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## Institutions, trade policy and trade flows

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## World Trade Organization

Economic Research and Statistics Division

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### Institutions, trade policy and trade flows

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## INSTITUTIONS, TRADE POLICY AND TRADE FLOWS

*Marion Jansen and Hildegunn Kyvik Nordås \**

### **Abstract**

This paper analyses to which extent domestic institutions affect trade flows. We use two complementary approaches, one focusing on the size of total trade flows and one focusing on bilateral trade patterns (gravity equation). Besides, we control for two other domestic policy variables: trade policy and domestic infrastructure. We find that the quality of institutions has a positive and significant impact on a country's level of openness. Domestic tariffs have no statistically significant impact on their own, but do affect total trade flows when combined with good institutions. Domestic institutions also have a positive and significant impact on bilateral trade flows, but the parameter of our institution variables is reduced by almost a half and may turn insignificant when the quality of domestic infrastructure is included in the regression.

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## I. INTRODUCTION

International trade involves contracts between parties operating in different jurisdictions, different institutional environments, different currencies and often speaking different languages. In addition the contracting parties are often located far from each other. The decision to export or to import therefore involves a large number of uncertainties. It takes, for instance, time to ship goods from one place to the other and it is uncertain to which extent the quality and quantity of the shipment upon arrival corresponds to the one upon departure. The time factor also implies that the signing of the contract does not necessarily take place at the same time as the payment involved. An exporter may, for instance, send goods abroad that will only be paid for upon delivery. The exporter thus has to pay for production and transport costs in advance and runs a certain risk that the expected payment will not be made. Needless to say, these uncertainties and the resources involved in negotiating and enforcing contracts amount to considerable transaction costs that invariably affect the volume of trade. Since countries differ as far as enforcement of contracts is concerned and they have different institutional structures, one would also expect that transaction costs related to trade differ between trading partners. This paper investigates these two questions empirically: to what extent does institutional quality affect the total volume of trade? And to what extent does institutional quality affect the direction of trade? In addition we analyse how the quality of institutions affects the trade response to trade liberalization.

The second of these questions has been addressed in several papers recently (Anderson and Marcouiller, 2002; de Groot et al. 2004), but the two other questions have to our knowledge not been addressed in the literature. Given the emphasis on the quality of institutions as a determinant of international trade as well as economic development, it is perhaps surprising that trade policy and the quality of institutions have not been brought together in the empirical literature. The objective of this paper is, therefore, first to analyse to which extent the quality of institutions affects a country's integration in global trade flows and second to analyse how the trade response to trade liberalization is affected by the quality of institutions. Our approach also allows us to study which aspects of institutional quality are the most important determinants of trade performance following trade liberalization.

We will also argue in this paper that recent literature on the impact of institutions on bilateral trade flows is likely to suffer from omitted variable bias. Although the average tariff rate on industrial products now stands below 5 per cent, there are both national and international tariff peaks resulting

in quite large differences in bilateral average applied tariff rates. Using the gravity model for estimating the determinants of bilateral trade without including bilateral tariffs in the equation may therefore lead to omitted variable bias. This paper contributes to the empirical trade literature by including relative bilateral tariffs in gravity model estimates, and thus avoiding this source of omitted variable bias. Another variable that is likely to affect bilateral trade flows and that has so far been neglected by the relevant empirical literature focusing on institutions is the quality of domestic infrastructure. In addition to bilateral tariff data we therefore include measures for the quality of infrastructure in our gravity estimation in order to control for this additional determinant of transaction costs.

The paper proceeds as follows. Section II gives an overview of the related literature and is followed, in Section III, by a discussion of the data used in this paper. Section IV presents the results of our empirical estimates. That Section is divided in two parts: Section IV.A focuses on the determinants of a country's overall level of openness, while Section IV.B focuses on the determinants of bilateral trade patterns. Section V concludes.

## **II. DISCUSSION OF RELATED LITERATURE**

Trade as a share of world GDP has increased from 25 per cent in 1960 to 58 per cent in 2001 (WDI, 2003). This reflects deeper international specialization, which has probably led to an increase in the number of international transactions per dollar of world GDP. The increased number of transactions per unit of world GDP has coincided with a reduction in transaction costs. Tariffs have come down substantially since the 1960s, and the same goes for international transport costs. Both phenomena are supposed to have contributed to the observed global increase in trade.

However, not all countries have experienced the same growth in trade and the impression may arise that the elasticity of trade flows with respect to changes in tariffs differs across countries. One possible explanation for this phenomenon would be that tariff reductions increase trade flows only to the extent that other domestic factors create an environment that is favourable for trade. Another explanation is that in the relevant countries transaction costs other than those related to tariffs and international transport costs have remained high. Recent economic literature has emphasised the role of domestic institutions in this respect. Institutions set the rules for the interaction between private

actors and for the interaction between public and private actors.<sup>1</sup> Well functioning institutions therefore reduce the level of uncertainty inherent to this interaction and as a result reduce transaction costs. High quality institutions are therefore expected to have a positive effect on economic activity in general and on international trade in particular.

Inefficient institutions, in contrast, can lead to serious obstacles for trade. Bigsten et al. (2000), for instance, describe how the absence of an efficient legal system hinders interaction between manufacturing firms in a number of African countries and potential foreign importers. The authors examine the contractual practices of African manufacturing firms using survey data collected in Burundi, Cameroon, Côte d'Ivoire, Kenya, Zambia and Zimbabwe. It is shown that contractual flexibility is pervasive and that it is a rational response to risk: the riskier the environment, the higher the incidence of contract non-performance, and the higher the probability of renegotiation of a contract. Complete contract breaches and the use of lawyers and courts to enforce the original contract are rare, simply because of the absence of an efficient legal system. Instead, suppliers and clients fulfil their contracts but in a "flexible" way: supplies occasionally arrive late or their quality is different from what was ordered, and clients sometimes pay late. In their dealings with African firms, trading partners are often taken by surprise by contractual delays and calls for contractual renegotiation. Those who are used to functioning in a very different environment may find it hard to understand that the somewhat unpredictable behaviour of African firms in such cases is a rational response to an inefficient system. This may explain why foreign firms find it difficult to deal with African partners and why African manufacturers have a hard time breaking into export markets.

Domestic institutions, both in the home and the foreign country, can thus be expected to affect a country's choice of trading partners and, as a consequence, the overall pattern of bilateral trade. At the same time we would expect domestic institutions to affect a country's overall level of openness, in the sense that countries with better institutions trade more. Inefficient institutions represent a cost factor for domestic exporters and thus lower their international competitiveness with negative repercussions on export flows. Transaction costs due to inefficient institutions also raise the final consumer price of imported goods with negative repercussions on a country's import flows. Last but not least we would expect that institutions affect the effectiveness of trade policy. Even if a country lowers its trade barriers, outsiders may be reluctant to trade with that country if, for instance, they do not believe contracts can be enforced or are not sure whether payments will be made. The three different hypotheses will be tested in this paper.

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<sup>1</sup> See North (1990) for a definition of institutions and a description of the way in which they affect economic activities.

Much of the existing empirical literature on countries' overall propensity to trade has focused on the geographical determinants of trade. They are likely to affect the transaction costs a country faces in terms of international transport costs. It is standard to include dummies for islands and landlocked countries in OLS regressions explaining openness, as both types of countries are expected to face higher international transport costs (e.g. Frankel and Rose, 2000 and Wei, 2000). A country's distance to its trading partners also has a negative effect on its propensity to trade and it is a standard result that measures of "remoteness" have a negative and significant effect on openness (e.g. Rodrik, 1998; Frankel and Rose, 2000 and Wei, 2000).<sup>2</sup> The measures for remoteness used in the literature are, however, likely to mainly reflect international transport costs and to ignore the effect of domestic infrastructure on transport costs. If, for instance, the geographical distance between capitals is used as a measure for remoteness, the internal part of transport costs is captured by the distance between the country's border and its capital. The capital may however not correspond to the place of final consumption of the relevant goods. Besides the quality of a country's infrastructure is not taken into account at all in this measure.

The quality of domestic infrastructure is, however, likely to have an important impact on a country's propensity to trade. In this respect the study by Minten and Kyle (1999) on transport costs in the region surrounding Kinshasa (Republic of Congo) is quite illuminating as it gives us an idea of the dimensions involved. Small-scale farmers in the Kinshasa region trade their surplus output in Kinshasa. The region is characterized by large distances between villages and roads are often of poor quality. As a result a 300 km journey by road will take around 4 days and transport costs account for as much as 30 per cent of the wholesale price for goods transported by road and sold in Kinshasa. These 30 per cent are likely to have a significantly negative effect on the possibilities of Congolese farmers to compete in international markets.

This paper will include both, measures for international and measures for domestic transport costs in its empirical analysis and will thus allow us to conclude to which extent domestic infrastructure has an impact on countries' overall level of openness. In particular we include latitude (a country's distance from the equator) and dummies for islands and landlocked countries in our OLS regressions

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<sup>2</sup> Few papers have used direct measures for transport costs as in the case of Baier and Bergstrand (2001). They also include tariffs in their regressions and find that income growth accounted for 67 per cent of trade growth among 16 OECD countries during the period 1958-1988, tariff reductions accounted for 25 per cent and transport cost reductions 8 per cent. As a measure for transport costs they use c.i.f./f.o.b ratios from the IMF's International Financial Statistics, a measure that has been criticized in the literature for its low quality (Hummels, 2001). It should be noted that the IMF has in the meantime stopped publishing the relevant data.

in order to capture international transport costs. In addition we include measures for the quality of domestic infrastructure to capture the role of domestic transaction costs for international trade.

A country's size is also likely to affect openness, independent on whether it is measured by population, land mass or GDP. This is due to the fact that small size limits the country's possibilities to diversify production. Smaller economies therefore rely to a larger extent on imports to satisfy their domestic demand than their larger counterparts.<sup>3</sup> Country size has indeed systematically been found to have a significantly negative impact on openness (e.g. Rodrik, 1998; Frankel and Rose, 2000 and Wei, 2000).

For a long time the literature also considered it to be a statistical regularity that the elasticity of trade with respect to output is larger than unity, i.e. that richer countries trade more. Frankel and Rose (2000) point out that some of this can be attributed to the tendency of countries to reduce tariffs as they become richer. In their regressions the coefficient on income per capita falls by half when a measure of tariff duties is included in the regression. Recent findings of the empirical literature on bilateral trade flows suggest that the finding of a significantly positive effect of GDP per capita on trade is entirely due to the omission of variables capturing domestic transaction costs.<sup>4</sup> When including measures for institutional quality and trade policy in gravity equations the effect of GDP per capita on trade becomes either insignificant or turns negative.<sup>5</sup>

This paper contributes to the existing literature in that it introduces measures for the quality of domestic institutions into an OLS regression explaining countries' levels of openness, while at the same time controlling for the impact of trade policy and domestic infrastructure. This allows us to analyse to which extent each of the three domestic policy variables contributes to a country's integration in world markets. Besides, we allow in one of our specifications for the interaction between trade policy and institutions to check the hypothesis that trade liberalization has a larger effect on trade in countries with an appropriate institutional set-up.

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<sup>3</sup> See for instance Commonwealth Secretariat and World Bank (2000) and Easterly and Kraay (2000) for the particularities of small economies.

<sup>4</sup> As shown by Hummels (2001) and Andersen and Wincoop (2003b), tariffs constitute only a fraction of trade costs, and they are often not even the largest. Transport costs and other transaction costs related to finding a trade partner, entering and enforcing contracts between trading partners are found to be significantly higher than tariffs when tariff equivalents are calculated.

<sup>5</sup> See for instance Anderson and Marcouiller (2002), de Groot et al. (2003) and de Groot et al. (2004). The theoretical gravity model presented in Anderson and van Wincoop (2003a) predicts that the income elasticity of imports is equal to one, which corresponds to our findings when we include institutions, infrastructure and bilateral tariffs in our gravity regressions.



The workhorse model for empirical work on trade flows has so far been the gravity equation. It explains the geographical distribution of trade for given production and expenditure patterns. The gravity equation is therefore not an appropriate tool to analyse the effect of our three policy measures on a country's overall propensity to trade. Instead the gravity approach should be seen as a complement to the OLS analysis described in the previous paragraphs, in that the first allows us to analyse to which extent the three domestic policy measures determine countries' choice of trading partners.

The gravity equation explains bilateral trade as a function of the trading partners' market size and bilateral trade costs. Different specifications of the gravity equation have been tested in the empirical literature and several of them control for institutional quality, the quality of infrastructure and/or trade policy. This paper, however, constitutes the first attempt to include all three policy induced trade costs together in the regression.

Our focus in this paper is on the role of domestic institutions. The effect of institutional factors on bilateral trade flows has in the past typically been captured by variables reflecting a shared historical, political and cultural background. The measures that have been most commonly used for this purpose are dummies that indicate the presence of a common language, a common dominant religion and/or a common colonial history. The three variables are likely to be related and each of them is in its own way likely to affect international transaction costs. A common language facilitates communication in personal contact. The same may be true for a common religion and the latter may besides increase mutual trust and thus reduce the perceived risk of transactions. A common colonial history has been considered to increase the similarity between countries' institutions and through this channel affect international transaction costs.

A number of recent empirical papers have used more sophisticated measures for institutional quality in gravity equations. Anderson and Marcouiller (2002) use survey data from businessmen by the World Economic Forum on contractual enforcement and corruption as an index of institutional quality. They find that lower institutional quality has a substantially negative effect on trade. They include measures for tariff and non-tariff barriers in their regression, but contrary to the data used in this paper, their measures are not bilateral. Rauch and Trindade (2002) focus on the role of transnational networks for trade. Such networks can be considered to represent informal institutions that can either take the function of missing formal institutions or complement existing formal institutions. It has been shown in the literature that networks of traders can play an important role when it comes

to contract enforcement in international trade.<sup>6</sup> They can also reduce transaction costs through the reduction of information costs. Rauch and Trindade (2002) find that the presence of ethnic Chinese networks has an important positive impact on bilateral trade and that this impact is larger for differentiated than for homogeneous products. The latter result can be explained by the fact that information costs are more important in the case of differentiated goods. De Groot et al. (2004) use the measure for institutional quality used in this paper to analyse the effect of institutions on bilateral trade flows. They find that a better quality of formal institutions tends to coincide with more trade. They also find that similarity between trading partners in the quality of their institutions promotes trade. Their paper only includes a dummy for regional trade agreements to control for trade barriers. None of the papers discussed in this paragraph controls for domestic infrastructure.

We include in our gravity regressions bilateral tariff data in order to capture the effect of trade policy on bilateral trade. In line with the approach taken in our OLS regressions we also introduce measures for international and for domestic transport costs into our regressions. International transport costs are captured by the geographical distance between countries and by a border dummy.<sup>7</sup> The quality of domestic infrastructure is captured by an aggregate index including the quality of roads, telecommunications, ports, airports and railways. Our approach is therefore related to the one taken in Limão and Venables (1999), a paper that focuses on the role of transport costs for bilateral trade and does not control for the impact of trade policy and institutions.<sup>8</sup>

### III. DATA

Economic literature, in particularly growth literature, has recently increased its interest in the role of institutions for the functioning of markets.<sup>9</sup> The notion of an institution embodies several elements – formal and informal rules of behaviour, ways and means of enforcing these rules, procedures for

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<sup>6</sup> See for instance Greif (1993) on the role of coalitions between traders that governed agency relations among the Maghribi traders in the Mediterranean in the 11<sup>th</sup> century.

<sup>7</sup> Trade between adjacent countries is expected to be characterized by lower transaction costs.

<sup>8</sup> To measure the impact of domestic infrastructure Limão and Venables (1999) include both an infrastructure variable for each trading partner and for the countries that each trading partner has to transit. Their infrastructure measure is constructed as an average of the density of the road network, the paved road network, the rail network, and the number of telephones per person.

<sup>9</sup> See for instance Frankel and Romer (1999), Acemoglu et al (2001) and Rodrik et al (2002) for contributions to the relevant growth literature. The instrument used for property rights institutions in those papers is the settler mortality rate in the colonial era, while an instrument for the legal system and hence transaction costs is colonial history. Acemoglu and Johnson (2003) find that property rights have an impact on economic growth, while transaction costs do not.

mediation of conflicts, and sanctions in the case of breach of the rules.<sup>10</sup> Institutions are more or less developed, depending on how well these different features operate. Well-developed institutions are likely to decrease the transaction costs for market participants and thus increase the efficiency of markets. They do this through a number of channels:<sup>11</sup>

- They decrease information asymmetries as they channel information about market conditions, goods and participants;
- They reduce risk as they define and enforce property rights and contracts, determining who gets what and when;
- They restrict the actions of politicians and interest groups, making them accountable to citizens;

This paper uses as a measure for institutional quality three indicators included in the Kaufmann et al. (2002) database:<sup>12</sup>

- 'Government Effectiveness' refers to the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies. It is, therefore, a measure for the quality of government inputs.
- 'Rule of Law' is based on several indicators that measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts.
- 'Control of Corruption' measures perceptions of corruption, conventionally defined as the exercise of public power for private gain.

These indices can take values between -2.5 and 2.5, the higher the value the better the institution. The reason to focus on these particular three variables is that they can be expected to closely affect the uncertainty involved in trade and thus transaction costs. Governments in many cases have the power to change domestic institutions and the index of "government effectiveness" is therefore likely to reflect the quality of domestic institutions in general. This index will also determine the importance

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<sup>10</sup> See North (1994) and World Bank (2002). North (1990) makes a distinction between institutions and organizations, referring to the first as the rules and the second as the players.

<sup>11</sup> World Bank (2002)

<sup>12</sup> The measures for institutional quality in de Groot et al. (2004) are taken from the same database.

of uncertainties related to policy changes in general and trade policy changes in particular. The “rule of law index” refers among others to the enforceability of contracts, the importance of which has been discussed above. High levels of corruption increase the uncertainty about the size of gains to be expected from economic activities. Corruption seems to be a widespread phenomenon with potentially large negative effects on trade.<sup>13</sup> In a 1996 World Bank survey of 3,685 firms in 69 countries, for instance, corruption turned out to be the second most important obstacle to doing business.<sup>14</sup> Table 1 shows the countries with the highest and lowest value for the three institutional variables and also indicates the country at the median value. Data reflect average values for the years 1996, 1998 and 2000.

As discussed above, we control in our regressions for domestic transport costs and domestic trade policy. Transport costs are in principle observable, but data are not readily available and a number of proxies have been applied in the literature. We have chosen the quality of roads measured by the share of paved roads. Finally, we assume that the relevant costs of finance and information are closely related to the depth of financial services as measured by credit to private sector relative to GDP and the penetration of telephones (mobile and fixed lines) respectively. Here one could argue that more direct cost measures could be used such as the cost of making a telephone call, the real interest rate on borrowing or fees for payment services. However, the cost of information flows are not only related to the cost of making a telephone call, but also to how many people can be reached by telephone and the ease at which local, long-distance and international calls can be placed, and not least the opportunity cost of not being able to make a call or access information on the internet. These aspects are likely to be more closely related to telephone density than to the cost of making a call. The following Table shows the countries with the highest and lowest value for the three infrastructure variables. It also shows the country at the median value. The values reflect averages for the period 1995-2001 and include all observations for which data are available for at least one year during this period.

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<sup>13</sup> Causality can also go in the other direction. Ales and Di Tella (1999) argue that openness increases competition and thus reduces the rents that can be appropriated through corruption. Their data analysis confirms this argument. Wei (2000) shows that “natural openness”, as determined by a country’s geography and size, reduces corruption. He argues that this is the case because natural openness increases a country’s incentive to invest in corruption-fighting public governance infrastructure. Another strand of literature has focused on the negative effects of corruption on foreign direct investment. See for instance Wei (1997).

<sup>14</sup> Brunetti et al. (1997) as cited in Anderson and Marcouiller (2002). The obstacle that ranked first were complaints about tax regulation and high taxes.

**Table 1: Highest, lowest and median values in institutional quality and infrastructure**

	Government Effectiveness	Rule of Law	Corruption Control	Tele-comm.	Roads	Credit
Maximum	Singapore (2.34)	Switzerland (2.21)	Finland (2.39)	Sweden (118.7)	Hong Kong (100)	Switzerland (166)
Median	Peru (-0.18)	Philippines (-0.22)	Madagascar (-0.28)	Dominican Rep. (14.2)	Hungary (43.5)	Dominican Rep. (27.4)
Minimum	Somalia (-2.14)	Congo, Democratic Republic of the (-1.83)	Congo (-1.56)	Congo, Democratic Republic of the (0.1)	Chad (0.8)	Congo, Democratic Republic of the (0.004)

*Sources: Kaufmann et al. (2002), World Bank: WDI 2003, ITU 2003, and IMF dataset on financial indicators.*

The variation of bilateral tariffs is illustrated by table 2, which shows the mean, maximum, minimum and standard deviation of each variable. The bilateral tariffs are used in the gravity regressions and represent the simple average applied tariff rate country  $i$  (the importer) levies on imports from country  $j$ . Tariff lines in which there are no imports are not included in the average. Importers' average tariffs are the simple average of applied tariffs across all tariff lines and all trading partners. Finally, the tariffs facing exporters from country  $j$  are average applied tariff rates facing exporters from country  $j$  in country  $i$  weighted by country  $i$ 's share in country  $j$ 's total exports and summed over  $i$ .

**Table 2. Descriptive statistics, tariffs**

	Mean	Minimum	Maximum	Standard deviation
Bilateral tariffs	9.7	0	186	9.0
Importers' average tariffs	10.2	0	34.6	6.7
Tariffs facing exporters	4.0	0.1	44.6	3.5

*Source: TRAINS database*

The highest bilateral rate is found on Romania's imports from Guyana. The much higher means in the first two rows compared to the last row reflect the fact that high tariff rates have a larger weight in the first two variables for two reasons. First, as already noted, trade-weighted averages reflect the impact that high rates have on the volume of trade. Second, developing countries have higher tariffs and lower trade volumes than developed countries while three quarters of the countries in the sample are developing countries.

#### IV. EMPIRICAL ESTIMATES

The empirical estimates of the impact of trade policy on trade takes two complementary approaches. The first approach investigates the relation between trade policy and openness. Openness is a commonly used indicator of how well a country is integrated in international markets and it is also found to be a significant determinant of economic growth in a number of studies.<sup>15</sup> Openness is measured by exports + imports over GDP, while trade policy is measured by the simple average applied tariff rate of the country in question. However, since the dependent variable of the openness regression contains both trade and income, we cannot distinguish whether the independent variables affect exports, imports or income. Thus, if an independent variable has no significant impact on the openness indicator this can either be because it does not affect trade or income or it can be because it affects trade and income proportionally. We therefore use the gravity equation in order to further investigate the determinants of bilateral trade flows. The gravity equation determines the geographical distribution of trade, *given* production patterns and expenditure patterns but is less useful for explaining changes in a country's aggregate trade or total world trade. A uniform reduction of transport costs due to technological changes would for example have no effect on bilateral trade flows in a gravity model, while the openness indicator would probably increase. It can also be argued that the impact on trade of institutions and infrastructure is more likely to affect openness than bilateral trade flows, since these variables characterize a country, irrespective of which are its trading partners. The two approaches taken in this paper are therefore complementary and as far as possible we apply the same control variables in both regressions.

##### A. OPENNESS AND TRADE POLICY - A SIMPLE OLS REGRESSION

We start the empirical investigation of the impact of trade policy on openness using OLS regressions applied to a cross-section dataset. We believe that simple average tariff rates best capture the restrictiveness of a country's own tariffs because trade-weighted tariffs also capture the effect of tariffs on trade as high rates get a low weight because they lead to low import values. As the many trade negotiations on a multilateral, regional or bilateral level witness, the tariffs meeting a country's exporters are also perceived to be important for trade performance. We therefore include the trade-weighted average tariff rate meeting exporters in the regression. The reason why tariffs are trade-weighted in this case is that countries have different resource endowments and comparative advantage. Countries specializing in agriculture or textiles and clothing, for example, will face higher

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<sup>15</sup> See for instance Frankel and Rose (2002), Frankel and Romer (1999), Edwards (1993a) and Levine and Renelt (1992). Edwards (1993b) surveys the literature.

tariffs for their exports than countries specializing in electronics and other high-technology products. Since the partner tariff rate is aggregated over all countries, endogeneity between tariffs and trade flows should be less of a problem for this measure.

We control for the effect of market size by including the population size in the regressions. Gravity regressions consistently find that trade falls off with distance. We investigate whether distance to major markets also affects a country's openness. Previous studies have found that income is largely concentrated in the temperate zones on both sides of the equator. Hence major markets are located at a certain distance from equator and a country's latitude is introduced as a proxy for distance to major markets.<sup>16</sup> We expect this variable to have a positive sign since the higher the latitude the further from equator and the closer to major markets. We also include an island dummy and a landlocked dummy to capture geographical indicators that may affect a country's openness.

As discussed in previous sections, transaction costs related to finding a trading partner, entering and enforcing contracts between trading partners depend on the quality of institutions, but also on the cost and availability of information flows and financial flows, for which we use telecommunication density and credit to private sector as proxies. Annex Table A.1. presents the correlation matrix between the variables included in the openness regressions. The institutional variables are highly correlated with a coefficient of correlation of about 0.95 for all combinations of pairs of the three indicators. They are also relatively rough and imprecise measures of various aspects of the same thing – the quality of a country's institutions. Nevertheless, corruption, uncertainties related to entering and enforcing contracts and ineffective provision of government services probably account for separate cost elements which add to the total trade costs incurred by companies that engage in international trade. We therefore regress openness on each of the institutional indices separately while controlling for country size and geographical indicators in each case. The results are presented in Table 3. T-statistics are in parenthesis and significance at a one per cent level is indicated by three stars, significance at a 5 per cent level is indicated by two stars and at 10 per cent level by one star.

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<sup>16</sup> See Sala-i-Martin (1997) for a discussion of latitude and its relation to income.

**Table 3: Regression results, institutions**

Dependent variable: trade/GDP

	Rule of law	Government effectiveness	Control of corruption
Log population	-14.4*** (-6.10)	-14.5*** (-6.87)	-14.1*** (-6.44)
Island	-22.3 (-1.50)	-22.5* (-1.79)	-20.7 (-1.59)
Landlocked	-2.68 (-0.30)	-0.56 (-0.07)	-3.43 (-0.39)
Latitude	-0.28 (-1.13)	-0.36 (-1.53)	-0.25 (-1.04)
Own tariffs	-0.57 (-1.07)	-0.46 (-0.91)	-0.64 (-1.24)
Partner tariffs	0.02 (0.02)	0.21 (0.21)	0.13 (0.13)
Institution indicator	13.25*** (3.00)	16.05*** (3.60)	10.79*** (2.49)
Number of observations	140	149	148
Adjusted R <sup>2</sup>	0.29	0.34	0.30

It appears that the institutional variables do capture different aspects of trade cost since they yield somewhat different results. All the institutional indicators are positively and significantly related to openness at a one per cent level. Thus, countries with better institutions appear to be more integrated in world markets than countries with less well developed institutions. The landlocked and island dummies have the expected negative sign, but are not significant. Latitude is not significant either, but has a negative sign. This may be surprising, but a recent study by de Groot et al. (2003) finds that OECD countries trade less than expected when the quality of institutions are controlled for.<sup>17</sup> The OECD countries are mainly located in the temperate zone and a negative sign is thus consistent with this study. Own tariffs have the expected negative sign in all the reported regressions, but are not significant, and trading partners' tariffs appear to be irrelevant for openness, at least within the range observed in the data set.

We next turn to a partial analysis of trade costs related to the quality of infrastructure. The indicators included are those that we believe affect transport and transaction costs the most directly; the quality of roads (percentage of total roads that is paved), number of fixed and mobile telephone lines per 100 inhabitants and access to credit (credit to private sector as a share of GDP). We expect the impact of telephone density to level off as universal coverage is reached and therefore include the logarithm of

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<sup>17</sup> De Groot et al. (2003) find that introducing an OECD dummy in the gravity equation yields a significant and negative parameter when institutions are controlled for.



telephone density. The infrastructure variables are correlated, but not as strongly as the institutional indicators. Nevertheless, problems with multicollinearity should be expected and we start with regressing openness on size and tariffs, geographical indicators and one infrastructure indicator at the time. The results are reported in Table 4.

**Table 4: Regression results, infrastructure**

Dependent variable: trade/GDP			
	Roads	Telecom	Finance
Population	-13.9*** (-6.70)	-13.1*** (-5.90)	-16.1*** (-7.19)
Island	-28.0** (-2.25)	-23.9* (-1.87)	-27.4** (-2.04)
Landlocked	-10.3 (-1.25)	4.25 (0.47)	-0.79 (-0.09)
Latitude	-0.70*** (-2.79)	-0.60** (-2.24)	-0.17 (-0.75)
Own Tariffs	-1.02** (-2.20)	-0.38 (-0.74)	-0.30 (-0.57)
Partner tariffs	-0.45 (-0.46)	-0.43 (-0.41)	-0.34 (-0.25)
Infrastructure	0.61*** (4.97)	10.6*** (3.62)	0.45*** (4.45)
Number of observations	144	146	133
Adjusted R <sup>2</sup>	0.37	0.35	0.37

All the infrastructure variables have the expected sign and all are significant at a 1 per cent level. The island dummy is now significant in all regressions, while the landlocked dummy is still not significant. The latitude variable now takes a significant and negative sign in two out of three regressions and indicates that the relatively rich countries located in the temperate zones are less open than expected when infrastructure is controlled for. Combined with the results presented in Table 3, this suggests that developed institutions and financial markets capture much of the effect that location relative to major markets has on the openness indicator. Tariffs have the expected sign, but are only significant in the regression containing road quality and even then only own tariffs are significant. Telecommunications appear to have the by far largest impact on openness. An increase in the telephone density of one standard deviation increases the openness indicator by as much as 35 percentage points, while a one standard deviation improvement in road quality or credit to private sector increase openness by about 20 percentage points.<sup>18</sup>

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<sup>18</sup> Röller and Waverman (2001) find that telecommunication infrastructure is positively and causally related to economic growth. Our result indicates that a possible channel through which telecommunications affect growth is through the openness indicator.

We finally explore the relative importance of tariffs, institutions and infrastructure. A reduction in tariffs is expected to reduce the relative price of imports and hence lead to an increase in imports. If exporting industries import intermediate inputs, a reduction in tariffs should also reduce their costs and possibly stimulate exports. The institutional framework is however likely to affect both the extent to which relative prices change as a result of tariff reductions and the supply and demand response as discussed above. This possibility is captured in the interaction terms between tariffs and institutions. We control for market size, geographical indicators, trading partner tariffs and infrastructure, choosing the infrastructure variable that is least correlated with the institutional variables, roads. The regression equation is the following:

$$(X + M)/GDP = a_0 + a_1 \ln pop + a_2 isl + a_3 landl + a_4 lati + a_5 t_{own} + a_6 t_{part} + a_7 infr + a_8 inst + a_9 t * inst$$

The results are presented in Table 5.

**Table 5: Regression results institutions, infrastructure and interaction terms**

Dependent variable: trade/GDP

	Rule of law		Government effectiveness		Control of corruption	
In population	-13.6*** (-6.09)	-14.0*** (-6.36)	-13.9*** (-6.86)	-13.9*** (-6.92)	-13.7*** (-6.53)	-14.3*** (-6.88)
Island	-29.5** (-2.08)	-24.4* (-1.73)	-30.7** (-2.52)	-29.0** (-2.39)	-30.0** (-2.39)	-26.0** (-2.08)
Landlocked	-5.04 (-0.57)	-6.69 (-0.77)	-3.52 (-0.41)	-4.72 (-0.56)	-6.50 (-0.76)	-7.61 (-0.90)
Latitude	-0.88*** (-3.24)	-0.85*** (-3.17)	-0.87*** (-3.43)	-0.84*** (-3.36)	-0.82*** (-3.16)	-0.78*** (-3.06)
Own tariffs	-0.65 (-1.30)	-0.69 (-1.41)	-0.62 (-1.29)	-0.83* (-1.84)	-0.77 (-1.58)	-1.13** (-2.23)
Partner tariffs	-0.29 (-0.28)	-0.50 (-0.49)	-0.15 (-0.15)	-0.18 (-0.19)	-0.26 (-0.26)	-0.29 (-0.29)
Roads	0.58*** (4.32)	0.63*** (4.70)	0.52*** (4.14)	0.53*** (4.27)	0.56*** (4.48)	0.59*** (4.74)
Institution indicator	8.98** (2.02)	20.6*** (3.15)	11.9*** (2.66)	19.6*** (3.19)	7.1* (1.67)	16.6*** (2.80)
Interaction term inst. own tariffs		-1.56** (-2.38)		-0.97* (-1.81)		-1.34** (-2.26)
Number of observations	136	136	144	144	143	148
Adjusted R <sup>2</sup>	0.37	0.40	0.40	0.41	0.38	0.39

Both institutions and the quality of roads remain significant at a 1 per cent level in all regressions. The coefficient on roads is robust to the inclusion of other variables as it takes about the same value in all regressions, including the one presented in Table 4. Institutions appear to become less economically significant when we control for infrastructure (i.e. the coefficient takes a lower value) before introducing the interaction term, but the economic significance is more than restored when the

interaction term is included. In all three pairs of regressions a reduction in own tariffs has no statistically significant impact on its own, but in combination with good institutions a tariff reduction will significantly increase openness. We also notice that latitude is again significant at a one per cent level, its coefficient is negative and stable in the six regressions. In other words, when controlling for institutions, the quality of roads and the interaction between trade policy and institutional quality, countries close to the major markets actually trade less than expected.

The marginal impact of lowering tariffs is the following:

$$\Delta(X + M)/GDP = \Delta t(a_2 + a_5 inst).$$

On the basis of this relationship some examples illustrate the economic significance of the results. A one standard deviation reduction of tariffs from the mean would lead to an increase in openness of about 9 percentage points if the control of corruption index is zero, and an increase of about 19 per cent if the control of corruption index is 1. For government effectiveness, the corresponding figures are an increase in openness of about 6.5 percentage point if the institutional quality index takes a value of zero and 14 percentage points if it has the value of one. Finally, using the rule of law index, openness increases with about 5 percentage points in response to a one standard deviation reduction of tariffs if the institution quality index is zero and almost 18 percentage points if it is one. Thus, it appears that the effect of institutional quality on the outcome of trade liberalization policies is large and highly significant. Further, it appears that control of corruption has the largest effect in absolute terms while an improvement in the rule of law has the largest relative effect. We also note again that it is a country's own tariffs that matter for openness, while the impact of trade barriers the country faces abroad appears to be insignificant.

## B. THE GRAVITY EQUATION

The previous section found a positive and robust relation between the quality of institutions and countries' openness to trade as measured by their total trade relative to GDP. In this section we investigate to what extent institutional quality also affects bilateral trade flows, using the gravity model of international trade.<sup>19</sup> As noted above, Anderson and Marcouiller (2002) and de Groot et al. (2004) have found such a relationship and we explore to what extent these previous results are

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<sup>19</sup> The gravity model, for instance is based on the Armington assumption and the varieties produced in the world economy enter consumer preferences as CES aggregates in one-sector or multi-sector models.

sensitive to the inclusion of trade policy as measured by relative bilateral tariffs and the quality of infrastructure.

A theoretically founded gravity model is based on a CES expenditure system where goods are differentiated by region of origin. Bilateral trade is then a function of the two trading partners' respective shares in world income and the trade barriers between them relative to the trade barriers between them and all other countries. Bilateral trade is, in other words, determined by *relative* trade barriers, not absolute trade barriers between the two countries in question, which is typically assumed in empirical work. We therefore include resistance terms into our equation for tariffs. The bilateral tariffs we use are extracted from the TRAINS database and are presented in Table 2 above. The resistance terms are importers average tariffs and the trade-weighted average tariff meeting exports (see Table 2 with explanation).<sup>20</sup> All variables except the dummies are in logarithms. All data are from 2000.

The distance variable in gravity models is a proxy for transport costs and other trade costs that vary with distance. Other transport and transaction costs, e.g. port handling, customs clearance, to some extent telecommunications and transport from border to final destination do not vary much with distance to trading partner and we use the quality of infrastructure as a proxy for these. This is an aggregated index including the quality of roads, telecommunications, ports, airports and railways. The index is calculated by the same methodology as Limão and Venables (1999), but adds quality of ports, and density of airports. The index takes values between 1 and 7, the lower the value the better the infrastructure. As is the case for the institution variables, the quality of infrastructure is a country-specific indicator that for a given importer is the same for all sources of imports. The quality of infrastructure and the quality of institutions variables are thus measured in a similar way and it is interesting to investigate the robustness of the impact of institutions relative to the inclusion of the quality of infrastructure.

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<sup>20</sup> See Anderson and van Wincoop (2003). An important insight from this paper is that a uniform increase or reduction in world trade barriers; for example an improvement in transport technology does not affect bilateral trade. Hence the robustness of the distance parameter in gravity equation estimates over time in spite of declining transport costs over time.

The equation estimated is the following:

$$\ln M_{ij} = a_0 + a_1 \ln y_i + a_2 \ln y_j + a_3 \ln d_{ij} + a_4 \ln(1 + b_{ij}) + a_5 (1 + l_{ij}) + a_6 \left[ \ln(1 + t_{ij}) - \frac{1}{n} \sum_j \ln(1 + t_{ij}) - \sum_i \varphi_i \ln(1 + t_{ij}) \right] + a_7 \ln inst_i + a_7 \ln inst_j + a_8 \ln inf_i + a_9 \ln inf_j$$

$M_{ij}$  represent imports from country  $j$  to country  $i$ ,  $y$  represent GDP,  $d$  distance,  $b$  the border dummy,  $l$  the common language dummy,  $t$  the tariff rate,  $n$  represents the number of trading partners,  $\varphi$  represent trade share. The proxies for institutional quality are added one at a time in the regressions. The results are reported in Table 6.

**Table 6. Gravity regressions**

		Rule of law		Government effectiveness		Control of corruption	
	Core	inst	+infrastr.	inst	+infrastr.	inst	+infrastr.
log GDP <sub>i</sub>	0.97*** (101.1)	0.96*** (90.05)	0.97*** (81.9)	0.95*** (87.5)	0.96*** (79.8)	0.97*** (90.9)	0.97*** (83.2)
log GDP <sub>j</sub>	1.17*** (129.4)	1.13*** (106.5)	1.12*** (99.1)	1.13*** (105.1)	1.12*** (97.5)	1.14*** (110.8)	1.13*** (102.8)
log Distance	-1.29*** (-49.4)	-1.26*** (-48.2)	-1.18*** (-42.2)	-1.27*** (-48.6)	-1.18*** (-42.3)	-1.27*** (-48.4)	-1.17*** (-42.2)
Border	0.49*** (3.33)	0.65*** (4.38)	0.80*** (5.26)	0.63*** (4.26)	0.81*** (5.31)	0.61*** (4.16)	0.79*** (5.18)
Language	1.48*** (22.71)	1.46*** (22.43)	1.44*** (20.8)	1.47*** (22.5)	1.44*** (20.8)	1.47*** (22.5)	1.44*** (20.8)
log (1+t <sub>ij</sub> )	-2.1*** (-6.07)	-1.96*** (-5.68)	-1.36*** (-3.59)	-2.01*** (-5.81)	-1.40*** (-3.69)	-1.86*** (-5.37)	-1.35*** (-3.56)
log Institution <sub>i</sub>		0.26*** (4.03)	0.01 (0.15)	0.33*** (5.00)	0.18** (2.07)	0.16*** (2.66)	-0.10 (-1.28)
log Institution <sub>j</sub>		0.48*** (7.54)	0.07 (0.88)	0.46*** (7.4)	0.13* (1.68)	0.40*** (6.59)	0.01 (0.11)
log Infrastructure <sub>i</sub>			-0.46*** (-4.74)		-0.35*** (-3.78)		-0.55*** (-5.77)
log Infrastructure <sub>j</sub>			-0.70*** (-9.53)		-0.67*** (-9.52)		-0.73*** (-10.2)
n	12008	11893	10458	11893	10458	11893	10458
R <sup>2</sup>	0.66	0.67	0.67	0.67	0.67	0.66	0.67

The first column presents the standard gravity regression, adding bilateral tariffs. We note that import demand is elastic to relative tariffs and the parameter is significant at a one per cent level. As in de Groot et al. (2004) import demand is not income elastic, but including tariffs makes the elasticity closer to unity than in the former study. Also the border dummy takes a lower coefficient when relative bilateral tariffs are included. This suggests that when bilateral tariffs are not included, the

border dummy may capture the fact that neighbouring countries often give each other preferential market access through free trade agreements that are more or less comprehensive in scope. The average bilateral applied rates cover this better than a dummy for whether or not two countries are members of a free trade area, since free trade areas vary in terms of which sectors are covered.

The next three double columns present regressions including the three institutional variables alone and combined with the infrastructure variable. Both importers' and exporters' institutions take the expected sign, they are significant at a one per cent level when included on their own, and exporters' institutions appear to be most important. It appears, perhaps somewhat surprisingly, that control of corruption is slightly less important in terms of parameter value than the two other indicators.<sup>21</sup> Finally, when including the quality of infrastructure in the regressions, the parameters of the institution variables are reduced sharply and become less significant. In the case of corruption and rule of law, the institution variables become insignificant both for exporters and importers. The quality of infrastructure on the other hand is significant at a one per cent level in all regressions and it appears that the exporter's infrastructure is the most economically significant.<sup>22</sup>

The lack of robustness for the corruption and rule of law index is surprising since it has been emphasized in numerous studies and business surveys that corruption is one of the most serious concerns of businesses when engaging in transactions with a particular country. One possible explanation is that foreign markets can be serviced either through exports or through foreign direct investment. Arms-length trade involves less commitment and less sunk costs than foreign direct investment, and exports are therefore more likely the chosen mode of servicing corrupt countries. Sales by foreign affiliates are large relative to trade flows (UNCTAD, 2003), and FDI has in at least one study been found to be negatively related to the level of corruption (Wei, 1997). It is plausible that the other institutional indicators would have a similar effect, but it might also be the case that an on average low government efficiency index conceals large differences between designated industrial areas and the average for the country, while corruption will be more endemic across the board and probably particularly in areas where large transactions are involved such as FDI. More research is however necessary to explore this hypothesis.

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<sup>21</sup> This is also the case in de Groot et al. (2004).

<sup>22</sup> We get similar results when we control for the quality of roads as in section III.A, but since the aggregate index did not seem to involve problems of multicollinearity in the gravity equation (the highest correlation coefficient is with the rule of law indicator, where it is -0.61), we prefer this broader measure.

## V. CONCLUSIONS

This paper focuses on the role of domestic institutions for international trade and analyses to which extent they affect trade flows. It presents two complementary approaches, one focusing on the size of total trade flows and one focusing on bilateral trade patterns (gravity equation). Besides, we control for two other domestic policy variables: trade policy and domestic infrastructure.

When taking the first approach we find that all institutional variables included have a significant and positive impact on trade flows. We also find that domestic tariffs have no statistically significant impact on their own. The interaction terms between tariffs and institutions, however, are negative and significant in all regressions. This means that the marginal impact of a reduction of tariffs on the openness indicator is larger the better the institutional quality. Institutions have in other words both a direct impact on openness and an indirect impact through increasing the impact of changes in tariffs on openness. The policy implication of this finding is that institutional reforms such as rooting out corruption would strengthen the outcome of trade reforms as measured by total trade flows. Conversely, small changes in trade flows should be expected when trade liberalization is conducted within a poor institutional framework.

In a next step we analyse the impact of domestic institutions on bilateral trade flows in a gravity equation, again controlling for domestic trade policy and the quality of domestic infrastructure. An important result from our study is that relative bilateral tariffs are strongly and negatively related to bilateral trade flows. In accordance with the results in two other recent studies we also find that the quality of domestic institutions has a significantly positive impact on bilateral trade flows. Yet, we find that when controlling for the quality of infrastructure, the relation between bilateral trade flows and the quality of institutions becomes less robust, indeed, the quality of institutions becomes insignificant in some regressions. Thus, we argue that more research is needed on the mechanisms through which institutions affect trade before firm conclusions on the relationship between trade and the quality of institutions can be drawn.

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## ANNEX

Correlation matrix, variables included in the openness regressions.

	Population	Road	Tele	Credit	Rule of law	Governm. eff.	Corruption
Population	1						
Road	-0.08	1					
Tele	-0.11	0.64	1				
Credit	0.06	0.51	0.74	1			
Rule of law	-0.14	0.56	0.88	0.79	1		
Governm. eff.	-0.10	0.57	0.88	0.77	0.95	1	
Corruption	-0.16	0.54	0.90	0.74	0.96	0.97	1

Correlation matrix, variables included in the gravity regressions

	GDP	Infrastructure	Rule of law	Governm. eff.	Corruption
GDP	1				
Infrastructure	-0.36	1			
Rule of law	0.54	-0.62	1		
Governm. eff.	0.56	-0.61	0.95	1	
Corruption	0.52	-0.60	0.96	0.94	1