Differential Effects of Internal and External Remoteness on Trade Flows: The Case of Pakistan

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Abstract

Following the decline in international trade costs over time, attention is increasingly drawn to trade-inhibiting effects of relatively high behind-the-border trade costs arising from the dispersion of economic activity and poor transport network, especially in developing countries. This study differentiates the trade-impeding effects of internal remoteness from trade-processing infrastructure from those of external remoteness from export markets. Using a novel dataset that identifies the locations of manufacturing facilities and modes of shipment over time, it finds that the marginal effect of domestic distance to sea ports is almost double that of international distance to export markets. Both distances have heterogeneous effects along trade margins. Domestic distance impedes exports primarily through extensive margins (EM) of firms and product, whereas international distance restricts these mainly through quantity margins, in addition to constricting the EM. Although the trade-impeding effects of both components of distance have reduced over time, the drop has been relatively greater for the international leg. These findings imply that reducing inland transportation costs can boost exports though the channels of 1) entry of more firms into exporting and 2) widening of the export product set.

Keywords: Trade costs, transportation mode, remoteness, structural gravity, trade margins, Pakistan,

JEL Codes: F1, F14, O18, R12

Disclaimer

This study uses administrative datasets of the Government of Pakistan, some of which are completely confidential in nature. As an internal researcher, I have accessed this information purely for this research work and taken extreme care to ensure its confidentiality. Most of the analysis was completed during my research visits to Pakistan. The research datasets may not reproduce the exact aggregates reported in the government publications. The use of administrative data in this work does not imply the endorsement of the organizations in relation to the interpretation or analysis of the information. All errors and omissions are solely the responsibility of the author.

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1 Introduction

A typical trade consignment involves both domestic and international transportation, with possible transhipments at gateway sea ports, airports or land crossings. Quantitative models of international trade use mainly remoteness between trading partners in gravity estimations and find robust evidence on its trade-impeding effect (for a survey see Head and Mayer, 2014). A separate strand of literature examines the role of behind-the-border trade costs and shows the domestic component of trade cost is higher in developing countries in particular[2](Coşar and Demir, 2016; Donaldson, 2015; Van Leemput, 2016). This paper attempts to juxtapose these two streams of literature and generates quantitative evidence on the differential effects of both segments of distance on firm-level trade flows. It distinguishes the trade-impeding effects of internal remoteness from trade-processing facilities from those of international remoteness of export markets and finds that the marginal effect of inland component is almost twice that of international element. Both distances inhibit trade flows through different channels: internal remoteness shrinks mainly the extensive margin (EM) of firms and products, whereas external remoteness, besides restricting the EM, has a relatively large effect through quantity margins.

To compare the effects of domestic and international remoteness, this paper use a novel dataset that tracks the locations of firms' manufacturing facilities and modes of shipments in Pakistan. It measures the remoteness of firms' production facilities within the country to gateway sea ports and use the inland distances as an additional regressor in gravity estimations together with the international component of distance (to markets of trading partners). Following estimation of the overall trade-impeding effects of both distances, it deconstruct the estimated coefficients along the relative responses of EM of firms and products as well as margins of prices and quantities. Finally, it explores heterogeneity in the responses of trade margins across sectors and over time. A main challenge in this kind of analysis is to overcome the issue of potential endogeneity of internal remoteness arising from firms' choice of manufacturing locations. Exporting firms may decide to build a plant at a particular location to serve the domestic market (in addition to exporting) or use local inputs or benefit from externalities of industrial clusters. Although these issues have no definitive solution, this article attempts to circumvent them by using the rich datasets

[2] For instance, Atkin and Donaldson (2015) find that intra-national costs in Ethiopia and Nigeria are four to five times larger than those for the US.

on domestic sales and purchases of these firms, along with information on intra-country trade flows and the historical pattern of entry of firms into exporting.

The main contribution of the paper lies in its comparison of the trade-restricting effects of internal and external distances, which Coşar and Demir (2016) do not examine, as they focus exclusively on the inland component. These scholars examine the effect of improvements in internal transportation infrastructure on regional access to international markets in Turkey and find that the effect is transmitted through the EM. In another closely related paper, Crozet and Koenig (2010) include domestic transportation distances for French exports to adjacent countries in estimations to compute the structural parameters of Chaney's (2008) model. In contrast with these studies, this paper examines the differential effects of domestic and international elements of distance. Compared with France and Turkey, Pakistan is at a much lower stage of development[3] with poor infrastructure and long inland haulages. Theoretically, all firms are within the same country, but practically speaking their manufacturing base may be thousands of miles away[4] from export-processing stations (see Table 2). This empirical setting is therefore typical of a developing economy.

The second contribution of this paper is to extend the micro-literature on the response of trade margins to trade costs. Existing studies in this stream (e.g. Bernard et al., 2007; Eaton et al., 2004; Mayer and Ottaviano, 2008) explore the responses of trade margins to the international component of trade costs. This paper applies a similar methodology to decompose trade flows into multiple margins and confirms the above studies' findings regarding the reactions of trade margins to the international component of trade costs. In addition, it informs on the effects of the domestic element of trade costs on trade margins as well, which above studies do not explore. In another stream of literature, Hillberry and Hummels (2008) focus on the effects of domestic spatial frictions on intra-national shipments in the US, and Limão and Venables (2001) examine the effect of geography on transportation costs and trade volume across countries. By contrast, this paper explores the implications of internal and external remoteness for

[3] The behaviour of exporters have been found to vary with the stages of development (Fernandes et al., 2016).
[4] Average inland transportation distances from manufacturing locations to main sea ports for some economies vary from 500 km to more than 1,000 km (see Table A1 in the appendix) and for Pakistan they vary from 50 km to more than 2,500 km (Table 2).

international consignments originating from a developing economy and reveal the precise channels of their influence.

The examination of responses of trade margins improves our understanding of the mechanisms of influence of domestic and international trade costs. Existing literature shows that these costs inhibit entry of firms into export markets (ADBI, 2009; Albarran et al., 2013), affect the pattern of regional specialisation (Coşar and Fajhelbaum, 2016) and impede firms from moving up the value chain ladder (OECD/WTO, 2015). In extension of these studies, this paper shows that the internal and external components of trade costs have a heterogeneous effect on trade margins. The internal element operates primarily through the EM of firms and products and thus impedes the entry of firms and diversification of exports, whereas the external element mainly restricts quantities of shipment. These results complement the findings of Milner and McGowan (2013) regarding the impact of trade costs on trade composition. Milner and McGowan (2013) find that trade costs influence the export mix of OECD countries. This paper generates micro-level empirical evidence to the effect of trade costs in a developing country, which shrink the EM of firms and products, two basic elements of trade composition.

The third contribution of this article is to extend the literature on transportation infrastructure. In this vein of literature, Hummels (2007) provides a detailed accounting of the time-series pattern of shipping costs and shows that the ad-valorem impact of ocean shipping costs is not much lower today than in the 1950s. In the earlier work, Limão and Venables (2001) show that the per unit cost of overland transport in the US is higher than that of the sea leg. Rousslang and To (1993) find that domestic freight costs for US imports are of the same order as their international component. This paper shows that the marginal trade-inhibiting effect of distances along road is much larger than through sea transports, which corroborates the findings of these studies. It further informs on the transmission mechanisms and heterogeneity of the effect across products and over time.

The findings regarding variation in the distance effect over time add to the literature on "Distance Puzzle"[5], a well-known challenge in international trade. Some refer to this phenomenon as the "missing

[5] Levinsohn (1995, 1387–1388) stated that the effect of distance on trade patterns is not diminishing over time.

globalisation puzzle" (Coe, Subramanian, and Tamirisa 2007; Coe, Subramanian, Tamirisa, and Bhavnani, 2002), or "the conservation of distance in international trade" (Berthelon and Freund, 2008). The debate is still unsettled: Brun et al. (2005) argue that "distance has died", while Carrere and Schiff (2005), state that "it is alive and well." This study adds another dimension to this debate. It finds some evidence of drop in trade-impeding effect of international element of distance; moreover it shows that the effect of domestic element has not changed much over time, however.

This study uses an administrative dataset from Pakistan that is being used for the first time for such empirical research work. This dataset is unique in many respects. First, in addition to tracking firms' production locations and modes of shipments, it identifies products at the eight-digit level of the Harmonised System (HS) of classification and thus allows estimation of a relatively precise role of the extensive margins. Second, its coverage of the recent period and its long timespan (2000–2014) makes it possible to examine the reactions of trade margins over time. Third, it encompasses the population of exporters in manufacturing and agriculture sectors, whereas many existing datasets are limited in coverage to manufacturing firms. Since agriculture is an important component of exports from many developing countries in Asia, Africa and South America (Hanson, 2012), analysis based on the data of firms in all sectors helps in generalising the results to other economies.

This paper thus contributes to the literature as the first paper (to the best of my knowledge) that explicitly investigates the differential effect of trade flows to domestic and international elements of remoteness by using unique datasets from a developing country.

This study therefore adds a new dimension to the micro-literature on firms and has development policy implications as it informs on the precise channels of influence of these costs, in addition to estimating their magnitude. The structure of the paper is as follows. Section 2 introduces the data and presents preliminary evidence. Section 3 discusses the empirical strategy and Section 4 presents the estimation results and robustness checks. Section 5 deconstructs the responses of trade flows along trade margins and Section 6 concludes by highlighting the policy implications of this work.

2 Data Description and Preliminary Analysis

2.1 Background

This research uses primary data sources of Pakistan[6]. Pakistan is the 26th largest economy globally and is characterised as being among the emerging and growth-leading countries of the developing world. In terms of size, Pakistan is the 36th largest country, with an area covering 881,913 km^2 (340,509 square miles). It is bordered by India to the east, Afghanistan to the west, Iran to the southwest and China to the far northeast. Its 650-mile coastline along the Arabian Sea in the south has two sea ports, Karachi and Qasim, which handle 90% of Pakistan's exports (Table 1). Around 50% of exports originate from the coastal belt and the remainder from the hinterland. Exporting firms based in hinterland regions either directly transport goods to sea ports or use inland export-processing stations that are linked to these ports (Figure 1). Road transport is the primary mode of inland freight transportation and road distances from industrial areas in the hinterland to the sea ports vary from 50 km to more than 2,000 km. As sea ports are quite distant from the manufacturing locations of many firms, it makes domestic transportation potentially an important element of trade costs.

2.2 Trade Data

Micro-level information on various margins of firms and products is retrieved from the national database of Pakistan Customs. This dataset contains information on export values, HS8 product codes, prices and quantities for the universe of firms exporting to 190 export markets. Details on the firms' spatial locations come from the records of the Pakistan Inland Revenue Services (IRS). Both datasets (Customs and IRS) identify firms by the same unique identification code, their National Tax Number (NTN), which facilitates merger of the data. The merged dataset informs on the location of firms' production facilities, identities of trade-processing stations and modes of shipments (sea, air and land). This additional information allows us to examine the effect of remoteness arising as a result of the dispersion of production and exporting activities within the country.

[6] These datasets are subjected to a confidentiality agreement with the author. Most of the information is, however, available from the Export Dynamics Database of the World Bank.

Figure 1: Export-processing Infrastructure in Pakistan

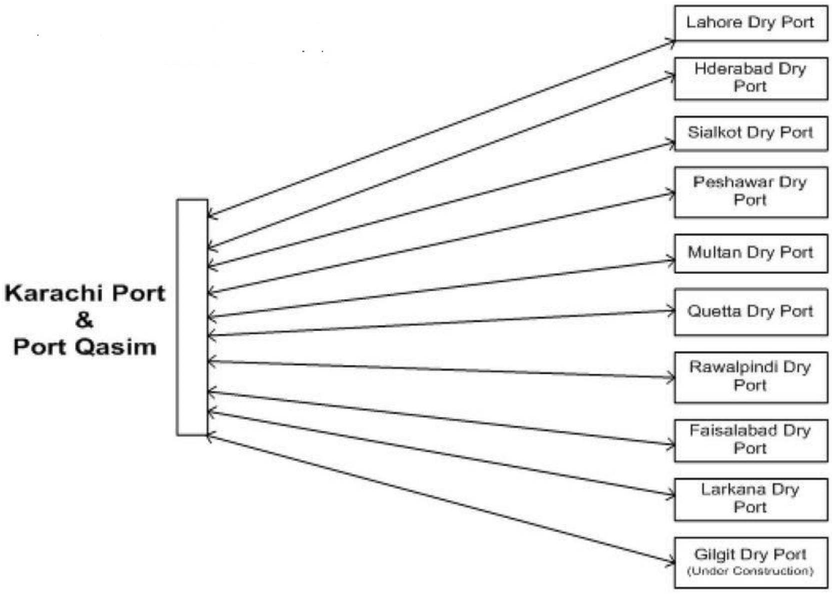


Table 1: Snapshot of Pakistan's Exporting Sectors in 2014

Category		Exports		Firms		Products		Markets	
		Value	%	#	%	#	%	#	%
Spatial distribution of manufacturing for exports	Hinterland	1,235	50	7,362	44	3,496	83	182	96
	Coastal region	1,228	50	9,283	56	3,194	76	186	98
Modes of shipment	Sea	2,204	89	12,335	74	3,690	88	179	95
	Air	246	10	9,701	58	2,650	63	183	97
	Land	13	1	429	3	108	3	11	6
	All	2,463		16,645		4,200		189	

Notes: The data presents the distribution of exports, firms and products along spatial dimensions, as well as along modes of shipment for the most recent year (2014). Export values are in PKR billions. Products are identified at an eight-digit level of Harmonised System (HS). Coastal region indicates manufacturing areas near the sea ports of Karachi including industrial zones in five districts, and hinterland represents all up-country regions of Pakistan. The nearest hinterland industrial region (Hyderabad) is 150 KM from Karachi.

As exports through sea ports are a major component of the overall exports[7] of the country, this paper restricts the analysis to shipments by sea only. The data contains 16.1 million transactions for the period 2000–2014. For ease of estimation, I construct trade flows and trade margins for five administrative regions of Pakistan at the sector-market-year level, following Comtrade's broader classification of products in 16 groups. This transformation yields 66,416 observations, of which 38,538 pertain to hinterland firms and remainder to those located in coastal region. In addition to export data, the paper

7 Sea ports handle around 90%of Pakistan's exports (Table 1) and remainder 9% transacts through air and 1% through land routes.

also uses import and domestic trade data in robustness checks. These datasets are descried in detail in relevant sections.

2.3 Inland Distances to Sea Ports

This analysis computes the inland distances from the manufacturing locations of firms to sea ports in two different ways: straight-line distance with geographical coordinates and shortest road distance. These measurements are precise up to town level, the smallest unit of administration[8]. The information on manufacturing location comes from the dataset of the IRS. The IRS has territorial jurisdiction and firms are required to register with the regional offices of the agency for VAT purposes. The raw data indicates that exporting firms are located in 1,935 towns; however, after standardisation of town names by removing typographical mistakes, the figure drops to 1,323.

The latitudes and longitudes for 1,323 towns are retrieved from Google Maps and straight-line distances to sea ports computed using Stata command 'geodist'. This command provides the length of the shortest curve between two points along the surface of a mathematical model of the earth. The same approach is applied to compute intra-town distances within the country to run a domestic gravity model, used as a robustness check for baseline estimates. In another variant of this approach, the shortest road distance from the centre of towns to sea ports are retrieved from Google Maps.

2.4 Preliminary Evidence and Empirical Motivation

This sub-section presents some preliminary evidence on how the export performance of firms based in the hinterland is different from that of those located near the sea ports. Table 2 shows spatial distribution of exports across geographical regions of Pakistan (sorted by order of distance from sea ports) and decomposes this to the number of firms, products and markets. Although major exporting activity tends to agglomerate in Karachi, there is excessive spatial variation within the country. Firms located in Karachi (near the sea ports) export a large set of products to a large number of markets (columns 7 and 9). Following Karachi, the three main export manufacturing regions are Lahore, Sialkot and Rawalpindi, all of which are more than 1,000 km from the sea ports. The number of exporting firms in

8 Pakistan consists of four provinces, one federal capital territory and one autonomous region (Kashmir). These administrative units are divided into 34 divisions, 149 districts, 588 sub-districts or tehsils (roughly equivalent to counties) and several thousand towns.

these distant regions is relatively small and the set of exported products is quite narrow. Moreover, these firms appear to ship to fewer destinations. This heterogeneity in trade margins across regions highlights, inter alia, the role of the internal remoteness from trade-processing facilities.

Table 2: Spatial Distribution of Pakistan's Exports in 2014

Distance to port <=km	Exports (Bn) Value	%	Firms #	%	Products #	%	Markets #	%	Region
1	2	3	4	5	6	7	8	9	10
50	1,235.5	50.1	7,273	42.8	3,497	82.6	182	96.3	Karachi
162	23.9	0.9	63	0.4	122	2.9	83	43.9	Hyderabad
490	3.8	0.2	34	0.2	13	0.3	15	7.9	Sukkur
715	39.4	1.4	153	0.9	296	7	72	38.1	Quetta
876	0.3	0	8	0	14	0.3	16	8.5	Bahawalpur
958	64.2	2.5	174	1	406	9.6	84	44.4	Multan
1,203	272.9	11	691	4.1	782	18.5	141	74.6	Faisalabad
1,280	465.0	19.2	3,405	20	2,362	55.8	163	86.2	Lahore
1,360	34.0	1.3	341	2	629	14.9	99	52.4	Gujranwala
1,390	146.0	5.9	3,940	23.2	1,096	25.9	178	94.2	Sialkot
1,411	6.9	0.3	45	0.3	129	3	45	23.8	Sargodha
1,516	17.6	0.7	277	1.6	552	13	82	43.4	Rawalpindi
1,521	21.7	1.4	124	0.7	371	8.8	86	45.5	Islamabad
1,605	2.7	0.1	26	0.2	47	1.1	23	12.2	Abbottabad
1,616	129.0	5.1	442	2.6	845	20	103	54.5	Peshawar
2,500	0.1	0	6	0	60	1.4	16	8.5	Sust
All	2,463		16,645		4,200		189		

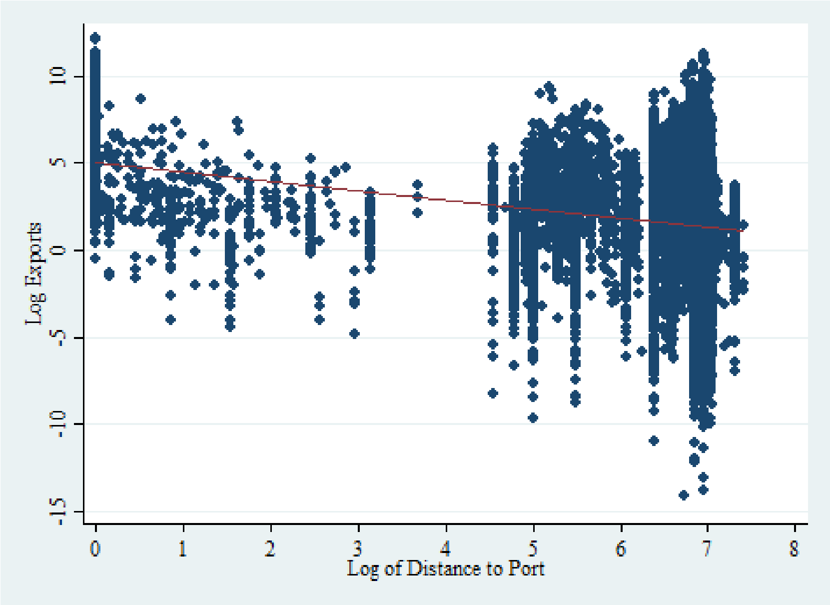
Notes: The data shows spatial distribution of exports across geographical regions of Pakistan and decomposes exports to firms, products and markets. Distance is measured in km from the sea ports of Karachi. Export values are in PKR billions. Products are identified at eight-digit level of Harmonised System (HS).
Source: Constructed using administrative dataset of Pakistan Customs.

Figure 2 presents the distribution of exports according to distance from sea ports and Figure 3 shows the same distribution for four trade margins: EM of firms and products, and margins of price and quantity. These charts suggest that exports drop in remoteness from sea ports, and the main action appears to come from the EM of firms and products. This pattern is quite intuitive as firms located in the hinterland face more transport costs compared with those located in coastal areas. For example, shipping a standard 20-feet container from the port of Karachi to the US involves a freight of $700, but the internal transportation of the same container from the indusial area of Rawalpindi (1,500 km from sea ports) to Karachi incurs almost the same charges[9]. The clustering of data points at the upper end

[9] Figures on domestic freight collected from transporters' associations and those on international freight are retrieved from the Customs' dataset.

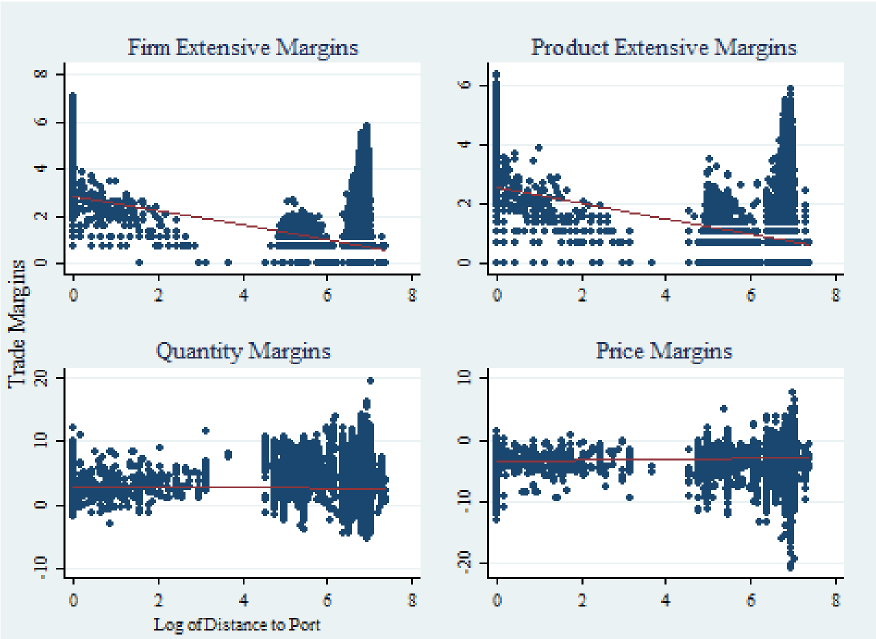
reflects exports originating from two large cities, Lahore and Faisalabad, and other adjoining regions. These regions, although relatively far from sea ports, are major centres of production of textiles.

Figure 2: Response of Exports to Remoteness from Sea Ports



Notes: The figure presents the variation in firm-level export in internal remoteness from sea ports. The clustering of data points at the upper end reflects exports originating from two large cities, Lahore and Faisalabad, and other adjoining regions. These regions, although relatively far from sea ports, are major centres of production of textiles.

Figure 3: Responses of Trade Margins to Remoteness from Sea Ports



Notes: The figure presents the variation in four elementary margins against internal remoteness from sea ports. The deconstruction approach follows Mayer and Ottaviano (2008). The clustering of data points at the upper end reflects exports originating from two large cities, Lahore and Faisalabad, and other adjoining regions. These regions, although relatively far from sea ports, are major centres of production of textiles.

Simple dummy variable regressions on the transaction-level data of 2014 indicate that, on average, firms located far from shipping facilities export a smaller volume, ship a narrow set of products and serve a smaller number of markets (Table 3). Distance from sea ports, therefore, seems to negatively affect both IM (column 1) and EM (columns 2 and 3).

Table 3: Differential Export Response from Coastal and Hinterland Regions

Dependent variables	Export/firm/market (1)	Product/firm/market (2)	Market/firm (3)
Hinterland region (1, 0)	-0.152*** (0.006)	-0.163*** (0.004)	-0.048*** (0.003)
Market-year FE	Y	Y	Y
R-squared	0.281	0.265	0.326
Observations	742,029	742,023	239,359

Notes: The table shows the regressions of a few firm performance measures on a dummy variable that takes the value of '1' if a transaction pertains to the hinterland regions of Pakistan and zero if it pertains to the coastal regions. Coastal region indicates manufacturing areas near the sea ports of Karachi including industrial zones in five districts, and hinterland represents all up-country regions of Pakistan. The nearest hinterland industrial region (Hyderabad) is 150 KM from Karachi. The dependent variable is described at the head of each column. All estimations are in log. Standard errors clustered at market level are in parentheses * p<0.10, ** p<0.05, *** p<0.01. Y indicates the inclusion of fixed effects.

To examine the heterogeneity of distance effect for firms based in various regions I estimate a typical gravity model following the estimation approach of Bernard et al. (2007) and Mayer and Ottaviano (2008)) using equation (1).

$$ln(X)_{jkt} = \alpha_0 + \beta_1\, ln\,(dist)_j + \beta_2(GDP)_{jt} + \beta_3(contig)_j + \beta_4(lang)_j + \beta_5(PTA)_{jt} + \varepsilon_{jkt} \ldots\ldots\ldots(1)$$

In this equation, dependent variable is log of exports at region-market-year level. The gravity variables are retrieved from CEPII and bear the definitions contained therein. The regression results in Table 4, show that effect of distance on trade flows is negative, while those of GDP of trading partner, contiguity, common language and FTA is positive. All gravity controls bear expected sign and magnitude of coefficients are in the range of those found in earlier studies (Head and Mayer, 2014).

Using the same estimation equation Figure 4 presents heterogeneity of the distance effect for various manufacturing regions arranged in the order of distance from sea ports. It shows that the trade-impeding effect of distance is relatively larger for firms located in the hinterland compared with for those located in coastal belt. Within the hinterland, the effect is relatively smaller for regions having better connectivity with trade-processing infrastructure (Lahore and Sialkot). The next sections investigate this trade-impeding effect of remoteness in an empirical framework in a more systematic manner.

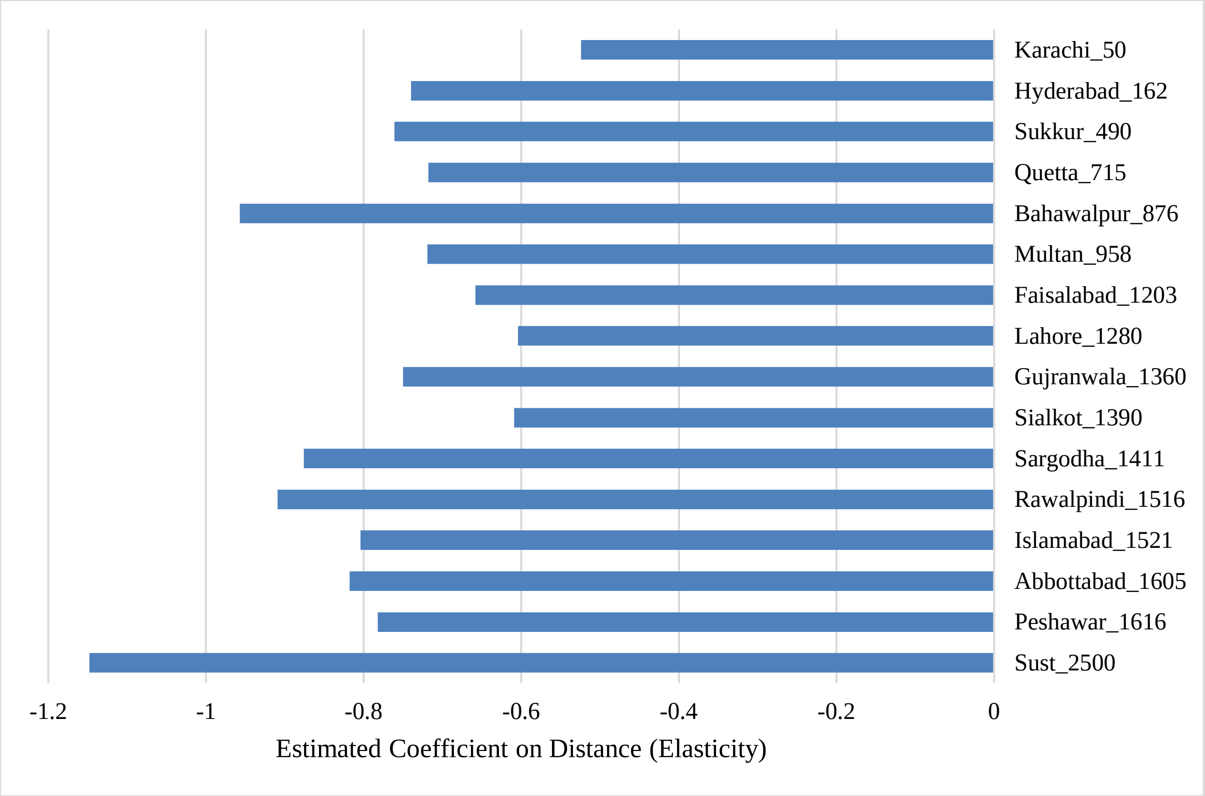
Table 4: Gravity Estimates at Aggregate Level

Dependent variable is log of export at region-market-year level

	(1)
Distance	-0.831***
	(0.036)
Dest. GDP	0.742***
	(0.008)
Contiguity (0,1)	0.361***
	(0.137)
Language (0,1)	0.714***
	(0.039)
PTA (0,1)	1.188***
	(0.141)
R^2	0.43
Observations	21,808

Notes: Standard errors clustered at market level are in parentheses * p<0.10, ** p<0.05, *** p<0.01.

Figure 4: Decomposition of Distance Effect along Spatial Distribution of Firms in Pakistan



Notes. The figure decomposes the distance effect on trade flows for various regions in Pakistan. It shows that the trade-impeding effect of distance is relatively larger for hinterland firms compared with those located in coastal region of Karachi. The estimation method is the OLS using regression equation (1) above.

3 Empirical Strategy

The descriptive analysis in the previous section shows that manufacturing activities in Pakistan are quite dispersed in the hinterland, and many industrial areas are thousands of miles from the gateway sea ports. Moreover, various margins of firms and products appear to drop in internal distance to trade-processing stations. To investigate empirically the differential effects of internal and external remoteness on trade flows, the following equation (2) is estimated:

$$ln(X)_{ijkt} = \beta_0 + \beta_1 \ln(dist.)_{ik} + \beta_2 \ln(dist.)_j + \beta Z'_{ijt} + \gamma_{kt} + \alpha_{it} + \varepsilon_{ijkt} \quad \ldots\ldots\ldots\ldots(2)$$

The subscript 'i' denotes region in Pakistan, 'j' export market, 'k' sector and 't' time (year). The dependent variable, X_{ijkt}, is the value of exports originating from each administrative region at sector-market-year level. All products are bundled into 16 sectors following UNCTAD's standard groups and the country is divided into five regions following the administrative set-up discussed in Section 2.3.

The main explanatory variable, $dist._{ik,}$ is the distance from the locations of industry in region 'i' in hinterland to sea ports. As industrial activity within the regions is concentrated in various clusters[10] and internal distance within each region vary widely (up to 500 km), I compute sector specific distance for each region. The construction of inland distance variable is discussed in detail in Section 2.3. The second explanatory variable, $dist._j$, measures the international distance to the market of trading partner. It is retrieved from the CEPII dataset and measures straight-line distances between the capitals of countries, which is quite standard in the gravity literature. The coefficients β_1 and β_2 are expected to be negative.

γ_{kt} are time-varying fixed effects for products. They account for heterogeneity across various sectors. α_{it} is the set of region fixed effects, which control for differences in physical and human infrastructure and the nature of economic activities across various administrative regions, like GDP, population or income. These industry- and region-specific variables account for time-invariant and time-varying unobservable.

10 For instance, Faisalabad is a hub of textiles, Sialkot is centre of sports goods and Kasure is home of leather products. These three cities although located in the same administrative region specialise in various sectors. The above estimation equation therefore allows inland distances to vary according to the location of industrial activity within each region.

Z' is a set of controls. The specification incorporates the usual gravity controls, such as GDP of trading partners, and a dummy variable identifying whether the trading partners have a common border, share a common official language and are a member of a preferential trade agreement. The common language and adjacency dummies are used to capture information costs. Search costs are probably lower for countries whose business climate, language and institutional structures are similar. These gravity variables are taken from CEPII and follow the definitions therein.

The same estimation equation (1) is used to examine the responses of various margins. Following Mayer and Ottaviano (2008) and Hillberry and Hummels (2008), the overall trade flow is decomposed to firm EM (number of exporting firms), product EM (number of products per firm) and quantity and price margins (quantity exported per product per firm, and export price per product per firm), respectively. This four-fold division helps us pin down the precise channels of influence of remoteness on exports along various dimensions. Moreover, the combined reaction of these four elementary margins adds to the total trade-impeding effect of distance on exports at the aggregate level[11], which helps in understanding the relative contribution of each component. This study therefore restricts the deconstruction of effect to four margins only. The reactions of intensive margins (IM) of firms and products, which are a sort of 'mixed' margin (Gil-Pareja et al., 2015) and represent price and quantity margins at a higher level of aggregation, are not considered separately in the analysis.

In an alternative specification (equation 3), I add both internal and external components of distance as in Crozet and Koenig (2010) and incorporate market-year fixed effects to absorb the effect of international element of distance as well as other factors that vary across markets and over time.

$$ln(X)_{ijkt} = \beta_0 + \beta_1 \, ln\,(dist)_{ij} + \alpha_{it} + \gamma_{kt} + \lambda_{jt} + \varepsilon_{ijkt} \ldots\ldots\ldots\ldots (3)$$

In this modified form, the variable of interest, dist.ij, becomes the total distance from the location of industry 'k' in region 'i' in Pakistan to the market of trading partner 'j'. α_{it}, γ_{kt} and λ_{jt} sets of time-varying fixed effect for regions, sectors and markets. Market-year fixed effects not only account for the general

[11] $X_{ijkt} = N^{f}_{ijktt} \times N^{p}_{ijkt} \times p^{-fp}_{ijkt} \times q^{-fp}_{ijkt}$, where N^{f}_{ijkt} and N^{p}_{ijkt} are the number of firms and products per market by sector and p^{-fp}_{ijkt} and q^{-fp}_{ijkt} are average quantity and average price per product by firm.

remoteness of Pakistan from export markets but also allow for better control for destination market's multilateral resistance. Since they soak up the effect of the international component of distance, the remaining effect can be attributed to domestic distance only[12]. This alternative estimation approach thus ensures robustness of the effect of inland distance on trade flows.

The estimation method is Ordinary Least Squares (OLS)[13]; however, to account for heteroskedasticity in trade data and the presence of zero trade flows, the Poisson Pseudo Maximum Likelihood (PPML) estimator, as suggested in Silva and Tenreyro (2006), is also used in robustness checks[14]. Using equation (2), the overall response of exports to inland and international components of distance is initially examined and then the estimated effect is decomposed to the responses of trade margins. The model with high dimensional fixed effects is estimated by using the Stata command, 'reghdfe', suggested in Guimaraes and Portugal (2010). Standard errors are clustered at the region-destination level. Following the baseline estimations and robustness checks, the heterogeneity of the effect across sectors and over time is investigated.

4 Estimation Results, Discussion and Robustness Checks

4.1 Estimation Results

Table 5 presents the baseline estimation results of equation (2). Column (1) contains the estimates for inland distance to sea ports for hinterland firms. The coefficient of interest is negative and statistically significant at a 1% significance level, showing that internal remoteness negatively affects exports, as transportation costs are higher for exports originating from distant regions. Column (2) adds both distances in the same equation. The effect of external remoteness is negative as expected. The magnitude of coefficient in row (1) is larger compared with the results in row (2). It indicates that the marginal effect of internal remoteness from exporting stations is greater compared with that of international remoteness from export markets.

[12] Addition of the internal and international elements of distances allows the bilateral distance to trading partners to vary depending on the location of industry within Pakistan. The specification therefore isolates the effect of domestic distance by soaking up the effect of international component from the combined effect of domestic and international elements.

[13] Since the OLS is a linear estimator, the coefficients have additive property. For example, trade flow = Firm EM + Firm IM, and Firm IM = Product EM + Product IM and Product IM = Quantity margin + Price margin.

[14] These results are available from author on request.

Table 5: Trade-Impeding Effects of Internal and External Remoteness – Main Results

	Dependent variable is log of exports by sector, region and market										
	Road distances (columns 1 to 4)				Straight-line dist.	Specification-II		Single period	Firm-level	Imports	Domestic trade
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$Dist._{ik}$	-0.513***	-0.693***	-0.879***	-0.829***	-0.674***			-0.880***	-0.351***	-0.640***	-1.059***
	(0.127)	(0.127)	(0.136)	(0.116)	(0.128)			(0.042)	(0.016)	(0.033)	(0.084)
$Dist._{j}$		-0.345***	-0.445***	-0.568***	-0.454***	-0.485***		-0.277***	-0.134***	-0.450***	
		(0.020)	(0.029)	(0.084)	(0.028)	(0.022)		(0.058)	(0.013)	(0.037)	
$Dist._{ik} \times Dist._{j}$				0.017							
				(0.012)							
$Dist_{ik} + Dist._{j}$							-0.871***				
							(0.161)				
Add. controls											
Sector-year	Y	Y	Y	Y		Y	Y		Y	Y	
Region-year	Y	Y	Y	Y		Y	Y		Y	Y	
Gravity variables			Y	Y	Y	Y			Y	Y	
Market-year							Y				
Region effects								Y			
Sector effects								Y			Y
R2	0.199	0.206	0.238	0.311	0.325	0.247	0.320	0.179	0.138	0.179	0.476
Observations	38,538	38,538	38,538	38,538	38,538	66,416	66,416	11,397	749,301	11,397	33,114

Notes: All estimations are in log. Robust standard errors clustered at region-market level are in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The coefficients on fixed effects and other gravity variables are not reported since they are not of direct interest. Columns (1) to (5) and (8) to (10) contain the results of specification-I and columns (6) and (7) contains those for specification-II. The number of observations in columns (6) and (7) are larger compared with columns (1) to (4) as trade flows pertaining to costal region are also considered in specification-II. The estimates in column (3) are used as a baseline.

Column (3) adds gravity variables, which yields similar results to those reported in columns (1) and (2). Although magnitude of the effect is larger in column (3), the relative effect of both elements of distance remains the same: the magnitude of coefficient on internal distance variable estimated in column (3) is almost double than that on international distance. Since these estimations are in logs, the coefficients correspond to elasticity. The coefficient in column (3), for example, suggests that, on average, an increase of 10% in the inland distance is associated with a drop in exports by 8.79%. The corresponding effect of international distance is 4.45% only. Column (4) interacts both elements of distance but the interaction terms is statistically insignificant, suggesting no complementarity in both legs of distance. The estimates in column (3) are used as baseline.

These estimates imply that the trade-impeding effect of domestic transportation costs is larger than that of their international component. These results are in line with the findings of earlier studies, which reckon that domestic trade costs are quite high: for example, Anderson and Van Wincoop (2004) argue that domestic costs in the US are more than twice as high as the cost of international transportation.

Columns (5) to (9) present initial robustness checks. Column (5) estimates equation (2) with an alternative measure of domestic distance. Instead of using road distances, it uses straight-line distance computed using coordinates of manufacturing locations and sea ports. The estimated coefficient on internal distance is similar in sign, statistical significance but smaller in magnitude. It indicates that the measurement error in computing straight-line distances might induce downward bias in the estimates.

Columns (6) and (7) use an alternative specification (equation 3). Column (6) shows the effect of external element of distance for all firms, located in the coastal region as well as in the hinterland. Column (7) combines two components of distance, instead of using them as separate regressors and includes market-year fixed effect in the estimations, which absorb other factors that vary across markets and over time. The estimated coefficient thus represents net effect of inland distance as the external component is absorbed by these dummies. It remains unaffected in terms of sign and statistical significance and its magnitude equal to that of baseline results regression (3). Column (8) collapses the data to a single period to overcome any potential problem of serial correlation in error terms. This transformation generates estimates that are comparable to the baseline specification in column (3). Column (9) replicates the estimations at a micro level. These estimates are similar in sign and significance, although the magnitude of coefficients is relatively smaller, which suggests the sensitivity of effect to the level of aggregation of data.

Column (11) presents the results of gravity estimations for the trade flows oriented away from sea ports rather than towards them. It uses the import data for hinterland firms through Karachi port. Karachi is the largest importing station and hub of transport sector. The estimated effect of inland distance on imports of hinterland firms is negative and statistically significant but the magnitude is relatively smaller compared that for exports, which could reflect the effect of competition in transport sector.

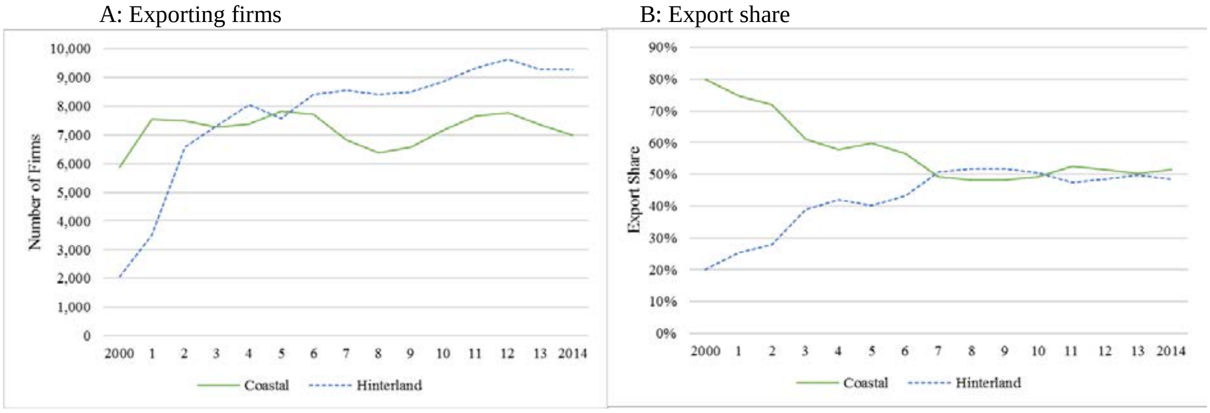
Column (11) examine the effect of internal transportation on domestic trade flows. As the estimates indicate, the effect is negative but the magnitude of coefficient in column (11) is slightly larger compared with the baseline estimates for export data in column (3). One potential reason for this large trade-impeding effect on domestic trade could be the sample composition as it contains exporting as well non-exporting firms. As non-exporting firms are generally small, they might not benefit from economies of scale in domestic transportation. Second, many non-exporting firms are based in small remote towns. As road infrastructure in remote towns is particularly poor, it might reflect larger resistance to trade flows. Moreover, it may also reflect the effect of ethnicity and cultural differences in various regions of Pakistan. The reason is that domestic trade of firms is highly concentrated in their own regions.

4.2 Further Robustness Checks

One of the major issues in this kind of analysis is to circumvent the endogeneity of firms' location choice, which could be endogenous for several reasons, such as engagement in sales in the home market, access to domestic inputs and positive externalities of agglomeration. This sub-section first shows that the pattern of entry of these firms into exporting is such that hinterland firms potentially take remoteness from sea ports as exogenous (Figure 5). It then takes multiple measures to account for the above mentioned issues and shows that these factors are not driving the baseline results.

Till 1999, Pakistan was a sort of closed economy. The trade openness started in the military regime of General Pervaiz Musharaf, who came to power by overthrowing an elected government and pursued a trade policy reform agenda to seek legitimacy on the grounds of economic performance. Firms established prior to 1999 in the hinterland were oriented mainly towards the domestic market but started exporting over time (panel A of Figure 5).

Figure 5: Evolution of Pakistan's Exports from the Hinterland and Coastal Regions over Time



Notes: Coastal region indicates the areas near the sea ports of Karachi and the hinterland represent all up-country parts of Pakistan. Panel B shows that, prior to 2000, Pakistan's exports were dominated by firms based near the sea ports. However, the export share of hinterland firms increased gradually as a result of trade policy reforms in this period.
Source: Constructed using administrative datasets for the financial year 2014.

As the charts indicate, in the earlier period, around 80% of exports originated from the coastal regions. Later on, after reform of the military establishment, the proportion of exports originating from the hinterland increased gradually (panel B of Figure 5). Therefore, for the set of firms serving just the domestic market in the earlier period distance to port is exogenous, as exporting was not their primary concern at the time of establishment.

To examine the effect of other factors affecting the choice of manufacturing locations, the trade-impeding effect of domestic distance is split between two groups of firms, exporting-only and exporters-cum-domestic sellers. Data shows that 65% firm do not sell in the domestic market and export all of their output (Table 6). The remaining 35% firms engage in exports as well as in domestic sales. The potential endogeneity induced by access to home market may be problematic for the exporter-cum-domestic suppliers, not for exporting-only firms that do not engage in domestic sales. Therefore, internal remoteness from sea ports for exporting-only firms can be considered largely exogenous, at least from the dimension of home-market effect.

Table 6: Trade Orientation of Exporting Firms

Firm type	Firms (%)	Exports (%)
Exports only	65	15
Exports+ domestic sales	35	85

Source: Author's working using Customs' dataset.

The decomposition of distance effect for these cohorts in column (1) show, the effect is negative and statistically significant for both cohorts, and the magnitude is slightly higher for exporting-only firms (Table 7). Exporting-only firms are of relatively small size[15] and might not benefit from the economy of scale in domestic transportation, which could explain a relatively large effect for this cohort. The estimated effect of internal remoteness for this exporting-only group can be treated as having been purged of the endogeneity concerns to a great extent.

Table 7: Robustness Checks for Endogeneity of Location Choice

Dependent variable is log of exports by sector and region				
	Home-Market Effect		Domestic inputs Effect	Agglomeration Effect
	(1)	(2)	(3)	(4)
Distance to port				
# Exports -cum- domestic sales	-1.024***	-0.922***	-0.994***	-1.442***
	(0.035)	(0.037)	(0.036)	(0.053)
#Exports only	-1.276***			
	(0.035)			
Distance to market	-0.430***	-0.401***	-0.462***	-0.482***
	(0.022)	(0.029)	(0.027)	(0.032)
Domestic sales		0.072***		
		(0.007)		
Domestic purchases			0.106***	
			(0.007)	
R2	0.332	0.366	0.357	
N	41,108	23,074	26,845	30,554

Notes: Robust standard errors clustered at market level are in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. These estimations follow specification 4 above. The coefficients on fixed effects and other gravity variables are not reported since they are not of direct interest.

Access to home market may affect the location choice of firms that simultaneously engage in domestic and international sales. In column (2) the home-market effect for exporter-cum-domestic sellers is controlled for through domestic sales[16], which leaves results unaffected. The third factor determining location choice could be access to domestic inputs. Column (3) controls for this by incorporating domestic purchases as an additional regressor. As column (2) and (3) indicate, the sign, statistical

[15] They comprise over 65% of exporting firms but deal with 15% of exports only (Table 5).
[16] This approach inherently assumes that domestic sales are a proxy for local population size.

significance and magnitude of the coefficient on the regressors of interest remain almost unaffected in these estimations. Moreover, both domestic sales and purchases positively affect trade flows. The positive effect of domestic sales may reflect the benefit of economy of scale in production to serve local and international markets.

Column (4) explores the effect of agglomeration. It uses the number of already established firms in each region at a sector-year level as an instrument for the potentially endogenous variable, distance to port. Pakistan has various industrial clusters in different regions[17]. This variable bears a negative correlation of '-0.45' with internal distance. This estimation approach does not affect the coefficient on external distance but increases the magnitude of internal distance considerably.

5 Mechanisms of Influence: Responses of Trade Margins

The estimates in Section 4 indicate the average effect of domestic and international aspects of remoteness but for policy prescriptions the relative responses of trade margins are considered to be more informative. This section therefore deconstructs the coefficient on the distance variables into four constituent components: the EM of firms and products, as well as price and quantity margins in the spirit of Bernard et al. (2007) (Table 8). Panel A contains the results for inland distance and panel B for international distance. Since the OLS is a liner estimator, the coefficients in columns (2) to (5) add up to that in column (1).

A comparison of the estimates in panels A and B shows that the EM of both firms and products drop in distances but the relative effect is much larger for internal distance (column 2 panel A). Columns (4) and (5) contain the responses of quantity and price margins. The results show that the response of quantities to domestic distance is positive but the same to international distance is negative (panel B), indicating that quantity margins defy domestic remoteness but drop in its international element.

[17] For instance, Faisalabad is a hub of textiles, Sialkot is a centre of sports goods and Wazirabad is a manufacturing base for surgical equipment. This spatial distribution alludes to the role of the agglomeration effect, which is exploited in the IV strategy. The number of firms in each region by sector and year is used as an instrumental variable for distance to sea ports.

Table 8: Decomposition of Export Response along Trade Margins

Dependent variables	X_{ijkt} (1)	Firm EM (2)	Prod. EM (3)	Qty. M (4)	Price. M (5)
Panel A:					
Distance to port	-0.879***	**-0.607*** **	-0.505***	**0.155*** **	0.013
	(0.034)	(0.017)	(0.016)	(0.031)	(0.028)
Panel B:					
Distance to market	-0.446***	**-0.146*** **	-0.120***	-0.226***	0.016
	(0.024)	(0.009)	(0.009)	(0.019)	(0.016)
R^2	0.343	0.393	0.401	0.362	0.314
Observations	34,117	34,117	34,117	34,105	34,105

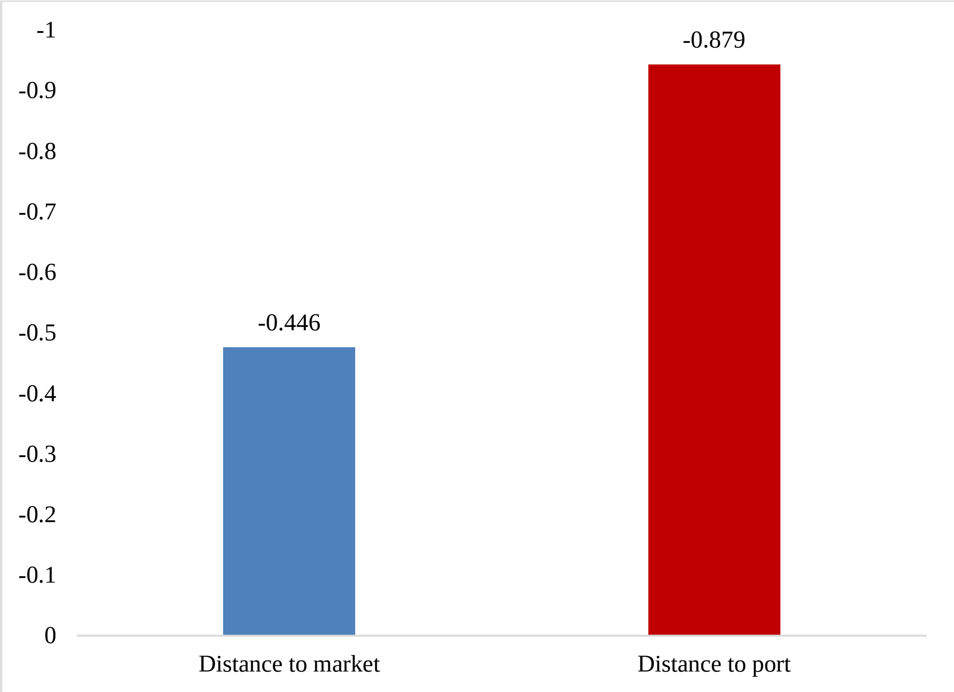
Note: Robust standard errors are in parentheses, *p<0.10, **p<0.05, ***p<0.01. The coefficients on fixed effects and other gravity variables are not reported since they are not of direct interest. EM denotes extensive margins and IM indicates intensive margins. Column (1) contains the overall effect of distance (as reported in column (3) of Table 5 above) and columns (2) through (5) decompose the coefficient in column (1) into various trade margins. All estimations are in logs.

Figure 6 plots these coefficients for ease of interpretation. Panel A shows that the net effect of domestic distance is almost double that of international distance. As the chart shows, 64% of the effect of domestic distance is transmitted through EM of firms and 54% through EM of products, but the corresponding figures for international distance are 31% and 25%, respectively (panel B of Figure 6). The relative effects on quantity margins are -47% for international remoteness and +16% for internal remoteness. The deconstruction in panel B suggests that the response of firms to internal remoteness is different from that to international remoteness. The former operates mainly through the EM of firms and products, whereas the latter operates primarily through quantity margins besides restricting trade along EM.

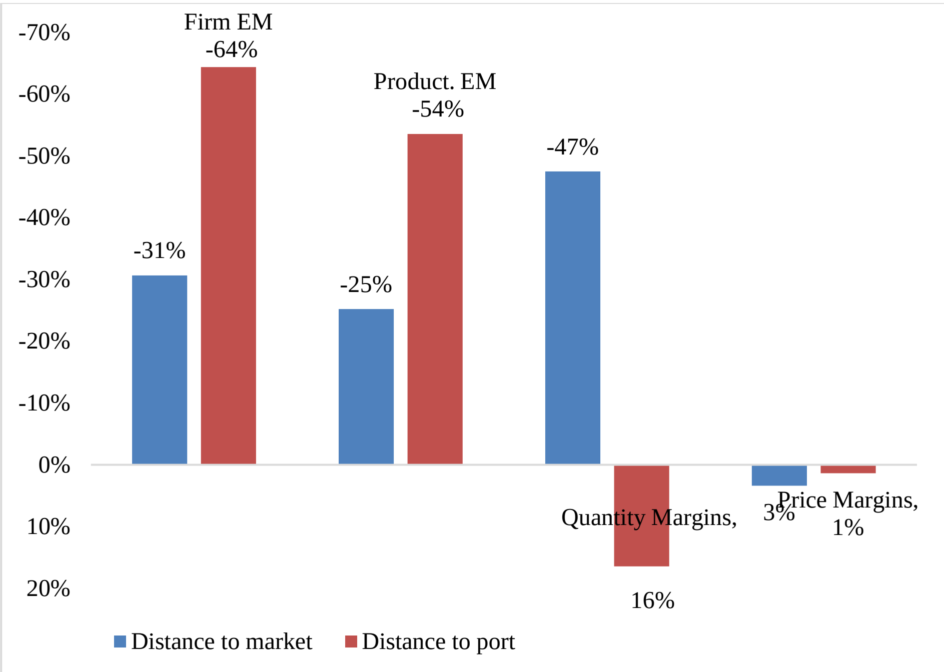
In the case of distance (a proxy for trade costs), the usual assumption in gravity modelling has been that it reflects transportation costs, which vary with the quantity exported. The positive response of quantities, however, suggests that there may be a fixed cost element to the domestic distance as well. For instance, loading, unloading, handling and documentation charges do not vary with distance. These estimations suggest that the fixed cost component of domestic distance operates through average sales and the variable cost component through EM by restricting the entry of firms. It seems that domestic distance may be capturing the other elements; for example, information networks may decline with distance from port and absence of information may increase cost of entry (Krautheim, 2009). This analysis also shows that internal distance to sea ports has some sort of selection effect on firms and products. It restricts the entry of firms into exporting but the entrants export a higher volume on average.

Figure 6: Heterogeneity of the Effect of Remoteness on Trade Flows and Trade Margins
(Values on y-axis are on inverse scale)

Panel A: Trade-impeding Effects of Distance on Exports



Panel B: Relative Responses of Trade Margins to Internal and External Remoteness

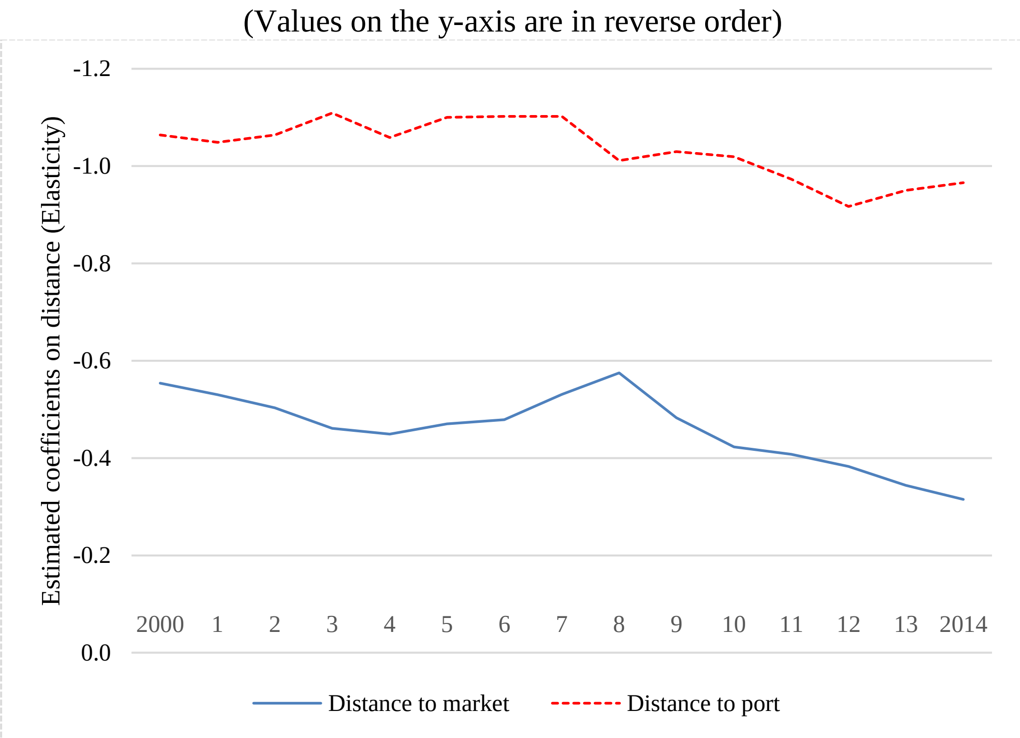


Notes: These figures plot the estimated coefficients in Table 7. Panel A indicates the net effect of distances on trade flows and panel B provides the relative contribution of each trade margin. EM denotes extensive margins. Panel A shows that the net effect of domestic distance is almost double that of international distance. The deconstruction in panel B suggests that the trade-inhibiting effect of domestic distance operates mainly through the EM of firms and products, whereas international distance operates primarily through quantity margins besides restricting trade along EM.

5.1 Heterogeneity over Time and across Sectors

Figure 7 deconstructs the effects of internal and external remoteness on trade flows over time. The detailed estimates are contained in Table A3. As the chart shows, the magnitudes of the effect of international component of distance are smaller than those for domestic component for all years. Moreover, the trade-impeding effect of both components of distance has reduced over time, and the drop is relatively higher for the international leg. From 2000 to 2014, the trade-resisting effect of international distance dropped by 34%, while that of domestic distance dropped by 9% only, on average. The former may be a result of improvements in shipping and communication technologies, leading to a reduction in international freight and other associated costs, and the latter may be a result of upgradation of domestic infrastructure. Similarly, the heterogeneous reactions of quantity margins observed at aggregate level are not specific to any particular year; they respond positively to internal remoteness but negatively to external remoteness (column 4, Table A3 in appendix).

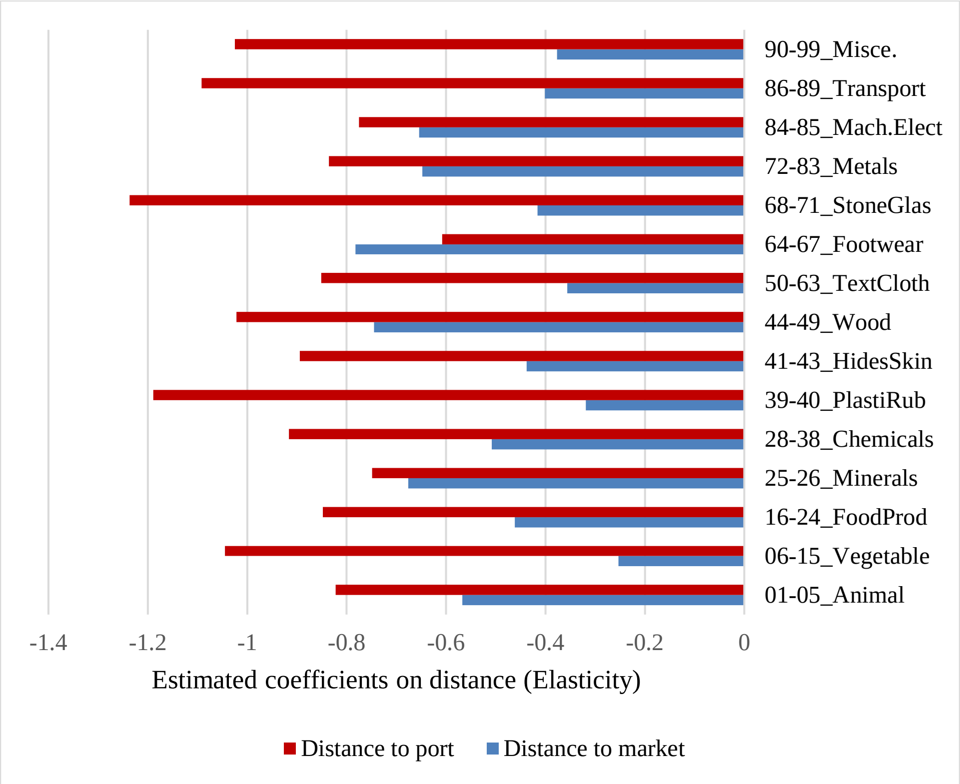
Figure 7: Heterogeneity of the Effects of Remoteness on Trade Flows over Time



Notes: The figure plots the regression coefficients on internal and external distances estimated using equation (1). As the chart indicates, the effect of remoteness from port is larger than the effect of remoteness from export markets for all years in the study period. The detailed estimates are contained in Table A3 in appendix.

Since the estimations include the universe of exporting firms in both sectors, agriculture and manufacturing, it can be argued that a particular sector may be driving these results. By deconstructing the baseline results across sectors, Figure 8 shows that the trade-restricting effect of internal remoteness is larger in all sectors. Similarly, the heterogeneity of the effect along the EM of firms and products (columns 2 and 3) and quantity margins (column 4) is evident across panels A and B (Table A4 in appendix). This deconstruction confirms baseline estimates and also yields further information on the asymmetric nature of trade costs across sectors.

Figure 8: Heterogeneity of the Effects of Remoteness on Trade Flows across Sectors



Notes: The figure plots the regression coefficients on internal and external distances deconstructed at a sector level using equation (1). It indicates that the effect of remoteness from ports is larger than the effect of remoteness from export markets for all sectors. The estimates vary widely, reflecting heterogeneity in the trade costs' sensitivity across sectors. The detailed estimates are contained in Table A4 in appendix.

6 Conclusion and Policy Implications

Relatively high costs of transporting goods from factories and farms to gateway sea ports and airports are considered to restrict the growth of exports from developing economies. Although domestic trade costs are very high, the existing micro-literature focuses mainly on the international segment of trade costs. This study examines the differential effects of both cost elements, domestic and international, by using novel datasets from a developing country, which identify the locations of manufacturing and modes of shipment. It finds that, on average, the marginal trade-restricting effect of internal remoteness is twice that of international remoteness from the markets of trading partners. Moreover, the relative effects of domestic costs on trade margins are different to those of international costs: the latter negatively affect trade along all margins, with a relatively large effect through quantity margins, but the former operate mainly through the extensive margins (EM) of firms and products, suggesting a larger role for domestic distance in restricting the entry of firms and constricting the diversification of products. Moreover, quantity margins defy internal remoteness, although they drop with its international element. The trade-impeding effects of remoteness, both international and domestic, have reduced over time but the drop is relatively higher for the international leg. These results are robust to alternative specifications, data sources and the measurement approach of internal distances as well as to the decomposition of the distance effects across sectors and over time.

During the past two decades, the fall in tariffs, improvements in maritime transport and the communication revolution have considerably reduced the international element of trade costs and drawn attention towards behind-the-border trade costs. In the developing world, these costs – *inter alia* – are usually induced by the remoteness of trade-processing infrastructure from firms' production facilities and are further compounded by poor transport networks (ODI, 2015). This paper shows that the relatively higher element of domestic costs is an important impediment to accessing international markets. Internal remoteness represents an implicit tax: it inhibits firms' participation in exporting and constricts their export product sets. This finding suggests that, from a trade facilitation perspective, a focus on reducing within-country trade costs is relatively more important to generate an appropriate trade response. Since the overall trade-restricting effect of domestic trade costs is much higher along the EM, this suggests that policies aimed at strengthening these margins assume more importance in promoting exports. Export promotion strategy and policy has to focus on facilitating the market entry of firms and products, rather than on quantity subsidies.

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8 Annexe-A

Table A1: Three Legs of Distance to Export Markets for Selected Economies

	Elements of Distance (km)		
	Origin	International	Destination
Country	(1)	(2)	(3)
Pakistan	555	7,583	246
Malaysia	556	9,992	256
C. African Republic	557	7,495	269
Vietnam	560	9,908	252
South Africa	585	8,392	285
Saudi Arabia	606	6,469	270
FM Sudan	620	11,942	266
Mozambique	696	7,879	261
Mexico	706	10,063	282
Indonesia	716	10,471	286
Congo, Rep.	803	6,995	267
Kenya	865	8,343	255
India	869	8,128	244
Kazakhstan	877	7,233	250
China	1,018	9,378	284
Australia	1,121	12,813	275
Brazil	1,157	9,232	265

Source: CEPII

Table A2: Summary Statistics

Variable	Observations	Mean	Standard Deviation
Internal distance (km)	66,044	903	310
International distance (km)	66,044	6,794	3,439
Intra-town distances (km)	33,114	920	301
Exports (X_{ijkt}) in PKR billions	66,044	0.335	2.67
Firm extensive margins	66,044	0.83	1.11
Firm intensive margins	66,044	0.50	2.09
Product intensive margins	66,044	7.34	70.14
Product extensive margins	66,044	0.81	1.05
Quantity margins	66,044	2.59	2.10
Price margins	66,044	0.26	8.29

Table A3: Deconstruction of Trade-Impeding Effects of Remoteness over Time

Dep. variables	X_{ijkt} (1)	Firm EM (2)	Prod. EM (3)	Qty. M (4)	Price. M (5)
A: Distance to port x					
2000	-1.064***	-0.671***	-0.512***	0.173***	-0.054*
	(0.038)	(0.020)	(0.018)	(0.035)	(0.030)
2001	-1.049***	-0.663***	-0.499***	0.163***	-0.051*
	(0.038)	(0.019)	(0.017)	(0.035)	(0.030)
2002	-1.064***	-0.674***	-0.554***	0.162***	0.001
	(0.038)	(0.020)	(0.020)	(0.039)	(0.033)
2003	-1.109***	-0.682***	-0.594***	0.080*	0.087**
	(0.041)	(0.021)	(0.019)	(0.047)	(0.044)
2004	-1.059***	-0.649***	-0.563***	0.134***	0.016
	(0.040)	(0.020)	(0.020)	(0.040)	(0.038)
2005	-1.100***	-0.667***	-0.589***	0.173***	-0.018
	(0.040)	(0.020)	(0.019)	(0.035)	(0.031)
2006	-1.102***	-0.660***	-0.581***	0.161***	-0.021
	(0.038)	(0.018)	(0.017)	(0.035)	(0.031)
2007	-1.102***	-0.660***	-0.579***	0.109***	0.030
	(0.041)	(0.020)	(0.019)	(0.042)	(0.036)
2008	-1.011***	-0.639***	-0.555***	0.104**	0.078**
	(0.045)	(0.022)	(0.020)	(0.044)	(0.038)
2009	-1.030***	-0.623***	-0.536***	0.123***	0.006
	(0.049)	(0.023)	(0.023)	(0.043)	(0.035)
2010	-1.019***	-0.626***	-0.523***	0.123***	0.007
	(0.051)	(0.024)	(0.020)	(0.042)	(0.036)
2011	-0.973***	-0.617***	-0.518***	0.158***	0.002
	(0.048)	(0.022)	(0.020)	(0.041)	(0.035)
2012	-0.917***	-0.578***	-0.495***	0.101***	0.055
	(0.041)	(0.019)	(0.018)	(0.038)	(0.034)
2013	-0.950***	-0.584***	-0.496***	0.077**	0.053
	(0.041)	(0.019)	(0.019)	(0.039)	(0.034)
2014	-0.966***	-0.591***	-0.495***	0.108***	0.012
	(0.042)	(0.019)	(0.018)	(0.036)	(0.031)
B: Distance to market x					
2000	-0.554***	-0.179***	-0.211***	-0.266***	0.103***
	(0.028)	(0.013)	(0.011)	(0.023)	(0.018)
2001	-0.530***	-0.171***	-0.211***	-0.263***	0.116***
	(0.027)	(0.012)	(0.010)	(0.022)	(0.017)
2002	-0.503***	-0.152***	-0.158***	-0.217***	0.024
	(0.028)	(0.013)	(0.013)	(0.025)	(0.020)
2003	-0.461***	-0.133***	-0.111***	-0.123***	-0.094***
	(0.031)	(0.014)	(0.013)	(0.030)	(0.027)
2004	-0.449***	-0.135***	-0.110***	-0.187***	-0.014
	(0.030)	(0.014)	(0.014)	(0.026)	(0.024)
2005	-0.470***	-0.144***	-0.100***	-0.230***	0.004
	(0.028)	(0.012)	(0.011)	(0.021)	(0.018)
2006	-0.479***	-0.151***	-0.108***	-0.227***	0.008
	(0.027)	(0.011)	(0.011)	(0.021)	(0.018)
2007	-0.531***	-0.161***	-0.115***	-0.254***	-0.001
	(0.028)	(0.012)	(0.011)	(0.025)	(0.021)
2008	-0.575***	-0.173***	-0.130***	-0.268***	-0.004
	(0.030)	(0.013)	(0.012)	(0.027)	(0.023)
2009	-0.483***	-0.130***	-0.098***	-0.297***	0.043*
	(0.037)	(0.017)	(0.016)	(0.030)	(0.024)
2010	-0.423***	-0.111***	-0.092***	-0.276***	0.055**
	(0.039)	(0.017)	(0.014)	(0.031)	(0.026)
2011	-0.408***	-0.109***	-0.089***	-0.277***	0.068***
	(0.035)	(0.015)	(0.014)	(0.029)	(0.023)
2012	-0.383***	-0.124***	-0.090***	-0.190***	0.022
	(0.032)	(0.013)	(0.012)	(0.027)	(0.024)
2013	-0.344***	-0.118***	-0.090***	-0.169***	0.033
	(0.032)	(0.013)	(0.013)	(0.027)	(0.023)
2014	-0.315***	-0.109***	-0.087***	-0.197***	0.079***
	(0.032)	(0.013)	(0.012)	(0.025)	(0.021)
R^2	0.316	0.375	0.376	0.336	0.295
Observations	34,118	34,118	34,118	34,106	34,106

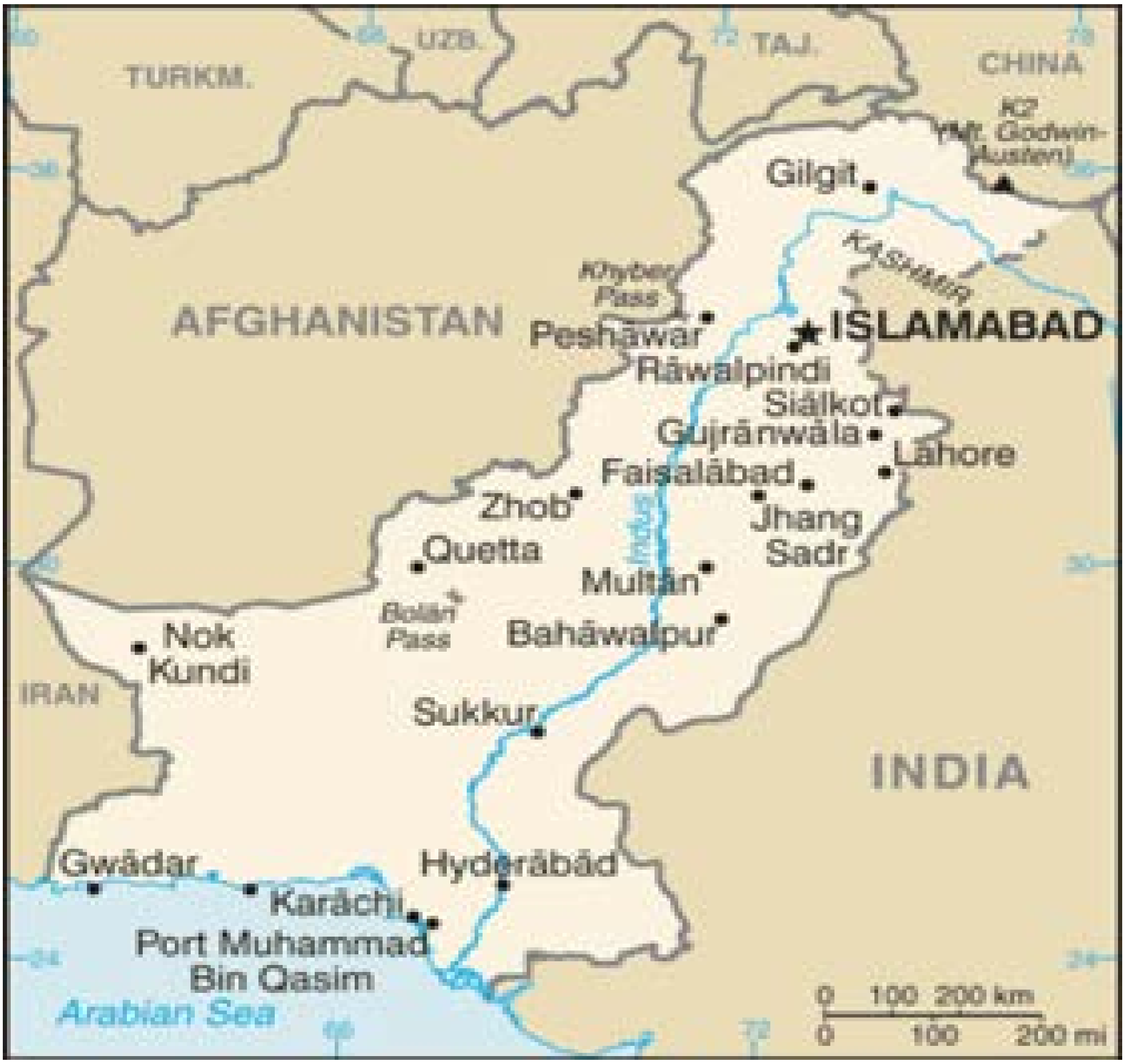
Notes: All estimations are in logs. The dependent variables are reported at the head of each column. EM denotes extensive margins. Column (1) contains the overall effect of distances and columns (2) through (5) decompose this into responses of various trade margins. The coefficients in columns (2) to (5) add to those in column (1). The coefficients on fixed effects and other gravity variables are not reported since they are not of direct interest. Robust standard errors clustered at market level are in parentheses, *p<0.10, **p<0.05, ***p<0.01.

Table A4: Deconstruction of Trade-Impeding Effects of Remoteness across Sectors

Dep. variables	X_{ijkt}	Firm EM	Prod. EM	Qty. M	Price. M
	(1)	(2)	(3)	(4)	(5)
A: Distance to port x					
01-05_Animal	-1.045***	-0.543***	-0.484***	0.114***	-0.135***
	(0.047)	(0.020)	(0.022)	(0.042)	(0.033)
06-15_Vegetable	-0.848***	-0.561***	-0.507***	0.197***	0.023
	(0.051)	(0.019)	(0.019)	(0.048)	(0.035)
16-24_FoodProd	-0.749***	-0.502***	-0.397***	0.163***	-0.014
	(0.062)	(0.021)	(0.017)	(0.061)	(0.039)
25-26_Minerals	-0.916***	-0.516***	-0.449***	0.194***	-0.138***
	(0.071)	(0.025)	(0.025)	(0.057)	(0.052)
28-38_Chemicals	-1.189***	-0.566***	-0.466***	0.008	-0.166***
	(0.070)	(0.023)	(0.023)	(0.056)	(0.044)
39-40_PlastiRub	-0.894***	-0.503***	-0.403***	0.223***	-0.210***
	(0.054)	(0.021)	(0.020)	(0.049)	(0.044)
41-43_HidesSkin	-1.022***	-0.582***	-0.476***	0.027	0.006
	(0.078)	(0.029)	(0.028)	(0.056)	(0.051)
44-49_Wood	-0.851***	-0.519***	-0.435***	0.098***	0.004
	(0.031)	(0.014)	(0.013)	(0.028)	(0.025)
50-63_TextCloth	-0.608***	-0.509***	-0.439***	0.342**	-0.002
	(0.161)	(0.036)	(0.036)	(0.134)	(0.093)
64-67_Footwear	-1.237***	-0.670***	-0.537***	0.149**	-0.181***
	(0.057)	(0.025)	(0.023)	(0.060)	(0.054)
68-71_StoneGlas	-0.836***	-0.503***	-0.406***	-0.005	0.068
	(0.059)	(0.022)	(0.022)	(0.063)	(0.059)
72-83_Metals	-0.775***	-0.458***	-0.397***	0.030	0.048
	(0.066)	(0.026)	(0.032)	(0.068)	(0.068)
84-85_Mach.Elect	-1.092***	-0.507***	-0.415***	0.011	-0.182**
	(0.091)	(0.034)	(0.036)	(0.086)	(0.073)
86-89_Transport	-1.025***	-0.570***	-0.349***	-0.062*	-0.045
	(0.037)	(0.019)	(0.017)	(0.035)	(0.029)
B: Distance to market x					
01-05_Animal	-0.567***	-0.038	-0.033	-0.181*	-0.316***
	(0.101)	(0.035)	(0.027)	(0.096)	(0.120)
06-15_Vegetable	-0.253***	-0.120***	-0.091***	-0.041	0.000
	(0.032)	(0.013)	(0.013)	(0.027)	(0.019)
16-24_FoodProd	-0.462***	-0.147***	-0.085***	-0.104***	-0.127***
	(0.035)	(0.012)	(0.012)	(0.033)	(0.022)
25-26_Minerals	-0.676***	-0.196***	-0.202***	-0.050	-0.227***
	(0.046)	(0.015)	(0.012)	(0.045)	(0.028)
28-38_Chemicals	-0.508***	-0.176***	-0.133***	-0.277***	0.075*
	(0.054)	(0.016)	(0.017)	(0.040)	(0.039)
39-40_PlastiRub	-0.319***	-0.159***	-0.132***	-0.090**	0.062**
	(0.048)	(0.014)	(0.014)	(0.036)	(0.028)
41-43_HidesSkin	-0.438***	-0.155***	-0.132***	-0.474***	0.323***
	(0.040)	(0.014)	(0.014)	(0.034)	(0.032)
44-49_Wood	-0.745***	-0.147***	-0.126***	-0.275***	-0.197***
	(0.055)	(0.020)	(0.019)	(0.039)	(0.035)
50-63_TextCloth	-0.356***	-0.089***	-0.038***	-0.291***	0.062***
	(0.025)	(0.010)	(0.010)	(0.020)	(0.016)
64-67_Footwear	-0.782***	-0.188***	-0.150***	-0.509***	0.065
	(0.123)	(0.026)	(0.026)	(0.102)	(0.071)
68-71_StoneGlas	-0.416***	-0.085***	-0.088***	-0.188***	-0.055
	(0.036)	(0.014)	(0.013)	(0.040)	(0.035)
72-83_Metals	-0.648***	-0.194***	-0.157***	-0.197***	-0.090**
	(0.043)	(0.014)	(0.015)	(0.043)	(0.042)
84-85_Mach.Elect	-0.654***	-0.234***	-0.165***	-0.237***	-0.016
	(0.052)	(0.018)	(0.023)	(0.051)	(0.054)
86-89_Transport	-0.401***	-0.211***	-0.172***	-0.173***	0.155***
	(0.062)	(0.021)	(0.023)	(0.060)	(0.048)
R^2	0.285	0.354	0.354	0.297	0.276
Observations	34,118	34,118	34,118	34,106	34,106

Notes: All estimations are in logs. The dependent variables are reported at the head of each column. EM denotes extensive margins. Column (1) contains the overall effect of distances and columns (2) through (5) decompose this into responses of various trade margins. The coefficients in columns (2) to (5) add to those in column (1). The coefficients on fixed effects and other gravity variables are not reported since they are not of direct interest. Robust standard errors clustered at market level are in parentheses, *p<0.10, **p<0.05, ***p<0.01.

Figure A1: Geographical Map of Pakistan



Source: www.googlemaps.com