A Portrait of Bilateral and National Trade Costs in Asia and Beyond

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1. Introduction

All the major puzzles of international macroeconomics have been described as hinging on trade costs (Obstfeld and Rogoff, 2000). Information flows, historical linkages as well as economic and geographic factors have been identified as core trade cost components but the direct impact they have upon the cost of exporting are unknown. During the past decade a literature has emerged that has cast light upon some of the factors that shape the cost of trading across borders, with micro and macroeconomic factors, as well as geography, information and historical ties, being found to be important. Aggregating these factors has proved to be difficult, meaning that important questions remain unanswered. Are there systematic differences in trade costs between countries and regions? What drives these differences?

In this paper we calculate bilateral and aggregate or overall trade costs for a large set of industrial and developing countries for the post 1980 period using a theoretically consistent method proposed by Novy (2008). This overcomes the problems associated with the multilateral resistance terms that have proved difficult to measure by using observable data on exports and output. We are able to quantify both country-level and bilateral trade costs for 176 countries during the period 1980 to 2006. A key advantage of this method is that it overcomes the problems that would arise from trying to aggregate estimates of the individual components of trade costs for a large number of countries and years, and for which the data would be incomplete or of poor quality.

The existing literature has established that trade flows are shaped by myriad factors which include informational barriers (Rauch and Trindade, 1999; Felbermayr, Jung and Toubal, 2009), geography (Limao and Venables, 1999), macroeconomic elements such as currency unions (Rose and van Wincoop, 2001) and microeconomic components such as the monopoly power of shipping cartels (Hummels, Lugovskyy and Skiba, 2009) and fixed exporting costs (Bernard and Jensen, 2004). In spite of this wealth of information we still do not know the relative importance of each component and aggregation of the individual parts has proved to be difficult. Anderson and van Wincoop (2004) estimate the ad-valorem tax equivalent (AVE) of trade costs in the United States to be 170%, of which local distribution costs account for 55% of the mark-up with international trade costs accounting for 74%.[1] They recognise that for developing countries the figure is likely to be considerably larger due to poor infrastructure and difficulties in accessing world markets, but do not attempt to quantify trade costs for these countries or other industrial countries.

[1] Their methodology is based on the aggregation of estimates of the separate component elements of trade costs.

In the first stage of our analysis we calculate bilateral trade costs and provide a description of how these have changed through time. We then investigate the drivers of bilateral trade costs and the relative importance of these drivers. We find strong evidence indicating that informational and infrastructure factors are important determinants of a country's bilateral trade costs. We then aggregate bilateral trade costs to produce estimates of overall or national trade costs, in order to explore whether they are systematic differences in each countries' trade costs with a common set of trading partners and what drives these differences. We focus on the differences between country types (industrial versus developing countries) and regions: contrasting in particular trade costs in Asia and Africa.

The rest of the paper is organised as follows. Section 2 sets out the theoretical approach to modelling trade costs. This approach is then applied and the summary evidence on the extent of bilateral trade costs and how they vary across country types and regions is presented in section 3. The drivers of these differences are investigated in section 4. In section 5 we consider the nature and evolution of aggregate or average trade costs for each country, and how and why these differ between countries. The summary conclusions of the paper are set out in section 6.

2. Theoretical Foundations

The gravity model has proven to be one of the most robust empirical relationships in economics. In spite of this, using the model to calculate trade costs has proven notoriously difficult, principally due to ambiguity surrounding how to quantify multilateral resistance. This has led authors to use proxies such as common borders and bilateral distance to circumvent reliance upon actual cost information (Anderson and van Wincoop, 2004). A problem with using proxies such as these is that they may omit potentially important trade cost determinants and result in misspecification of multilateral resistance.

Novy (2008) presents a means of getting around these problems by demonstrating that multilateral resistance can be captured by intra-national trade. The model begins with the familiar gravity formulation in Anderson and van Wincoop (2003), though Novy shows that the final result is invariant to whether the model is derived from a Ricardian (Eaton and Kortum, 2002) or heterogeneous firms (Chaney, 2008; Melitz and Ottaviano, 2008) model of international trade. Exports between a pair of countries is given by:

$$x_{ij} = \left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \quad (1)$$

where x_{ij} denotes exports from country i to j, t_{ij} are bilateral trade costs between the pair and $\pi_i P_j$ denote price indices in the two countries which correspond to multilateral resistance between the pair.

The gravity model posits that all else being equal, bigger countries trade more with each other. Bilateral trade costs decrease bilateral trade but they are measured relative to multilateral resistances to trade: where the barriers between country i and the rest of the world (multilateral barriers) are lower relative to bilateral barriers between i and j, country i will trade less with j relative to all other destinations.

Novy (2008) shows that a change in bilateral trade barriers affects both inter- and intra-national trade. For example, when the barriers to trade between country i and all other countries fall some of the goods that were previously consumed domestically are now shipped to foreign countries. Hence, it is not just international trade that is shaped by trade costs but intra-national trade as well.

Formally this can be seen through the representation of intra-national trade as:

$$x_{ii} = \frac{y_i y_i}{y^W} \left(\frac{t_{ii}}{\pi_i P_i}\right)^{1-\sigma} \quad (2)$$

where t_{ii} represents intra-national trade costs: domestic transportation costs. Through rearrangement equation (2) can be solved for inward multilateral resistance:

$$\pi_i P_i = \left(\frac{x_{ii} y^W}{y_i y_i}\right)^{\frac{1}{1-\sigma}} t_{ii} \quad (3)$$

To eliminate the multilateral resistance terms from equation (1) Novy shows that the product of bilateral trade (x_{ij}*x_{ji}) is given as:

$$x_{ij} x_{ji} = \left(\frac{y_i y_j}{y^W}\right)^2 \left(\frac{t_{ij} t_{ji}}{\pi_i P_j \pi_j P_i}\right)^{1-\sigma} \quad (4)$$

Incorporating equation (3) into (4) leads to the eventual solution for bilateral trade costs by using a geometric average and subtracting 1 to give a tariff equivalent:

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ij}x_{ji}}{x_{ii}x_{jj}}\right)^{\frac{1}{2(\sigma-1)}} - 1 \qquad (5)$$

where τ_{ij} measures bilateral trade costs, $t_{ij}t_{ji}$, relative to domestic trade costs, $t_{ii}t_{jj}$. The intuition underpinning the bilateral trade costs is straightforward. The gravity equation tells us how consumers decide to allocate spending across different countries. If bilateral exports increase relative to domestic trade flows, it must have become easier for the two countries to trade with each other. The key advantage to this approach is that trade costs can then be captured using observable trade flows.

3. The Evidence on Bilateral Trade Costs

Using the methodology outlined in the previous section we calculate trade costs for 177 countries over the period 1980 to 2006. Data on bilateral trade flows are taken from the IMF Direction of Trade Statistics database. Calculating intra-national trade relies upon the UN's Output at Basic Prices 2.7 dataset and is calculated as

$$x_{ii} = y_i - \sum_{j=1}^{N} x_{ij} \qquad (6)$$

where y_i is gross output in country i and x_{ij} are bilateral exports from country i to country j.[2]

Table 1: Average Bilateral Trade Costs (%)

Country/Year	**1980**	**2006**	**1980**	**2006**
Sample	**Un-Weighted**		**Weighted**	
Industrial Countries				
Australia	1817	551	151	92
Canada	1242	333	105	45
France	487	254	107	59
Germany	1020	205	253	51
Japan	564	299	113	67
Netherlands	589	190	85	45
New Zealand	2164	1319	254	138
Spain	1156	538	166	66
United Kingdom	2813	223	103	64
United States	787	349	118	59

[2] Where zero exports are reported between two countries a value close to zero is entered to permit calculation of trade costs for that pairing. The estimates are not sensitive to the choice of this small value.

Developing Countries				
Brazil	2119	888	286	97
China	3240	567	295	58
Egypt	2219	1612	431	114
India	2626	332	280	86
Indonesia	3041	959	605	87
Kenya	2462	1731	1070	185
Malaysia	2109	769	145	59
Mexico	2490	1178	214	56
Nigeria	5661	2384		116
Saudi Arabia	2194	1324	182	87

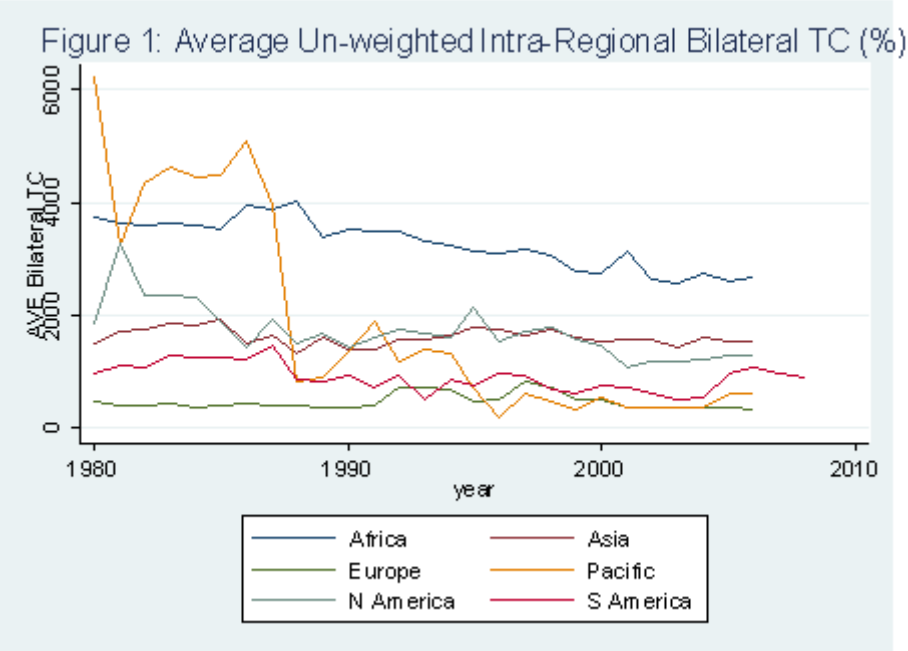
Notes: The values in the table are ad-valorem equivalents expressed in percentages. Un-weighted bilateral trade costs are calculated as the mean bilateral trade costs between country *i* and all other countries in the sample. Weighted bilateral trade costs are calculated by taking the un-weighted bilateral trade cost and weighting according to the ratio of exports from country *i* to *j* divided by country *i*'s total exports.

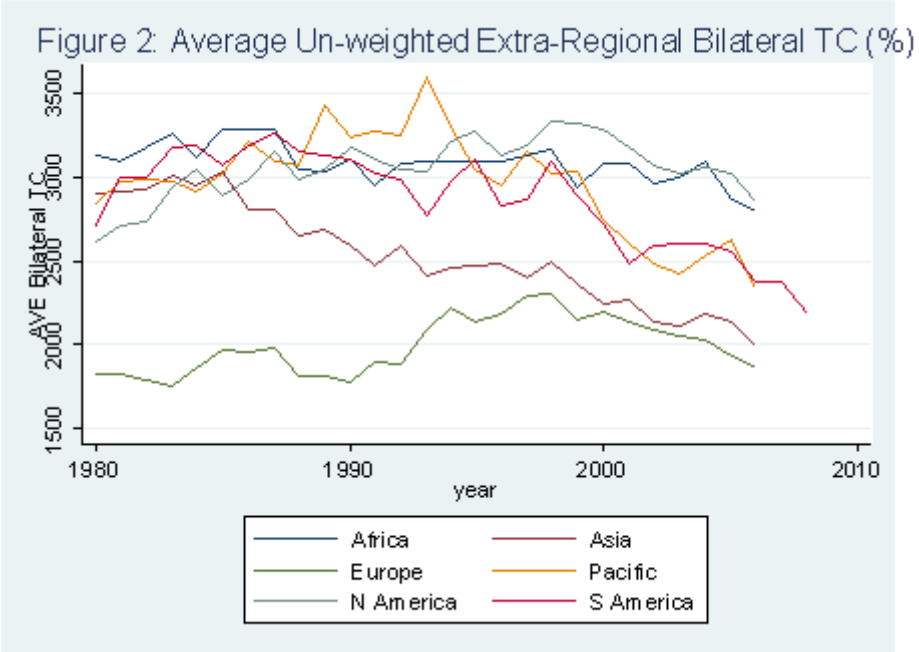
While the UN data provides information on output there are several instances where information is either missing or unreported. To alleviate this problem we imputed output values using data on GDP and output which is available for other countries within the region.[3] The relationship between GDP and output tends to be relatively stable both across countries and time. Consequently we use data on GDP taken from the Penn World Tables and the regional multipliers we calculated to impute missing output values.[4]

We report in Table 1 average bilateral trade costs (i.e. averaged across all the trading partners in our sample of countries and expressed as ad valorem equivalent percentage rates) for the start (1980) and end (2006) of our period of analysis, for a selection of industrial and developing countries. It is important to distinguish between the unweighted average (which gives equal weight to each bilateral relationship, irrespective of the value of bilateral trade, including to those instances where there is no trade) and the weighted average (weighted by the share of the value of bilateral exports in the country's total exports). The unweighted averages are considerably higher than the weighted values for all countries. The orders of magnitudes of our estimates of bilateral trade costs look sensible in terms of relativities, if one compares industrial and developing countries, or more (e.g. New Zealand) and less remote countries. Encouragingly also our estimates for the USA are also credible, given the earlier work for that country using a direct measure approach. Note also the sharp decline in average bilateral trade costs over the period, which is consistent with the trade policy and technological changes over the period and associated rapid globalization. Even by the end of the period, however,

[3] Approximately 59% of the observations of bilateral trade costs are calculated using imputed information. See the appendix for a description of the method used to impute output.
[4] In some instances it was not possible to obtain GDP data for specific countries meaning that our panels are unbalanced.

trade policy would still appear to be a relatively small element in the measured levels of total trade costs.





In Figures 1 and 2 we offer a summary of the differences in average bilateral trade costs between regions (distinguishing between intra- and extra-regional trade) and of the evolution of trade costs over time. Some important features to note are the relatively high costs of intra- African trade, the sharp decline in trade costs on trade within the Pacific region and the relatively stable and high costs to be found on intra- Asian trade. By contrast, in the case of Asia there has been a sharp decline in average extra- regional trade costs. This finding is in line with the view that many of the emerging economies of Asia have to-date strongly oriented their trade strategies towards exporting to industrial country markets rather than regional markets. The average trade costs (weighted and unweighted) of each region with itself and each other region are summarised for 2006 in Table 2. This demonstrates trade costs on actual intra- African trade (i.e. based on weighted values) are on average higher than in their trade with any other region. Interestingly, average trade costs on intra-Asian trade are on average higher than on Asia's exports to Europe.

Table 2: Intra- and Extra-Regional Bilateral Trade Costs in 2006 (%)

	Africa	**Asia**	**Europe**	**Pacific**	**N. America**	**S. America**
Un-weighted						
Africa	2758	2715	2551	4226	4785	4419
Asia	2715	1545	1483	2003	3274	2601
Europe	2551	1483	510	2498	3011	1923
Pacific	4226	2003	2498	541	2799	2755
N. America	4785	3274	3011	2799	1483	2063
S. America	4419	2601	1923	2755	2063	750
Weighted						
Africa	531	152	65	122	156	179
Asia	615	549	230	724	242	278
Europe	740	264	403	752	437	292
Pacific	169	73	31	682	80	33
N. America	956	516	118	2017	913	423
S. America	475	80	49	117	219	439

Notes: The values in the table are ad-valorem equivalents expressed in percentages. Un-weighted bilateral trade costs are calculated as the mean bilateral trade costs between country *i* and all other countries in the sample. Weighted bilateral trade costs are calculated by taking the un-weighted bilateral trade cost and weighting according to the ratio of exports from country *i* to *j* divided by country *i*'s total exports.

The gravity literature has identified numerous bilateral barriers to trade. Proximity is well documented for instance as mattering. We expand upon these insights to consider how trade costs differ along geographical, historical and cultural lines; see the summary statistics in Table 3, which record the average (unweighted) bilateral trade costs for the presence or absence of particular features. It shows that bilateral trade costs are lower where the trading partners have a shared border, have a common language, have had a previous colonial relationship, are both WTO members, are both members of the same regional trading arrangement or have a common currency. These findings show the importance of historical, cultural and policy factors, as well as geography, in fashioning bilateral trade costs.

Table 3: Gravity Variables and (Unweighted) Bilateral Trade Costs (%)

Variable	Absent	Present
Shared border	2444	561
Common language	2460	2078
Colonial relationship post-1945	2421	290
WTO members	2725	2032
Regional trade agreement	2523	609
Common currency	2410	1167

Notes: The values in the table are ad-valorem equivalents expressed in percentages.

4. Determinants of Bilateral Trade Costs

Cultural, political and historic ties were shown in the previous section to be related to trade costs between countries. In this section we investigate the determinants of bilateral trade costs using formal econometric techniques in order that we may quantify the impact of each facet in determining bilateral trade costs.

Anderson and van Wincoop (2004) provide a breakdown of trade costs into transportation costs, border-related trade barriers and retail and wholesale distribution costs. Table 4 provides a list of variables through which we capture these aspects, such as measures of international and domestic infrastructure and direct measures of shipping costs. However, we also expand upon this list by including a number of institutional measures taken from the EFI dataset provided by the Heritage Foundation as well as indicators from the World Bank's Doing Business survey. Recent empirical

work by Levchenko (2007) and Nunn (2007) has demonstrated the importance of institutions and legal systems in affecting exports of goods that use those factors intensively. We also include a number of variables to capture credit constraints to reflect recent findings. For example, Muuls (2008) shows that firms are more likely to be an exporter when they are productive and have low credit constraints. She also finds and that credit constraints are an important determinant of the extensive margin of trade in terms of destinations. This view is echoed by Manova (2008) who finds that credit constraints are an explanation for the predominance of zeroes in the bilateral trade matrix. Measures of the country's openness to trade, measured through indexes of average tariffs and freedom to trade internationally, are also included. Finally, measures of the extent of regulation in the country are captured through regulatory barriers to trade and an index of the general regulatory environment in the country.

Table 4: Summary Statistics of Main Variables

Country	Mean	Std. Dev	N
Aggregate trade costs (%)	265	358	4507
Bilateral trade costs (%)	2355	33.73	426532
Information Variables			
Internet users	14.23	20.69	295937
Voice traffic	19.63	1.84	244785
International Infrastructure			
Liner connectivity	22.85	24.41	83060
Port infrastructure	4.14	1.20	31257
Container traffic	14.70	1.30	77554
Air freight	949.15	3059	366165
Domestic Infrastructure			
Railways	8.50	2.41	240999
Road density	109.73	164	51892
Road goods	104345	261625	86537
WB Doing Business Indicators			
Depth of credit information	3.06	2.14	72702
Strength of investor protection	5.09	1.59	55895
Documents to export	6.81	2.21	54556
Time to export	24.14	15.40	54556
Export container cost (US$)	1143	634	37034
Contract procedures	36.91	6.32	90091
Contract time	601	292	90091
Contract claim	31.76	24.65	90830

Institutional Variables			
Size of government	4.55	1.61	336140
Legal quality	5.74	1.97	329742
Macroeconomic stability	7.16	2.29	337401
Mean tariff rate	2.94	2.47	298299
Regulatory trade barriers	3.31	1.77	157219
Freedom to trade internationally	6.58	1.45	330746
Credit market regulations	6.74	2.19	336725
Regulatory environment	4.29	1.09	333375

Notes: The trade cost values in the table are ad-valorem equivalents expressed in percentages. Un-weighted bilateral trade costs are calculated as the mean bilateral trade costs between country *i* and all other countries in the sample. Weighted bilateral trade costs are calculated by taking the un-weighted bilateral trade cost and weighting according to the ratio of exports from country *i* to *j* divided by country *i*'s total exports.

Given the high degree of correlation between the variables listed in Table 4 we chose to use factor analysis to compute broad measures of trade cost determinants. This results in the creation of five variables which capture information flows, the quality of domestic and foreign infrastructure, the ease of exporting and doing business in a country and a measure of the quality of institutions.

To investigate the importance of these factors we use a regression of the following form:

$$\tau_{ij} = X_i'\beta + \varepsilon_{ij} \qquad (7)$$

where τ_{ij} are bilateral trade costs between country *i* and *j*, X_i is a vector of trade cost determinants and ε_{ij} is an i.i.d. error term.

In Table 5 we present the results from equation (7) in terms of standardised coefficients to allow for easy comparison. In line with evidence from Rauch and Trindade (1999) and Felbermayr, Jung and Toubal (2007), we find that information flows between countries reduce the cost of trade. A one standard deviation increase in this variable reduces bilateral trade costs by 0.205 standard deviations, equivalent to a 692 percentage point reduction in the AVE of bilateral trade costs (using the unweighted measures). Despite this informational barriers only explain 4.2 per cent of the variation in bilateral trade costs, which suggests that either our measures do not entirely capture the effect of information or that there are a number of other considerations that matter.

The effect of international infrastructure is estimated to have a similar impact. However, it is worth noting that the coefficient estimate on the domestic infrastructure variable is approximately half as

large as that for international infrastructure. The r-squared values in regressions 2 and 3 of Table 5 confirm the importance of international infrastructure relative to domestic infrastructure, in that the former is capable of explaining four times as much of the underlying variation (though this remains low at 4.3 per cent). These results indicate that, while the cost of transporting goods from the factory to a port or distribution centre are important, they are quantitatively less so than the transport costs incurred outside the country.

We also observe from the World Bank ease of doing business variable is negatively related to bilateral trade costs. This suggests that, while the direct cost of exporting a container matters, procedural barriers such as the number of procedures required to write contracts and export also matter. Similarly, as in Levchenko (2007), institutional factors also matter as demonstrated in regression 5. Nor is it merely the impact of tariff barriers that this variable captures. Analysis of the eigenvalues reveals that it is the size of government and legal quality variables that account for most of the variation within the group of institutional variables. Institutional quality has been outlined by Nunn (2007) as an influence upon the type of goods countries trade due to the importance of relationship specific agreements. Legal institutions may be all the more important in light of the trend towards the outsourcing and offshoring production which necessitates binding agreements. It could be that countries with large governments have high trade bilateral costs because large public sectors divert resources away from private enterprises. Studies using firm-level data have shown that access to finance affect the probability of exporting (Greenaway, Guariglia and Kneller, 2007) and that large governmental sectors raise the cost of finance.

Table 5: Bilateral Trade Costs Regressions

	Regression				
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Information	-0.205 (-104.57)				
International infrastructure		-0.208 (-27.84)			
Domestic infrastructure			-0.112 (-23.30)		
WB Doing Business				-0.158 (-26.28)	
Institutions					-0.146 (-58.31)
Number of observations	197949	12271	19202	36872	154625
R^2	0.04	0.04	0.01	0.02	0.02

Notes: The coefficient estimates are beta coefficients with robust t-statistics in parentheses. Bilateral trade costs are measured as the un-weighted ad-valorem tax equivalent of trade costs between country *i* and *j*.

5. Evolution of Aggregate or Overall Country Trade Costs

In the previous section we observed that bilateral barriers to trade are large. This reflects the relative absence of trade between some countries due to impediments which may be economic, historic, geographical or cultural. In this section we provide evidence on the magnitude of country-level trade costs. We use the information on bilateral trade costs from the previous section to calculate aggregate trade costs as the un-weighted or weighted average of country *i*'s bilateral trade costs with all other countries in the rest of the world. Constructed in this way a country's aggregate trade costs is a composite of influences affecting trade costs of the country itself and those of all its trading partners. Differences in such an aggregated measure across countries will, however, reflect strongly on the own country effect since the large set of trading partners will be approximately common for each country.

In total this provides estimates of trade costs for 176 countries during the period 1980-2008.[5] We calculate that average, unweighted aggregate trade costs have fallen from 3137% in 1980 to 2326% in 2006. While this represents a large decrease the value remains high. In part this is a reflection of the presence of a large number of developing countries in the sample but also because there are many

[5] The panels are not balanced due to the creation of countries through time.

bilateral pairs where export sales are relatively low or non-existent. However, for 2008 we estimate aggregate (unweighted) trade costs to be 251% in the United States, 222% for the UK, 203% for Germany, 339% for Japan, 262% for France and 278% for China; estimates which are in line with those presented in Anderson and van Wincoop (2004). (The corresponding weighted trade costs estimates for these and all of the other countries in 2006 (and 1980) are reported in the appendix.)

In Table 6 we provide a summary of trade costs across time and continents. It is immediately apparent that there is a broad regional dimension to trade costs. For example, European countries are consistently ranked as the group with the lowest exporting costs. To a certain extent this is accounted for by the large share of exports these countries sell to others in the region and their relative proximity. However, the region has historically been one of the most integrated due to the expansion of the European Union. In contrast the Pacific region emerges as having the highest average aggregate trade costs which reflects the small size of economies in the region and their remoteness from other markets. Likewise African trade costs remain high, a fact which some have sought to explain by the lack of a major navigable river through the continent (Sachs et al., 2000) or the endogenous impact of underdevelopment on container shipping prices (Hummels, Lugovskky and Skiba, 2009).

Table 6 Aggregate Country Trade Costs by Region :1980-2006 (%)

a) Unweighted Country Averages

	All countries	Africa	Asia	Europe	Pacific	North America	South America
1980	3137	3881	2925	1900	4815	3016	2536
1985	3060	3369	3083	1859	4250	3321	2878
1990	2798	3324	2463	1670	3439	3168	2856
1995	2789	3280	2525	1860	3264	3475	2952
2000	2612	3127	2261	1922	2880	3249	2595
2006	2326	2837	2050	1604	2783	2891	2371

b) Weighted Country Averages

	All countries	Africa	Asia	Europe	Pacific	North America	South America
1980	390	489	361	247	849	356	233
1985	334	411	320	189	538	304	294
1990	260	347	255	151	262	209	266
1995	197	249	172	139	211	226	192
2000	214	274	193	147	218	247	208
2006	197	294	169	138	197	176	177

The rate at which barriers to trade have fallen has varied greatly across regions too. For example, trade costs in Africa fell by 26.9% compared with 29.9% in Asia and 42.2% in Pacific countries (based on the unweighted values). However, the pace of decline has been considerably slower in Europe and South America. These differences are a product of the pace and extent of globalisation. For example, the 'Tiger' economies of East Asia have historically had large current account surpluses and have been an outlet for extensive outsourcing and offshoring of production during the period. The substantial decreases in Pacific trade costs may be an indication of reductions in the cost of transport and improvements in information flows across borders due to the revolution in telecommunications.

The trend towards lower aggregate trade costs can also be seen to have an effect upon the distribution of trade costs across regions. In terms the standard deviation of trade costs (not reported in Table 6) there is a greater similarity in trade costs among South American countries than in the Pacific or North America. However, despite the general trend towards lower aggregate trade costs the dispersion across and within regions is large and far from constant

We consider also the impact of being landlocked upon aggregate trade costs. On average we find that landlocked countries' trade costs (unweighted) are 316 percentage points higher than the average coastal country. While this evidence is in line with that in Rauch and Trindade (1999) our figure is

considerably higher because we account for factors other than transport costs. Development also matters, not just because countries with greater economic mass have relatively higher exports but also because they can afford to make investments in infrastructure and institutions. We find that a one standard deviation increase in per capita GDP, equivalent to an increase of $9227, lowers (unweighted) trade costs by 211 percentage points. Finally, when we investigate how aggregate trade costs differ according to the country's legal origin, we observe that where the constitution is derived from German origins the average aggregate trade costs are approximately 1000%. For French, British and Scandinavian systems the figures are considerably higher at 2940%, 2816% and 1898% respectively. While certain legal systems may bequeath more regulations and barriers to trade it is also possible that these differences reflect the type of countries the European powers colonised. For example, the British and French empires contained many developing countries in Africa which have high trade costs due to their lack of development and distance from major markets. The same applies to many of the island economies located in the Caribbean.

6. Summary Conclusions and Directions of Further Research

This paper seeks to provide systematic evidence on overall trade costs for a large number of countries over the recent period of globalisation. We do this using a method recently proposed by Novy (2008), which uses a gravity framework to express bilateral trade costs in terms of the cost of supplying a specific export market relative to that of supplying the domestic market. This generates measures of bilateral trade costs which in turn can be aggregated across a common set of trading partners to produce an aggregate measure of each country’s trade costs. These (unweighted or weighted) measures provide credible measures of trade costs, and ones that are consistent with those based on the aggregation of direct measures of component elements of trade costs. Our approach has the advantage of allowing consistent measures over a much larger set of countries and much longer time period than would be possible with a (data-constrained and time-consuming) direct measurement method.

We show that there have been significant falls in general in trade costs over recent decades, but that there are marked variations in trade costs across and within the regions of the world. These differences are in turn shown to be driven by systematic differences of geography, history, policy and ‘endowments’ of institutions and infrastructure (associated in particular with the level of economic development).

The plan is to extend this work to explore whether trade costs fashion the composition, as well as volume, of trade.

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Appendix 1: Imputation Technique

Calculating trade costs relies upon information on a country's bilateral exports and on its aggregate output at basic prices, taken respectively from the IMF's Direction of Trade Statistics and the United Nations data base. In many instances information on output is missing (unreported or unavailable). To overcome this problem we use information on the ratio of output to GDP for each continent. This ratio is relatively uniform with continents and relatively stable over time, ranging, on average between 1.746 for Africa to 1.876 for the Pacific region countries. Where GDP data is available from the World Development Indicators we impute aggregate output at basic prices using the continental ratio between output and GDP.

Appendix 2: Aggregate Weighted Country Trade Costs

Table A1: Average (Weighted) Aggregate Trade Costs (%)

	Aggregate Trade Costs	
Country	**1980**	**2006**
Afghanistan	202	605
Albania		159
Algeria	118	130
Angola		127
Argentina	212	175
Armenia		200
Australia	141	145
Austria	154	102
Azerbaijan		154
Bahamas	2.5	160
Bahrain	198	490
Bangladesh	1007	171
Barbados	168	175
Belarus		140
Belgium		94
Belize	7208	333
Benin	394	195
Bermuda	667	188
Bolivia	187	156
Bosnia and Herzegovina		108
Brazil	248	154
Brunei Darussalam	108	158
Bulgaria	1920	120
Burkina Faso	358	197
Burundi	379	576
Cambodia		180
Cameroon	365	198

Canada	93	75
Cape Verde		384
Central African Republic	193	420
Chad	6681	205
Chile	268	146
China	108	91
Colombia	253	163
Comoros		740
Congo	157	151
Costa Rica	191	140
Cote d'Ivoire	151	296
Croatia		159
Cyprus	406	188
Czech Republic		87
DR Congo	239	209
Denmark	166	113
Djibouti		54
Dominica	577	288
Ecuador	145	141
Egypt	191	139
El Salvador	141	134
Eq. Guinea		161
Estonia		133
Ethiopia		200
Fiji	898	238
Finland	178	135
France	96	92
Gabon	643	185
Gambia	261	263
Georgia		189
Germany	264	76
Ghana	394	182
Greece	191	120
Greenland	492	220
Grenada	1199	255
Guatemala	217	143
Guinea	2284	303
Guyana	311	213
Haiti		210
Honduras	150	128
Hong Kong	163	40
Hungary	158	101
Iceland	176	177
India	253	132
Indonesia	238	127
Iran	1963	131
Iraq	1850	
Ireland	169	109
Israel	187	145
Italy	84	97
Jamaica	393	230
Japan	113	106
Jordan	217	163
Kazakhstan		127

Kenya	677	240
Republic of Korea	220	134
Kuwait	100	143
Kyrgyzstan		516
Laos		159
Latvia		147
Lebanon		173
Liberia	163	
Libya		121
Lithuania		113
Luxembourg		151
Macao		224
FYR Macedonia		141
Madagascar	384	227
Malawi	261	465
Malaysia	112	81
Maldives		194
Mali	977	585
Malta	189	212
Mauritania	5779	226
Mauritius	146	198
Mexico	123	78
Moldova		182
Mongolia		150
Montenegro		147
Morocco	290	148
Mozambique	2046	148
Nepal		178
Netherlands	82	71
New Zealand	207	214
Nicaragua	175	174
Niger	136	874
Nigeria	1887	134
Norway	129	407
Oman	119	136
Pakistan	396	164
Panama	140	187
Papua New Guinea	253	130
Paraguay	278	264
Peru	151	166
Philippines	201	110
Poland		99
Portugal	165	112
Qatar	189	115
Romania		119
Russia		96
Rwanda	110	383
Samoa		122
Sao Tome and Principe		1672
Saudi Arabia	106	115
Senegal	238	198
Serbia		411
Seychelles	92	210
Sierra Leone	146	289

Slovakia		104
Slovenia		134
Solomon Islands	2580	220
Somalia	160	
South Africa		178
Spain	149	102
Sri Lanka	623	184
St. Kitts and Nevis		209
St. Lucia		158
St. Vincent & Grenadines	1565	183
Sudan	173	172
Suriname	163	200
Sweden	131	113
Switzerland	126	108
Syria	219	96
Tajikistan		123
Tanzania		200
Thailand	195	101
Togo	126	190
Tonga	1500	276
Trinidad & Tobago	140	141
Tunisia	212	146
Turkey	145	125
Turkmenistan		202
Uganda	259	768
Ukraine		134
UAE	144	92
United Kingdom	101	102
United States	115	93
Uruguay	423	245
Uzbekistan		261
Vanuatu	2192	228
Venezuela	159	105
Vietnam		141
Yemen		137
Zambia	206	149
Zimbabwe	2189	

Notes: The values in the table are ad-valorem equivalents expressed in percentages. Weighted aggregate bilateral trade costs are calculated by taking the un-weighted bilateral trade cost and weighting according to the ratio of exports from country *i* to *j* divided by country *i*'s total exports.