

**THE IMPACT OF TRADE COSTS ON EXPORTS:
AN EMPIRICAL MODELLING**

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Abstract

Studies, which have discussed some of the important issues concerning the measurement of trade costs, have conceded that the literature is still in the early stages of understanding and measuring what the real costs are. It is in this context, decomposing trade costs into ‘natural’ costs, ‘behind the border’ costs, ‘explicit beyond the border’ costs, and ‘implicit beyond the border’ costs, this paper suggests a method to measure the impacts of these components on changes in exports between countries in the absence of complete information on all the components of trade costs in home and partner countries. Empirical measurement has been demonstrated using 1999 and 2004 trade data from Pakistan. The results show that Pakistan’s export growth between 1999 and 2004 came mainly from the reduction in both ‘explicit and implicit beyond the border’ trade costs in partner countries.

Keywords:

trade costs, export growth decomposition, behind the border costs, beyond the border costs, Pakistan.

JEL Classification: B41, C13, C82, F13, F19

1. Introduction

The well known hypothesis of Obstfeld and Rogoff (2000) is that trade cost is the key to explaining all the major puzzles of international macroeconomics. McCallum's (1995) analysis of the 'border puzzle', which concerns large unexplained trade costs incurred in the process of goods crossing over a national border, has raised several questions about trade costs and their empirical measurements. Using a gravity model, McCallum estimated the loss in trade volume arising from goods crossing the border of the US and Canada as compared to crossing provincial borders within Canada. The results indicate that 'beyond the border' trade costs are higher than 'behind the border' trade costs even for countries that are highly integrated through the North American Free Trade Agreement (NAFTA). Anderson and van Wincoop (2003) attempted to solve the 'border puzzle' using McCallum's data in a gravity model framework. They have modeled the bilateral resistance between the US and Canada as a function of distance and tariff equivalent of border costs between the countries, and thereby have calculated the multilateral resistance factors to be included in the gravity model.

With their specification, they were able to explain a significant size of the border puzzle. For example, McCallum (1995) found trade between USA and Canada was lower than trade within the borders of Canada by 2,200 percent (Anderson and Wincoop, 2003, p.171), but Anderson and van Wincoop (2003) with their specification of the gravity model reduced McCallum's unexplained border effect to 44 percent. However, researchers have argued that the Anderson and van Wincoop analysis has a number of limitations. To mention a few, the OLS estimation of the log linearized gravity model would lead to biased estimates in the presence of heteroskedasticity (Silva and Tenreyro 2006) or in the case of observations with no trade between countries (Silva and Tenreyro 2006, Westerlund and Wilhelmsson 2006). Also, recently, Balisteri and Hillberry (2007) noted that the assumption of symmetric trade costs by Anderson and van Wincoop (2003) to solve their model is unrealistic and concluded that the literature still cannot explain the border puzzle fully. Anderson and van Wincoop (2004) also commented that it is very difficult to understand and measure the real costs involved in trade between countries. The interesting question is: When the researcher does not have full information on all components of trade costs, is it possible to measure the influence of trade costs on trade?

It is in this context, drawing on from Kalirajan (2007), an alternative method of measuring the total impact of trade costs on the realized exports from home country to different partner countries, when the researcher does not have full information on all costs

affecting resistance factors in and out of the exporting country, is suggested. It is rational to argue that all costs affecting trade resistance can be grouped into the following categories: ‘natural’ transport costs; ‘behind the border’ costs; ‘explicit beyond the border’ costs; and ‘implicit beyond the border’ costs.¹ ‘Behind the border’ costs emanate from the existing infrastructural and institutional inefficiencies and rigidities in home country; ‘explicit beyond the border’ costs arise from tariffs and exchange rate on which home country does not have any control; and ‘implicit beyond the border’ costs emanate from the existing infrastructural and institutional inefficiencies and rigidities in partner country on which home country does not have any control. Also, it is realistic to assume that these components of trade costs would be changing over time. Therefore, it is useful to model and measure the total impact of these components of trade costs on home country’s exports. The impact of changes in these components of trade costs on Pakistan’s exports has been estimated separately for each of its trading partner in this paper as a demonstration of the workability of the suggested method.

The next section describes a simple trade cost structure, followed by a procedure to model trade cost in the gravity equation framework in section 3. In section 4, the results of the estimation and export growth decomposition in terms of different components of trade costs are discussed. Section 5 gives the conclusion and the policy implications of the study.

2. Trade Costs

Trade costs can be defined as the difference in the marginal cost of production of the domestic firm and the price paid by the end user in a foreign country. Unlike domestic trade, these costs are incurred in two different geographical regions; the costs incurred in the home country, and the costs incurred in the importing country.² For analytical and measurement purposes trade costs can be grouped into the following categories: ‘natural’ transport costs; ‘behind the border’ costs; ‘explicit beyond the border’ costs; and ‘implicit beyond the border’ costs. For example, for a good whose marginal cost of production is \$ 1 in the home country,

¹ Drysdale and Garnaut (1982) classified the resistances to trade as ‘objective’ and ‘subjective’ constraints, which respectively refer to ‘natural’ and ‘behind’ and ‘beyond’ the border barriers. Baldwin and Taglioni (2006) grouped the resistances to trade into ‘natural’ and ‘manmade’ barriers referring to ‘natural’ and ‘artificial’ constraints respectively.

² To simplify the argument, we assume that the border related costs in international trade like freight, insurance, tariffs, exchange rate and currency conversion etc. are part of the costs incurred in the importing country. The costs incurred in the exporting country include all the costs between the marginal cost of production and the f.o.b. It includes the search and transaction costs of the exporters, domestic transport costs, packing for exports, domestic duties and export licensing fees, customs and port procedures related costs etc. A similar set of costs is incurred in the importing country after the goods arrive in the importing country’s port, but which particularly includes the marketing costs and retailers and wholesalers margins.

the end user pays \$ $(1 + T(i,k) + T(j,k))$, where $T(i,k)$ is the cost incurred in the home country per dollar of the output of the good 'k' indicating the cost of 'behind the border costs' to exports; while $T(j,k)$ is the cost incurred in the importing country per $(1+T(i,k))$ dollars f.o.b. of imported goods. As $1 + T(i,k)$ is the f.o.b. price of the good; the $T(j,k)$ consists of two parts: (i) the $[(c.i.f./f.o.b) - 1]$, shows the transport cost factor to a particular destination 'j' and depends on $d(j)$, the distance between exporting and importing countries, and (ii) the $t(j,k)$ is the residual cost arising from two sources — the 'explicit beyond the border costs' of the importing country like the tariffs and exchange rates, and the 'implicit beyond the border costs' consisting of all other costs incurred on factors like customs and port procedures, internal transport procedures, storage and marketing costs.

The behind the border resistance factors in the exporting country, would incur some costs for exports to all countries, but there may be significant variation of the per unit total internal trade costs on exports towards different countries. This would lead to reduction in exports to the countries for which the 'behind the border' costs are higher than the most cost-efficient exports to other countries after controlling for factors like size and distance of the importing country. This variation in the exporter's ability to reduce behind the border trade costs could result from several factors. First, the exporters to different countries might have different levels of management skills and cost efficiencies. Secondly, the transaction costs for exports to certain countries may be significantly higher than others due to bilateral observation specific factors like language barriers, lack of communication infrastructure, and lack of long-term relations with the importers. For example, the zero or marginal trade between distant small countries is mainly due to the high initial fixed costs in search and information gathering (Westerlund and Wilhelmsson 2006).

Thirdly, the discriminating government policies towards certain commodities or countries increase the behind the border trade costs significantly. For example, the export of certain agricultural commodities need special licensing and permissions from specific government institutions, while export of other commodities does not require such special licensing. The cost of delay and licensing procedures in such cases would affect the exports of these commodities. Similarly, the foreign policy orientation of the exporting country significantly affects exports towards certain countries. The limited trade relations between Pakistan and India/Israel are examples of the impact of such political factors.

Fourthly, the relative costs on transport, storage, and shipment on certain commodities may significantly be higher than the costs on such expenditures for other commodities. The primary agricultural non-perishable commodities are examples due to their bulky low value

to weight characteristics. Similarly, the processing and storage costs of perishable agricultural commodities like meat, fruit and vegetables are significantly higher per unit value of good as compared to costs on such expenditures on industrial consumer goods like clothing and apparels etc.³ If the export structure to some countries were predominantly primary agricultural products, then exports to these countries would severely be affected by large hauling/storage charges as compared to industrial products exports to other countries. Fifthly, the specific technical restrictions of the importing countries would result in higher costs of post-production processing than the costs on similar goods to other countries. These technical barriers to trade (TBT) refer to the additional processing required on a good for exporting to a particular country in order to comply with the differing standard requirement from other partners (Brenton et al. 2001). Moreover, some category of goods is subject to more technical restrictions than others (Messerlin and Zarrouk, 2000), which results in higher post-production trade costs of these goods. This higher trade costs would reduce exports to the countries to which these goods are exported (see for example Otsuki, Wilson and Sewadeh 2000, 2001).

Therefore, the volume of exports from any country 'i' to another country 'j' depends not only on the relative factor abundance and the comparative advantage in production, but also critically on the overall trade cost structure between these two countries. However, as these costs are not fixed and changing over time, the export performance towards different countries would also be changing. For example, improvement in trade and transport facilitation in an importing country would reduce the 'implicit beyond the border' costs in that country and would increase exports from the focus country. Similarly, improvement in trade and transport facilitation measures in home country would reduce 'behind the border' trade costs and the exports to all the trading partners can possibly be increased due to such cost reduction.

The changes in exports over time can therefore be analyzed as coming from four major sources. First, exports do change due to demand expansion in the importing countries due to the increase in size and/or income per capita of the importing countries without any change in the 'behind the border' or 'beyond the border' trade environments. Second, the importing countries reduce the 'explicit beyond the border' trade costs to imports through tariff reduction and exchange rate rationalization policies. Third, the exporting country

³ Such argument would render the estimation of gravity equation more problematic if the transport cost varies across the destinations. It is more convenient to assume that the internal transport costs for industrial goods are negligible because the production for exports takes place mainly in the port city. But the agricultural goods need to be moved from across the country to reach the port city.

initiates domestic reforms in terms of trade and transport infrastructure, customs and port procedure reforms or investment in specialized processing and storage infrastructure, thereby reducing the ‘behind the border’ trade costs. Fourth, the partner countries take the reform measures by removing restrictions and regulations on trade, and undertake other trade facilitation measures, thereby reducing the ‘implicit beyond the border’ trade costs. More importantly, an appropriate method of decomposition of changes in exports that identifies the impact of each factor on overall change in exports and for each importing country is needed to assess the impact of trade policies and the need and direction for further reforms in the focus country.

3. Methodology

The determinants of flow of goods from a single country to its trading partners in a particular year are generally estimated using the gravity equation, popularised by Tinbergen (1962), Anderson (1979), Bergstrand (1985), Frankel (1993), and Deardorff (1995) among others, as follows:⁴

$$\ln Ex_{ij} = B_0 + B_1 \ln Pop_j + B_2 \ln GDPPC_j + B_3 \ln Dist_j + B_4 \ln(1+T_{j,i}) + B_5 \ln RER_{i,j} + v_j \dots\dots\dots (1)$$

Where ‘i’ refers to exporting country and ‘j’ refers to importing country. Pop_j is population of country ‘j’; $GDPPC_j$ is per capita GDP of country ‘j’; $Dist_j$ refers to distance between i and j; $T_{j,i}$ is the tariff rate of the importing country ‘j’ and $RER_{i,j}$ is the real exchange rate between i and j; and v_j is a normally distributed statistical error term.

The above model is generally estimated using the OLS method. However, the above gravity model and the estimation procedure suffer from several limitations. The theoretical gravity model (Anderson 1979) indicates that after controlling the factors like income and size of the countries, the exports from region ‘i’ to region ‘j’ depends on the bilateral resistance between these two regions relative to the trade weighted resistance facing ‘i’ with all other countries of the world, which is referred to as the multilateral resistance factor. Until the multilateral resistance term is included in equation (1), it suffers from the omitted variable problem and the estimated coefficients would be biased (Anderson and van Wincoop, 2003). The best measure of bilateral resistance to trade between two regions would be the percentage price change in uniform currency as the goods are traded between these regions. However, as

⁴ Greenaway and Milner (2002) have provided an excellent survey on the use of gravity models in the analysis of regional trade agreements.

the price data is not always available and price indices include non-traded goods, Anderson and van Wincoop (2003) have modeled bilateral resistance as a function of distance and tariff equivalent of border costs between the countries, and thereby have calculated the multilateral resistance factors to be included in the gravity model.

However, besides the resistance factors emerging from distance and symmetric border costs between countries, the presence and variations in ‘behind the border’ trade costs in home country, and the ‘implicit beyond the border’ costs in the importing countries do exert influence on trade, which needs to be included in the gravity model. This issue can be solved by using panel data with fixed effects (Matyas 1997), if the bilateral country specific resistance terms are supposed to be time-invariant. However, this solution has limited applicability because: (i) the assumption of time-invariant fixed resistance factors may be implausible in case of long panels, and (ii) the model lacks any theoretical foundation.

As the gravity model is used most frequently for cross-section data, Egger (2005) provides tests and conditions for using the alternatives among OLS, Fixed Effects Model (FEM), Random Effects Model (REM) and the Hausman–Taylor Model. He concludes that OLS, which is generally the standard method of cross-section gravity model estimations, can be used only when there are no unobservable factors that influence trade between the two countries both from the exporters and the importers sides. In order to satisfy this condition, many researchers have used additional variables to proxy for the resistance factors in the exporting and importing countries, in addition to the conventional terms in the gravity model. For example, Wilson, Mann and Otsuki (2003, 2004) have used measures of port efficiency, customs environment, regulatory environment, and public sector infrastructure in the gravity model along with other variables. De (2006) used a measure of trade mobility infrastructure of both exporting and importing countries; the index constructed using a number of factors that show behind and beyond the border trade resisting factors of these countries. The advantage of inclusion of such proxy terms is that the impact of each resistance factor on the exports/imports can be estimated and their relative importance can be identified. However, the applicability of this method is limited in the sense that appropriate measures of all costs are not available for any set of countries, and for different time periods.

Following Kalirajan (2007), in the absence of complete information on all the components of trade costs in home and partner countries, the gravity equation can be estimated using the modeling and estimation methods developed by Aigner, Lovell, and Schmidt (1977) and Meeusen and van den Broeck (1977) for stochastic frontier production functions is as follows:

country's 'behind the border' trade costs in period 2. Therefore, potential export growth due to reduction in 'implicit beyond the border' trade costs can be measured by the vertical distance between the frontier in period 1, F_1 (i.e., Y_1^*) and the frontier in period 2, F_2 (i.e., Y_1^{**}) evaluated for the same levels of determinants of exports such as GDP, GDPPC, Distance, RER and Tariffs.

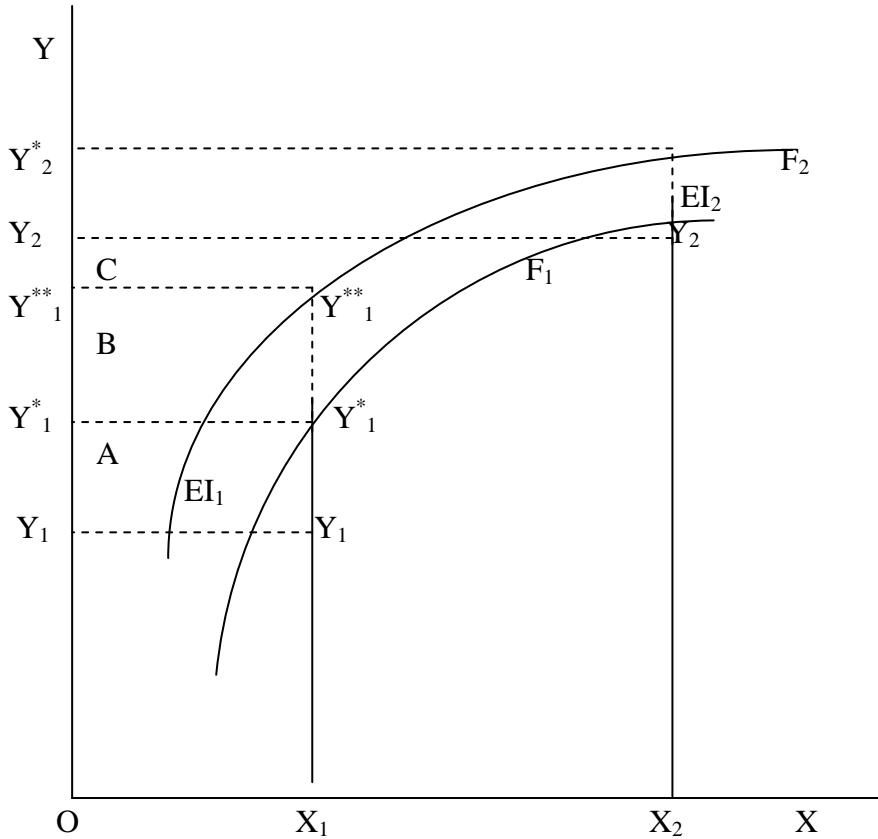


Fig 1: Export Growth Decomposition

The changes in realized exports can, thus, be decomposed into exports due to the changes in demand, changes in 'explicit beyond the border' trade costs in importing country, changes in 'implicit beyond the border' trade costs in importing countries, and changes in 'behind the border' trade costs in home country over time as follows:

$$\begin{aligned}
 D &= Y_2 - Y_1 \\
 &= A + B + C \\
 &= [Y_1^* - Y_1] + [Y_1^{**} - Y_1^*] + [Y_2 - Y_1^{**}] \\
 &= [Y_1^* - Y_1] + [Y_1^{**} - Y_1^*] + [Y_2^* - Y_1^{**}] - [Y_2^* - Y_2] \\
 &= \{[Y_1^* - Y_1] - [Y_2^* - Y_2]\} + [Y_1^{**} - Y_1^*] + [Y_2 - Y_1^{**}] \\
 &= \{EI_1 - EI_2\} + CIBBC + GCD
 \end{aligned}$$

where,

$EI_1 - EI_2$ = Difference between export inefficiency in period 1 and period 2 stemming from changes in ‘behind the border’ trade costs in home country.

CIBBC = Change in exports due to the trade facilitation steps taken by the partner countries, leading to changes in ‘implicit beyond the border’ trade costs.

GCD = Changes in exports due to the sum of changes in the core natural determinants of trade like the size, income per capita, and changes in ‘explicit beyond the border’ trade costs, which include tariffs and exchange rates.

As explained above, the changes in exports between two periods may possibly result from the reduction in ‘behind the border’ costs over time through home country’s domestic reforms; reduction in both ‘explicit and implicit beyond the border’ costs’ in partner countries; and increase in export demand in partner countries. It is more interesting to examine: (a) to which countries Pakistan’s exports increased from 1999 to 2004 due to the reduction in ‘behind the border’ trade costs? and (b) with which countries Pakistan’s exports grew due to the reduction in ‘implicit beyond the border’ trade costs that occurred in partner countries during the period of analysis?

4. Discussion of the Results

4.1 Data

The aggregate export data of Pakistan were taken from the UN COMTRADE database, while the data on variables like population and gross domestic product for importing countries were taken from WDI CD 2006. Any missing data on these variables was taken from the website of UN National Accounts database. The data on tariff were taken from TRAINS. The trade weighted average tariff of the importing countries with respect to imports from Pakistan was taken for the years under study.⁵ The data on Real Exchange Rate were calculated from the Nominal Exchange Rate (US\$ per unit of foreign currency) by using the GDP deflators of the importing country and the United States for each period. The data on Nominal Exchange Rate and GDP deflators were taken mainly from the International Financial Statistics Yearbook 2006, and the missing data on GDP deflators for a few countries were taken from WDI CD 2006. The distance between Pakistan and each of the importing country was taken mainly from the distance given in US Marine Distance Calculator, which gives the distance between the major port cities of the exporting and the importing countries.

⁵ However, if the tariff rate for the year under study was not available, the trade-weighted tariff of the adjacent year was taken as the tariff of the year under analysis. If such tariff rate for both the previous and the following years was available, then a simple mean average of the tariff of both the years was taken as the tariff rate of the year of analysis.

4.2 Analysis of Results

Pakistan's total exports in 1999 were US\$ 8.38 billion, which increased to US\$ 13.4 billion in 2004. The growth in exports, which was around 10% per annum, was much better than the growth in exports during the previous decade when it remained between 5–6% per annum. Moreover, unlike the previous decade, the exports growth since 1997 has been monotonous, with sudden jumps in 2002 and 2005. The fluctuation in Pakistan's exports can possibly be explained in terms of the supply line constraints within Pakistan, or in terms of the demand shocks. This may particularly be important because Pakistan's exports are highly concentrated both in terms of commodity groups and markets. For example, around 60% of the total exports are cotton manufactures, and around 50% of the total exports usually go to only 7 countries (US, Germany, Japan, UK, Hong Kong, UAE, Saudi Arabia) (Ministry of Finance, 2006–07). It may be noted that since 1995–96, there has neither been any significant change in the composition of exports nor in the export markets. It is in this context that we need to explain the sources of exports growth during 1999–2004.

For empirical analysis, 79 countries of Pakistan's trade partners were selected. The exports to these 79 countries were well above 80% of total exports in each period, the sample therefore is fairly representative. Total exports to these 79 countries were US\$ 7.15 billion in 1999 and US\$ 10.91 billion in 2004. The data includes Pakistan's major trading partners and regions, except UAE for which the tariff rate for 1999 was not available, and therefore was excluded from the estimation and comparative static analysis.

4.2.1. Export Losses due to 'Behind the Border' Trade Costs

The estimation results for the cross-section estimation of gravity model with the assumption of a composed error term are given in Table 1 separately for 1999 and 2004. Equation (2) was estimated using 1999 and 2004 data separately with the assumptions of a half normal distribution and a full normal distribution respectively for the one sided error term, u representing the impact of 'behind the border' trade costs and the statistical error term v representing the impact of 'implicit beyond the border' trade costs and conventional statistical errors. The distribution assumptions can be statistically justified on the basis of the significance levels of λ , which is the ratio of the standard deviation of the one-sided error term ' u ' to the standard deviation of the statistical error term ' v ', and the coefficients of the gravity model.

Table 1: Maximum Likelihood Estimates of the Stochastic Frontier Gravity Model
Dependent Variable: log of Exports

Independent Variables	Estimation for 1999	Estimation for 2004
Log of Population	0.798043 (0.0732453)***	0.8514847 (0.0769822)***
Log of per capita GDP	0.5721636 (0.1178764)***	0.5279272 (0.1153071)***
Log of Distance	-0.6782446 (0.2254659)***	-0.6775326 (0.2028684)***
Log of tariff	-5.595105 (1.965947)***	-2.848032 (1.913066)"
Log of Real Exchange Rate	0.0876627 (0.05947)"	0.1117691 (0.0561262)**
Constant	6.527939 (2.74861)**	5.994246 (2.62489)**
Number of Observations	79	79
Model Specification	Chi 2(5)= 214.94***	Chi 2(5)=197.43***
Lambda	1.418728 (0.3616949)***	1.445083 (0.6863188)**

Notes:

1. ** and *** show the significance at 5% and 1% level respectively, while " shows significance at the 15% level.
2. Tariff variable means 1+ (tariff rate/100)
3. The null hypothesis of Wald Test for Model Specification is that all coefficients are zero.

All the coefficients in both the models are of expected signs and are statistically significant at least at the 5% level with the exception of the coefficient of the log of Real Exchange Rate in 1999 and Tariff Rate in 2004, which are significant at the 15% level. Moreover, lambda is significant in both the periods, which shows that the observation specific ‘behind the border’ trade costs had caused significant variations in exports in each period. Moreover, all the coefficients seem to be stable over time except that of tariff, which changed from -5.95 in 1999 to -2.84 in 2004. This shows that the tariff rates of the partner countries on Pakistan’s exports have become less relevant on average in terms of trade restrictiveness during this time. This is an indication for the effectiveness of reduction in ‘explicit beyond the border’ trade costs in importing countries. The coefficient of log of population increased only marginally from 0.798 to 0.851 during this period, showing that the exports have remained mainly focused on low value added products. This conclusion is further supported by the fact that the coefficient of per capita income is lower than that of population in both periods and has decreased from 0.572 to 0.527 during this period. The elasticity of demand with respect to size (population) is higher than that of income (GDP per capita) in both periods, showing lower overall value added characteristics of exports of Pakistan.

The export losses incurred with an individual trading partner country in any period, due to the impact of ‘behind the border’ trade costs, for the given level of ‘implicit beyond the border’ trade costs, are calculated as the difference between the level of exports that would have happened in the absence of ‘behind the border’ trade costs ($u=0$) and the actual

exports that occurred in the presence of ‘behind the border’ trade costs ($u \neq 0$). While the former exports may be called as ‘potential’ exports, the latter may be called as ‘realized’ exports. The total export losses with all trading partner countries due to ‘behind the border’ trade costs in 1999 worked out to be US\$ 5.4318 billion. The largest losses were observed with respect to exports to Japan (US\$ 717.58 million), China (US\$ 712.61 million), India (US\$ 618.66 million), Italy (US\$ 374.9 million) and to Germany (US\$ 337.4 million). It is noteworthy that the export losses with respect to the three trading partners Japan, China and India, worked out to be almost half of the total export losses in 1999.⁶

The total export losses in 2004 doubled compared to losses in 1999, and amounted to US\$ 10.53 billion. The largest losses were associated with China (US\$ 2425.9 million), India (US\$ 2120.29 million), Japan (US\$ 985.59 million), Germany (US\$ 595.6 million), and France (US\$ 557.7 million). It is interesting to note that almost half of the total export losses in 2004 were due to the losses with respect to only China and India, and that the losses to these two fast growing neighbors in 2004 seem to be almost equal to the total export losses in 1999. We need to interpret this increase in losses with caution. Does the increase in cumulative losses suggest that the ‘behind the border’ trade costs have increased over time in Pakistan?

Table 2: Pakistan’s export losses due to ‘behind the border constraints’ (top 10 countries) (in US\$)

1999		2004	
Countries	Export losses	Countries	Export losses
Austria	130964303	Spain	221076092
Spain	175954246	Poland	227142342
Switzerland	193300278	Brazil	278736990
Turkey	296772697	Turkey	280775722
France	324241880	Italy	364182630
Germany	337403300	France	557705978
Italy	374926408	Germany	595608024
India	618665342	Japan	985592113
China	712618939	India	2120290392
Japan	717585620	China	2425978345

On the positive side, the export losses between 1999 and 2004 decreased (or the gains increased) in the case of 21 out of 79 countries, showing that Pakistan’s domestic policy reforms during this period had contributed towards reducing ‘behind the border’ trade costs

⁶ Due to stochastic nature of frontier estimation, the exports to 17 countries in 1999 and 14 countries in 2004 were higher than the predicted potential exports.

for exports to these countries. The largest additional gain between 1999 and 2004 due to domestic reforms was through higher exports to USA (US\$ 250.29 million), Nigeria (US\$ 236.9 million), Hong Kong (US\$ 97.87 million), Iran (US\$ 72.62 million) and to UK (US\$ 56.02 million). The total additional exports earnings through domestic policy reforms to these 21 countries worked out to be US\$ 905.72 million. However, the biggest increases in export losses between 1999 and 2004 were identified with respect to China (US\$ 1.71 billion) and India (US\$ 1.50 billion), followed by Japan (US\$ 268 million), Germany (US\$ 258 million) and France (US\$ 233 million). It is interesting to note that the additional losses to China and India from 1999 to 2004 alone were half of the total additional losses to all the countries included in the analysis.

The pattern of additional losses/gains shows that Pakistan could enjoy additional gains through its domestic policy reforms mainly due to exports growth to more stable and traditional export markets like USA, Hong Kong, UK and to some middle income countries particularly from Africa like Nigeria, South Africa and Kenya. However, the additional losses seem to be mainly with respect to the fast growing economies of China and India. The inability to expand exports in the fast growing economies shows the lack of dynamism and diversity in the export structure of Pakistan. When the economies grow rapidly, it is obvious that the nature and pattern of demand in those countries also change rather at a faster pace as compared with slow growing countries. The exporters face two types of constraints in exporting to such fast growing economies. First, they need to know that the demand for which particular type of goods would expand faster than traditionally exported goods; secondly, the trade costs of the higher growth sectors has to be kept comparable with the trade costs of the more traditional sectors. The ability of the production and trade environment of a country to adjust in a costless and quick way to changing demands can ensure the required level of growth of exports to the fast growing countries. However, this dynamism seems to be lacking and severely restricting the prospects for growth of exports to the two fast growing large countries China and India.

4.2.2 Export Losses due to ‘Implicit Beyond the Border’ Trade Costs

Another important source of growth in exports is the trade facilitation measures taken by importing countries that result in the reduction in the impact of ‘implicit beyond the border’ trade costs. The impact of such trade facilitation policies of the partner countries on the potential exports of Pakistan can be measured as the difference between Y_1^{**} and Y_1^* in Figure 1. In other words, simply, the measure is the difference between the level of Pakistan’s

potential exports in the absence of ‘behind the border’ trade costs in period I and the level of Pakistan’s potential exports in the absence of ‘behind the border’ trade costs in period I, had the second period export environment of reduced ‘implicit beyond the border’ trade costs existed in the first period, for the same given level of the core determinants of exports including the ‘explicit beyond the border’ trade costs in equation (2) above.⁷

It appears that the partner countries of Pakistan on average have taken appropriate measures towards trade facilitation during this period leading to reduction in ‘implicit beyond the border’ trade costs. Due to these reductions in ‘implicit beyond the border’ trade costs in the partner countries during 1999–2004, the largest export potential expansion for Pakistan was identified with respect to India (US\$ 1.067 billion) and China (US\$ 716.81 million) followed by USA (US\$ 565.96 million), Germany (US\$ 220.73 million) and UK (US\$ 157.31 million). Again, the trade facilitation of the two giant economies of India and China could increase Pakistan’s export potential to these countries by an amount that was almost half of the total export potential expansion through trade facilitation by all other countries in the sample. At the same time, some countries (9 in total) were becoming more restrictive in terms of their imports from Pakistan, and the potential exports to these countries decreased during this period. As can be seen from Table 3, six of these nine countries are the European Union members, and except for Maldives all these countries may be grouped as high-income countries.

Table 3: Top 10 countries with respect to Pakistan’s Export Gains and Losses due to changes in ‘behind the border constraints’ between 1999 and 2004.

Countries	change	countries	change
Turkey	15996975	China	-1713359406
Belgium	17180958	India	-1501625050
Netherlands	24381584	Japan	-268006493
Kenya	35483257	Germany	-258204724
South Africa Customs Union	43277106	France	-233464098
United Kingdom	56024070	Brazil	-149042572
Iran	72627184	Canada	-121906122
Hong Kong	97876027	Indonesia	-107502408
Nigeria	236912036	Poland	-104253744
USA	250298981	Egypt	-86309206

Note: Positive sign shows reduction in losses/additional exports during the two periods; and the negative sign shows the increase in losses.

⁷ Although, the exports in both periods are measured in log forms, we take their exponentials and then their differences in order to be more specific and explicit.

It seems unlikely that these additional beyond the border resistances in the above EU members and other countries could have resulted from the deterioration of infrastructure or the port and customs procedures becoming more cumbersome. The plausible reason for this increased resistance factors in those nine countries could be due to the strict adherence to TBT and SPS policies in these countries, which are cited in other studies as well (see for example Otsuki, Wilson and Sewadeh 2000, 2001). This conclusion is consistent with the findings of several exporters' surveys in Pakistan which concluded that inability to meet the qualitative standards is the most important constraint to existing exports as well as any expansion in exports (World Bank and UNIDO 2005; PIDE 2007). The decline of potential exports to the developing countries could either be due to deterioration of infrastructure and policies and procedures on imports or due to the implementation of quality standards more rigorously, which Pakistan's exports could not meet with.

5. Conclusions

Trade costs play a crucial role in determining the level of trade that occurs between countries. In spite of its importance, less attention has been paid in the literature on modeling and measuring its impact on trade between countries. Those studies, which have discussed some of the important issues concerning the measurement of trade costs, have conceded that the literature is still in the early stages of understanding and measuring what the real costs are. It is in this context, decomposing trade costs into 'natural' costs, 'behind the border' costs, 'explicit beyond the border' costs, and 'implicit beyond the border' costs, this paper suggests a method to measure the impacts of these components on export growth between countries in the absence of complete information on all the components of trade costs in home and partner countries. The conventional gravity model framework has been modified to incorporate the different components of trade costs. The econometric error components methods used to estimate stochastic frontier production functions have been applied to estimate the modified gravity model. Empirical measurement has been demonstrated using 1999 and 2004 trade data from Pakistan.

The sources of export growth of Pakistan during 1999–2004 have been identified. The results show that Pakistan's exports to some of its partner countries grew mainly due to the reduction in both 'explicit and implicit beyond the border' trade costs and due to increased demand in partner countries between 1999 and 2004. On the other hand, 'behind the border' trade costs within Pakistan have led to larger export losses in 2004 particularly with respect

to China and India. The focus of the trade policy should be faster and on more effective domestic reforms, investment in trade infrastructure and institutions, training and streamlining of exporters and manufacturers, and establishment of closer trade ties with the importers through Pakistan's Missions abroad. Particularly needed are comprehensive market studies for China and India, and providing an enabling environment for the growth of the sectors in Pakistan for which the demand is growing faster in China and India.

Table 4: Impact of Changes in 'Implicit Beyond the Border Constraints' (Top 10 countries) during 1999-2004 on Pakistan's Exports

Countries	Gain	Countries	Loss
Spain	76359230	Switzerland	-33888315
Turkey	113470694	Hong Kong	-30170735
Brazil	115772875	Norway	-3837860
Italy	143991160	Czech Rep.	-3223599
France	144282928	Estonia	-2825774
United Kingdom	157317072	Luxembourg	-1333228
Germany	220732670	Malta	-121409
USA	565960357	Maldives	-68449
China	716816186	New Zealand	-51478
India	1067980374		

Note: Negative sign shows reduction in Pakistan's exports due to more restrictive trade environment existing in those countries.

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