employee, GDP and GDP per capita values are 1999-2003 period's averages. All regressions are estimated with a constant term (not reported). Robust t-statistics in parentheses. a) statistically significant at 1%; b) statistically significant at 5%; c) statistically significant at 10%.