Final report

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Pakistan's international trade

The potential for expansion towards East and West

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Pakistan's International Trade: the Potential for Expansion Towards East and West

Final Report

(January, 2017)

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Executive Summary

Neighboring countries engage in considerable trade with each other using land transportation. Pakistan shares a common border with two large emerging economies, China and India. However, the land route accounts for only a small fraction of the total trade between China and Pakistan. This is because, until recently, there were no feasible low cost land routes for transportation of goods between the two countries. There are well developed land routes between Pakistan and India, but high tariff and nontariff barriers arising from strained relations have significantly impeded Pakistan-India trade. Trade with other neighboring countries, Afghanistan and Iran, has also been hampered by conflict in Afghanistan and strife in tribal areas and Baluchistan. Historically important east-west trade routes connecting India with central Asia and China passed though Pakistan. These routes are no longer used and Pakistan has relied largely on international trade by sea through the port of Karachi. Expansion of east-west trade presents a great opportunity for Pakistan to increase its economic growth (Nabi, 2013). There has been much interest in exploring the effect of trade liberalization with India (Pakistan Business Council report, 2013). The recent China-Pakistan Economic Corridor (CPEC) project has also stimulated interest in the potential for the expansion of overland trade with China.

Our research project examines the effect of barriers to Pakistan's east-west trade, especially trade with China and India, and explores the potential for trade expansion from reduction in these barriers. To identify the trade effect of east-west barriers, we use a large data set to estimate a model that explains bilateral trade flows for most trading pairs in the world. If there are special barriers to Pakistan's trade with a country, which are not accounted for in the model - - for example, land transportation barriers to trade with China and policy-induced trade restrictions on trade with India - - then Pakistan's actual trade with the country should be less

than the trade predicted by the model. An important finding of our study is that Pakistan's imports from and exports to both China and India are significantly less than the values predicted by the model. This finding suggests a potential for substantial expansion of trade with the two economies. Although the effects of trade liberalization on trade between Pakistan and India have been examined in a number of studies, the implications of lower land transportation costs on Pakistan-China trade have not been explored.

We use an up-to-date version of the Gravity model which has had considerable empirical success in explaining bilateral trade flows and has strong theoretical foundations (Anderson and van Wincoop, 2003; Helpman et al., 2008). The traditional version of the Gravity model explains bilateral flows using only three variables: GDP of importing country, GDP of exporting country, and bilateral transportation costs proxied by the distance between the trading pair. All three variables are found to be significant determinants of bilateral trade flows. The significance of the distance index underscores the importance of transportation costs in determining the volume of trade between country pairs. It is recognized that distance may not be an adequate measure of transportation costs, and bilateral trade costs also depend on tariff and nontariff barriers. Additional variables are thus added to proxy omitted sources of trade costs.

Although the traditional Gravity model was not motivated by international trade theory, recent developments have shown that widely-used new-style international trade models imply a regression equation that has a similar form as the traditional gravity equation (Anderson and van Wincoop, 2003; Helpman et al., 2008). Key features of the new trade models are that countries trade differentiated goods produced under monopolistic competition and firms incur additional variable and possibly fixed trade costs to sell in the foreign markets. These features provide an explanation of intraindustry trade and account for the fact that only some of the firms in an industry engage in exports. The new trade models can be used to derive a general form of the Gravity model, in which bilateral trade flows depend on three multiplicative components: (1) a component that includes factors specific to the exporting country, (2) a component that includes factors specific to the importing country, and (3) a component that includes trade cost indexes specific to the trading pair.

To estimate the Gravity model, we assembled a panel data set that includes bilateral trade flows of 183 reporting countries from 2004 to 2013. For each year and reporting country, the bilateral data set includes data on the US dollar value of all exports to and all imports from each partner. A striking feature of the data is that no trade is reported for a large number of country pairs. An explanation of this fact provided by the new trade models is that profits expected from sales to destinations with small markets may not be enough to justify costs of setting up export operations to these destinations. We estimate the general form of the Gravity model. A simple way to estimate it is to express it in its log-linear form. In this form, the components including factors specific to exporting and importing countries are captured by time-variant dummy variables for exporting and importing countries. For the component representing bilateral trade costs, we use the standard indexes represented by the log of distance (between major cities of the pair) and by dummy variables for common border (which would facilitate trade by land), common official language and shared colonial history (which would reduce informational barriers) and membership in RTA's (which would lower both tariff and non-tariff barriers). We add bilateral dummy variables for Pakistan's trade with each neighbors (equal to 1 for observations representing trade flows between Pakistan and a particular nighbor and equal to 0 for all other observations) to measure the effects of barriers to Pakistan's east-west traded, which are not accounted for by the standard indexes of trade costs. A negative coefficient of such a dummy variable would indicate a negative difference between the actual bilateral trade and the value predicted by the standard model (averaged over 2004-2013).

One problem with the log-linear form is that the dependent variable canot be expressed in logs if there is zero trade. One simple solution to this problem drops zero trade observations and fits the model to observations with non-zero trade using OLS regressions. This procedure, however, inroduces an unknown selection bias. We consider two alternative estimation procedures. One procedure is suggested by Eaton and Kortum (2001) based on the Tobit model. This procedure assumes that zero trade is observed if potential trade falls below a critical level, and uses (left censored) interval regression to estimate the model. Although this approach can be motivated by models with fixed exporting costs, it has an element of arbitrariness in its treatment of zero trade. Another procedure is proposed by Santos Silva and Tenreyro (2006) and uses the Poisson Pseudo Maximum Likelihood (PPML) estimator. This procedure avoids the bias in logarithmic estimation due to heteroskedasticity of the error (in logs). As PPML procedure does not require logarithmic transformation of the dependent variable, it can accommodate zero trade flows. However, the procedure is not motivated by theory explaining zero trade and a number of observations may need to be dropped to achieve convergence to parameter solution. We use all three procedures discussed above to estimate the Gravity model with either bilateral imports or exports as the dependent variable.

In our results, estimates of the coefficients of Pak-China and Pak-India dummy variables are of special interest. These estimates for both the import and export regressions are sensitive to the estimation procedure. The effect of the two dummy variables is the strongest in the EK Tobit regression and the weakest in the PPML regression. In all cases, however, the coefficients of both dummy variables are significantly negative. These results also suggest that the cost of special barriers to trade with China and India are substantial. For example, our mid-level OLS estimates from the import regressions suggest that based on a typical value of trade elasticity, the Pak-China barriers are equivalent to a tariff rate of 37% and Pak-India barriers to a tariff rate of 100%.

We also explore the potential for trade expansion available from lowering of these barriers. We construct counterfactuals which examine the effects of lowering Pak-India and Pak-China trade barriers. We use a general equilibrium methodology that examines not only the direct effect of reducing trade costs on the bilateral component (captured by the bilateral dummy variable), but also indirect effects operating through country specific components. Pak-India barriers to trade are based on policy restrictions and they can be potentially reduced by any amount or even eliminated completely. Reduction in Pak-China barriers, on the other hand, depends on the effect of CPEC on transportation cost by land. CPEC would be more effective if it is well connected to large markets and production centers in different provinces in Pakistan and there are economical transportation links between Xinjiang region (which CPEC connects to) and the industrialized Eastern region in China.

For illustrative purposes, we consider two scenarios: (1) a modest 10% decrease, and (2) a more substantial 25% decrease in both Pak-China and Pak-India barriers. For each scenario, our counterfactuals predict a range of growth rates in Pakistan's trade with China and India, depending upon the estimates of the effect of bilateral barriers (which vary across different estimation procedures). However, even at the lower end of the range, there is significant potential for expansion not only of Pakistan's trade with India, but also of trade with China.

1. Introduction

Pakistan faces high barriers to international trade across its eastern as well as western and north-western borders. Historically important east-west trade routes connecting India with central Asia and China passed though Pakistan. However, strained relations with India, war and political instability in Afghanistan, lack of development of transportation infrastructure for land routes to China, and strife in tribal areas and Baluchistan have impeded Pakistan's trade towards east and west. Expansion of east-west trade presents a great opportunity for Pakistan to increase its economic growth (Nabi, 2013). There has been much interest in exploring the effect of trade liberalization with India. The recent China-Pakistan Economic Corridor (CPEC) project has also stimulated interest in the potential for trade expansion with China.

The object of this research project is to examine the effect of barriers to Pakistan's east-west trade, and explore the potential for trade expansion available from reduction in these barriers. The project was divided into three phases. In the first phase of the project, we assembled a large data set required to estimate the modern versions of the Gravity model of international trade. The second phase estimated these versions and identified the effect of east-west trade barriers on Pakistan's bilateral trade flows with its neighbors, in particular India and China. Our results show that barriers to overland trade with China, and policy-induced restrictions on trade with India have substantially reduced bilateral trade with these countries. Our estimates of the Gravity model were utilized in the third and final phase to examine the potential for trade expansion available from lowering of trade barriers to Pakistan's trade with China and India. This phase examined the impact of lower transport costs via CPEC on trade with China, and of reduction of tariff and nontariff barriers on trade with India.

Sections 2 of this report discusses the theoretical structure and the empirical implementation of the gravity model. Section 3 briefly describes our data set and Pakistan's international trade. Section 4 explains our methodology for estimating the gravity model and reports our results. Section 5 uses our estimates of the Gravity model and general equilibrium analysis to construct counterfactuals for exploring potential trede effects of liberalization of Pakistan's trade with China and India. .

2. Gravity Model

2.1 Theoretical Structure

The Gravity model of international trade is now regarded as the main empirical tool for explaining bilateral trade flows. The traditional version of the Gravity model explains bilateral trade flows between a pair of countries as a positive function of each country's GDP and a negative function of the distance between the two countries, and can be expressed as

$$X_{ij,t} = A_t Y_{i,t}^{a_1} Y_{j,t}^{a_2} D_{ij}^{a_3}, \quad a_1 > 0, a_2 > 0, a_3 < 0, \tag{1}$$

where $X_{ij,t}$ is the value of export from country i to j, $Y_{i,t}$ and $Y_{j,t}$ are the GDP's of countries i and j in period t; A_t is a period-specific constant term; and D_{ij} represents a measure of bilateral distance between the exporting and importing countries.[1] The distance measure is considered an index of the transportation cost between the country pair. Additional indexes of trade costs are often included in the above equation. Note that letting $M_{ji,t}$ denote the value of

[1] Here we discuss the form suitable for panel data estimation. The time subscript is not needed for cross-section estimation (and is often dropped for expositional simplicity).

imports of j from i, $X_{ij,t} = M_{ji,t}$.[2] Thus, the gravity equation can be used to explain either import or export flows.

Although the traditional gravity equation did not have clear-cut theoretical underpinnings, recent developments have derived gravity equations that can be related to new-style structural models of international trade. One popular structural gravity model developed by Anderson and van Wincoop (2003) can be derived from an international trade model with either perfect competition and the Armington (1969) assumption that goods are differentiated according to the country of origin or with monopolistic competition and differentiated varieties produced by homogeneous firms (Krugman, 1980). Letting $\sigma\,(>1)$ denote the elasticity of substitution between differentiated goods or varieties (in a CES utility function) and $\tau_{ij,t}$ (>1) a bilateral iceberg trade cost index (i.e., $\tau_{ij,t}$ units of a good or variety have to be shipped from i for one unit to arrive in j), the Anderson-van Wincoop model is expessed as

$$X_{ij,t} = \frac{Y_{i,t}E_{j,t}}{Y_t}\left(\frac{\tau_{ij,t}}{\Pi_{i,t}P_{j,t}}\right)^{1-\sigma}, \tag{2}$$

where $\Pi_{i,t}^{1-\sigma} = \sum_j \left(\frac{\tau_{ij,t}}{P_{j,t}}\right)^{1-\sigma} \frac{E_{j,t}}{Y_t}$, $P_{j,t}^{1-\sigma} = \sum_i \left(\frac{\tau_{ij,t}}{\Pi_{i,t}}\right)^{1-\sigma} \frac{Y_{i,t}}{Y_t}$, and $E_{j,t}$ is country j 's aggregate expenditure and Y_t is world income in period t. Under balanced trade, $E_{j,t} = Y_{j,t}$. The iceberg trade cost index captures variable trade costs (i.e., trade costs per unit of trade flow) and can be defined broadly to depend on transportation costs (a function of bilateral distance) as well as tariff and non-tariff barriers. The tariff equivalent of trade costs is given by $\tau_{ij,t} - 1$.

[2] In data, $X_{ji,t}$ and $M_{ji,t}$ can differ because of discrepencies in the measeurement of trade flows by the importing and exporting countries.

Both the traditional and the above structural gravity relations imply that bilateral trade flows can be expressed in the following multiplicative form:

$$X_{ij,t} = G_t S_{i,t} U_{j,t} \phi_{ij,t} , \tag{3}$$

where $S_{i,t}$, $U_{j,t}$ and $\phi_{ij,t}$ represent, respectively, the effect of factors specific to the exporting country i, importing country j, and the pair i, j in period t; and G_t is a term that can vary over time but does not depend on country characteristics.[3] The components specific to importers and exporters in the structural gravity model include variables $\Pi_{i,t}^{1-\sigma}$ and $P_{j,t}^{1-\sigma}$, and thus are different from the corresponding components in the traditional model.[4] Anderson and van Wincoop (2003) call these variables inward and outward multilateral resistance terms. An important implication of their model is that the omission of these variables from the gravity equation can lead to a significant bias in the estimates of its coefficients.

The trade model with monopolistic competition has been extended by Melitz (2003) to allow for firm heterogeneity and fixed costs of exporting.The Melitz model has been successful in explaining some key features of international trade data (such as why only a proportion of firms in an industry are typically engaged in exporting) and is now widely used for trade policy analysis. Helpman et al. (2008) show that a gravity equation can also be derived from this model. Moreover, the gravity equation based on the Melitz model under balanced trade can be expressed in the following form that is similar to Anderson-van Wincoop model but incorporates an additional term:

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[3] For a discussion of alternative models that also lead to this general form of the Gravity equation, see Head and Mayer (2014).

[4] Equation 2 also has a different specification of trade frictions than (1). However, note that the bilateral component, $\phi_{ij,t}$, can be the same in the two equations if $\tau_{ij,t}$ is assumed to be an appropriate function of the distance index and additional (possibly time-variant) trade cost variables are included in the traditional model.

$$X_{ij,t} = \frac{Y_{i,t}Y_{j,t}}{Y_t}\left(\frac{\tau_{ij,t}}{\tilde{\Pi}_{i,t}P_{j,t}}\right)^{1-\sigma} V_{ij,t}, \tag{4}$$

where $\tilde{\Pi}_{i,t}^{1-\sigma} = \sum_j \left(\frac{\tau_{ij,t}}{P_{j,t}}\right)^{1-\sigma} \frac{Y_{j,t}}{Y_t} V_{ij,t}$, and $V_{ij,t}$ is an index based on weighted average unit input requirement (inverse of factor productivity) for i 's firms exporting to j.[5] This index controls for the proportion of exporting firms and equals zero if no firms in i export to j. A firm in i will export to j if its input requirement is below the threshold needed for profitable export operation. Thus some firms in i will export to j if the threshold for i and j is above the minimum value of the input requirement; otherwise no firm in i will export to j. The threshold for a country pair depends on both fixed and variable costs of exporting and can vary from one pair to another.

To determine the bilateral threshold levels and the index $V_{ij,t}$, a typical assumption is that the distribution of input requirement across firms is characterized by the Pareto distribution. If the Pareto distribution is untruncated (lower bound for the input requirement equals zero), $V_{ij,t} > 0$ since some firms in i will have a low enough input requirement to export to j. The non-zero $V_{ij,t}$ term can be decomposed multiplicatively into three components depending on, respectively, the exporter, importer and trading pair characteristics. The gravity equation (4) for this version of the Melitz model can be expressed in the general form (3). The expression for the $\phi_{ij,t}$ component, however, is different in the Melitz model. In the Anderson-van Wincoop model,

[5] Letting $\alpha_{ij,t}^*$ denote the input requirement threshold for i 's exports to j for period t , and $G(\alpha)$ represent the cumulative distribution function for input requirement with lower support equal to α_L , $V_{ij,t} = \int_{\alpha_L}^{\alpha_{ij,t}^*} \alpha^{1-\sigma} dG(\alpha)$ if $\alpha_{ij}^* \geq \alpha_L$; otherwise $V_{ij,t} = 0$.

$\phi_{ij,t} = \tau_{ij,t}^{1-\sigma}$. In contrast, letting θ denote the shape parameter in the Pareto distribution and $f_{ij,t}$ the input requirement for fixed cost of exporting from i to j, it can be shown that $\phi_{ij,t} = \tau_{ij,t}^{-\theta} f_{ij,t}^{-\left(\frac{\theta}{\sigma-1}-1\right)}$ in the general form of the Meltiz model with untruncated Pareto distribution.[6] This expression implies that the elasticity of bilateral exports with respect to variable trade cost depend only on the shape parameter of the disribution while the elasticity with respect to fixed costs depends both on the shape paameter and the substitution elasticity.

One limitation of the above version of the Melitz model is that like the Anderson-van Wincoop model, it does not explain the fact that zero exports are observed for many country pairs. To explain this fact, Helpman et al. (2008) use a model which assumes a truncated Pareto distribution with non-zero lower support. In this version, $V_{ij,t} = 0$ and there is zero trade if the threshold for the i, j pair is blow the lower support. This version of the model, moreover, cannot be expressed in the general form (3) because this form does not allow for zero trade. Estimating the model excluding observations with zero trade flows would introduce a selection bias.

2.2 Empirical Implementaton

Gravity models are generally estimated in a log-linear form. For example, after adding a multiplicitive error term, $e_{ij,t}$, the traditional gravity model can be expressed as

$$\ln X_{ij,t} = \ln A_t + a_1 Y_{i,t} + a_2 Y_{j,t} + a_3 \ln D_{ij} + \ln e_{ij,t} . \tag{5}$$

[6] Fixed exporting costs can be incurred in i, j or both, and can be related to the input requirement as $F_{ij,t} = c_{i,t}^{\mu} c_{j,t}^{1-\mu} f_{ij,t}$, where $c_{i,t}$ and $c_{j,t}$ are the input costs (wage rates if labor is the only factor) in i and j, and $\mu \in [0,1]$.

This equation can be estimated by OLS (time dummies can be used to estimate $\ln A_t$). The log-linear form of the Anderson-van Wincoop gravity model (with balanced trade and multiplicitive error) is: $\ln X_{ij,t} = b_0 \ln Y_t + b_1 \ln Y_{i,t} + b_2 \ln Y_{j,t} + b_3 \ln \Pi_{i,t} + b_4 \ln P_{j,t} + b_5 \ln \tau_{ij,t} + \ln e_{ij,t}$, where $b_0 = -1$, $b_1 = b_2 = 1$, $b_3 = b_4 = \sigma - 1$ and $b_5 = 1 - \sigma$. Trade costs are typically modeled as $\tau_{ij,t} = D_{ij}^{-\varepsilon_D} \mathrm{T}_{ij,t}$, where ε_D is the elasticity of trade costs with respect to distance and $\mathrm{T}_{ij,t}$ is the effect of other determinants of trade costs generally represented by binary variables.[7] The multilateral resistance terms, $\Pi_{i,t}$ and $P_{j,t}$, are not directly observable. Although some proxies for these variables can be derived, a typical approach is to estimate this model in the log-linear version of the general form (3):

$$\ln X_{ij,t} = \ln G_t + \ln S_{i,t} + \ln U_{j,t} + \ln \phi_{ij,t} + \ln e_{ij,t} \,. \tag{6}$$

In this form, $\ln S_{i,t} = \ln Y_{i,t} + (\sigma - 1) \ln \Pi_{i,t}$ and $\ln U_{j,t} = \ln Y_{j,t} + (\sigma - 1) \ln P_{j,t}$, and time-variant dummy variables for exporting and importing countries can be used to estimate these components. The component $\ln G_t = -\ln Y_t$ can be estimated using time dummies, but if there is no need to isolate the effect of this component, it could be dropped and its effect would then be included in the exporter and importer time-variant dummy variables. Finally, $\ln \phi_{ij,t}$ would depend on $\ln D_{ij}$ and indicator variables for other determinants of trade costs. OLS can also be used to estimate (6).

The Melitz model with untruncated Pareto distribution could also be represented by (6) with a different interpretation of the component, $\ln \phi_{ij,t}$. One basic problem with the log-linear

[7] For example, other determinants of trade costs include dummy variables for whether a country pair shares a common border, language or colonial history or belongs to a regional trade agreement. Note that some of these variables like the membership of a regional trade agrrements could vary over time.

form (6) is that it cannot include or explain zero bilateral trade flows. One approach is to estimate (6) excluding zero trade observations. This approach, however would introduce a selection bias because of the omission of observations with zero trade.

The Melitz model with truncated Pareto distribution explains zero trade. For this model, Helpman et al. (2008) suggest a two-stage Heckman estimation procedure where the first stage model explains the choice of a pair of countries to trade or not to trade, and the second stage model explains bilateral trade flows for country pairs with non-zero trade. A limitation of this procedure is that it requires an exclusion restriction, that is, at least one variable that is included in the first-stage model but not the second-stage model. Such a variable is hard to find since the factors determining a firm's decision whether to export to a destination or not are also likely to influence the decision of how much to export if it chooses to export.

An alternative approach is suggested by a method proposed by Eaton and Kortum (2001) based on the Tobit model. According to this method, there is a critical value of exports for each country (in a given period), $X_{i,t}^{L}$, such that if "ideal" trade falls below this level, zero exports are observed, otherwise observed exports equal ideal exports. This method can be related to the heterogeneous firm model which implies that a country will not export to a destination if the threshold levels for the destination falls below the lower support of the truncated Pareto distribution. Threshold input requirements (varying across destinations) would determine country i's exports to each destination. The critical value, $X_{i,t}^{L}$, can be interpreted as the lower bound for country i's exports to different destinations in period t, and can be estimated from observed bilateral exports as $X_{i,t}^{L} = \underset{j}{Min}\left(X_{ij,t}\right)$. This method can be implemented for estimating (6), by using interval regression with the dependent variable representing point data $(\ln X_{ij,t}, \ln X_{ij,t})$ for observations with non-zero trade and left-censored data $(-\infty, \ln X_{i,t}^{L})$ for observations with zero trade.

Santos Silva and Tenreyro (2006) point out another problem with estimating (6), which arises if $e_{ij,t}$ is heteroskedastic and its variance depends on one or more of the explanatory variables. In this case, since the expected value of $\ln e_{ij,t}$ depends on the variance of $e_{ij,t}$, the OLS estimator would be biased and inconsistent. They show that under weak assumptions, the Poisson Pseudo-Maximum Likelihood (PPML) estimator provides consistent estimates of the original nonlinear model. As this procedure does not require logarithmic transformation of the dependent variable, it can accommodate zero trade flows. Thus PPML could be used to estimate a model that uses the same explanatory variables as in (6) to explain bilateral trade flows including zero flows.

3. Data

In this section we briefly describe our sample and discuss the evolution and the distribution of Pakistan's trade in our sample period.

3.1 Sample

We have assembled a panel data set that includes bilateral trade flows of 183 reporting countries with 253 partner countries from 2004 to 2013. For each year and reporting country, the bilateral data set includes data on the US dollar value of all exports to and all imports from each partner. The data set includes 515120 observations. The source of the data is the U.N. Comtrade Database. One feature of the data that stands out and is worth mentioning is the large proportion of country pairs that report zero trade flows. As Figure 1 shows, the proportion of country pairs with no trade is around the 60% mark in 2004 and edges steadily upwards thereafter.

We have also collected data on a number of indexes of trade costs. These indexes are in line with standard practice in the gravity literature and include, among others, the log of distance, measured as the distance in kms between most populated cities. This ranges between 1.88 and 19904 kms, with a mean value of 7325 kms. We also measure trade costs by including dummies that take value 1 for common borders, common official or primary language and common colonizer after 1945. These data come from the CEPII gravity dataset. Finally we include a dummy that takes value 1 in case of membership to regional trade agreements (RTAs).

3.2 Pakistan's International Trade

Figure 2 shows that Pakistan's imports have grown from less than 20 billion in 2004 to to nearly 45 billion US dollars in 2013 while exports have increased at a slower pace from less than 15 billion to about 25 billion US dollars over the same period. The share of imports in GDP has fluctuated, but has not changed much between 2004 and 2013. The share of exports in GDP has declined from 2004 to 2013 .

Pakistan trades with over 175 countries. However, the bulk of Pakistan's trade takes place with a much smaller number of countries. Figures 3 shows the percentage of Pakistan's imports originating from the top ten countries in 2004 and 2013. Figure 4 shows the proportion of Pakistan's exports destined to the top ten countries in the sames years. The 10 largest trading partners for imports are different than for exports. As well, the list has changed from 2004 to 2013. USA is the largest importer of Palistan's goods in both years, although its share of

Pakistan's total exports declined from 23% to 15%. Saudi Arabia in 2004 and UAE in 2013 were the largest exporters to Pakistan.

A large country is likely to have large trade flows with Pakistan. To control for the size of the trade partner, we also examine Pakistan's bilateral imports and exports as a percentage of partner's GDP. According to this measure, Figures 5 shows the top ten countries in 2004 and 2013 for imports and Figure 6 the top 10 countries for exports.[8] The leading trading partner list based on the size adjusted imports and exports is quite different. The two large neighbors of Pakistan, China and India, do not appear in this list.

4. Empirical Analysis

4.1 Methodology

Our main objective is to estimate the effect of east-west trade barriers on Pakistan's trade with neighboring countries. To control for other factors influencing Pakistan's bilateral trade, we use our panel data set to estimate gravity models. We use the bilateral trade data of all reporting countries to estimate the effect of other factors. Bilateral dummy variables for Pakistan and selected countries are then used to isolate the effect of east-west barriers for Pakistan. We initially consider four countries that share a common border with Pakistan: India, China, Afghanistan and Iran. We define symmetric time-invariant bilateral dummy variables for Pakistan and each of these countries which take the value of 1 for observations for bilateral trade between Pakistan and the given neighbor and value of zero for all other observations.

[8] In Figure 6, we have excluded Afghanistan, as reported exports from Pakistan could include US supplies shipped though Pakistan and may have a considerable upward bias.

In estimating the model, we focus on the general form (6). For estimating the effects of components $S_{i,t}$ and $U_{j,t}$, we consider time-variant dummy variables (i.e, a separate dummy variable for each year) for reporters and partners. As this formulation involves a very large number of dummy varibles, we also use a simpler form which assumes that time effects are the same for all countries. In this form, fixed (time-invariant) reporter and partner dummies and dummies for years are used to estimate the effect of the monadic components $S_{i,t}$ and $U_{j,t}$. The dyadic component $\phi_{ij,t}$ captures the effect of trade costs. We use the conventional indexes of trade costs represented by $\ln D_{ij}$ and dummy variables for common border, common official language, shared colonial history and membership in RTA's.[9] In addition, we incorporate bilateral dummies for Pakistan and its neighbors to identify extra costs of east-west trade barriers for Pakistan. Note that the dyadic component is symmetric (i.e., $\phi_{ij,t} = \phi_{ji,t}$) since all of its determinants are symmetric

For estimating the model, we use a balanced sample where the number of partner countries is reduced to make the partner country set the same as the reporter country set. As it is not clear whether reported imports or exports are a more accurate measure of bilateral trade flows, we estimate two models, one for explaining exports and the other for explaining imports. We consider three methods for estimating the structural gravity model.[10] First, we use OLS to estimate a model for non-zero trade flows. This model suffers from a potential selection bias since zero trade observations are omitted. Second, we use EK Tobit procedure to estimate the model. This procedure includes all observations and is related to theory explaining zero trade,

[9] In this set, only the dummy variable for RTA is potentially time variant (if a country joins or leaves an RTA during the sample period).
[10] We did not use the 2-stage Heckman procedure because of a lack of a satisfactory variable satisfying the exclusion restriction.

but is somewhat arbitrary and can produce biased estimates because of heteroskedasticity. Finally, we employ PPML technique for estimation. This technique addresses the heteroskedasticity issue. It can also handle zero trade flows, but uses a model not designed to explain zero trade.[11]

4.2 Results

We estimate the three structural gravity models discussed above. For comparison, we also estimate a traditional gravity model. Tables 1 and 2 present the key results for these models. Table 1 shows results for regressions explaining bilateral imports and Table 2 for regressions explaining bilateral exports. In each table, we present estimates of the traditional OLS regression in column (1), the structural OLS regression excluding zero trade observations in column (2), the EK Tobit regression including zero trade observations in column (3); and the PPML regression including zero trade observations in column (4).[12] In the traditional regression, explanatory variables include the GDP of both the reporter and partner countries, but do not include any country- or time-specific dummy variables. All three structural regression include dummy variables for reporter and partner countries and for years (reporter and partner GDP is excluded). We also tried time-variant reporter and partner dummy variables in the structural regressions, but the results were not very different, and the tables focus on the simpler versions with a much smaller number of fixed effects.

We use the same set of trade cost variables for all regressions. This set include traditional indexes represented by $\ln D_{ij}$ and bilateral dummy variables labelled contig (contiguous country

[11] Another limitation of this procedure is that a number of country dummy variables and observations need to be dropped to ensure convergence in estimation.

[12] For reporter country i, partner country j and year t, the dependent variables in Tables 1 and 2 are $M_{ij,t}$ and $X_{ij,t}$ for PPML regressions and $\ln M_{ij,t}$ and $\ln X_{ij,t}$ for other regressions.

pair), com_langoff (common official language), comcol (common colonial history) and rta (part of an RTA). In addition, the set includes the dummy variables for Pakistan and each of its immediate neighbors, which are of special interest for this study. These variables are labelled pak_india, pak_china, pak_afg and pak_iran. In each regression, the coefficeints of a variable represents the elasticity of the bilateral trade index with respect to the variable.

As the tables show, results for the structural regressions are different than the traditional regressions. Moreover, the coefficients of trade cost indexes vary considerably across the three structural regressions. With a few exceptions, the coefficients (in absolute values) are the highest in the EK Tobit regression and the lowest in the PPML regression.[13] As would be expected from the presence of policy-induced special restrictions on trade between Pakistan and India, the coefficients for the pak-india dummy are significantly negative for all regressions in both tables. We find, moreover, that the coefficients for the pak-china dummy are also significantly negative in all cases. This result shows that both Pakistan's imports from and exports to China are significantly less than the values predicted by conventional variables in the traditional as well as structural gravity models. Pakistan has good relations with China and there are no apparent extra trade policy barriers between the two countries. Indeed, Pakistan and China have already negotiated a first phase of a free trade agreement since 2008. Thus our findings provide strong support to the view that inacessible land routes have diminished Pakistan's trade with China.

The coefficients for pak-afg dummy are positive and significant in all cases, and those for pak-iran dummy are significantly positive in some cases and insignificant in others. These results may seem surprising as war in Afganistan and conflict in tribal areas and Baluchistan would be

[13] One exception is the coefficients of the common border index (contig), which are insignificant for EK Toblt and significant and positive for the other structural regressions in both tables. The ordering of the coefficients for the pak-afg dummy is also different than for other variables.

expected to impede Pakistan's trade with Afghanistan and Iran. Pakistan's reported trade with Afghanistan, however, could be significantly biased because it likely includes movement of goods through Pakistan that are related to war operations. Moreover, other countries' trade with Afganistan and Iran was hindered by Afghanistan war and sanctions on Iran, perhaps to a larger extent than Pakistan's trade with these countries. These factors could account for the surprising results.

5. Potential for Trade Expansion

5.1 Trade Cost of Special Barriers

Our empirical analysis above suggests that special barriers to trade with China and India captured by Pakistan-India and Pakistan-China dummy variables have significantly decreased Pakistan's trade with these countries. We first examine how large are the trade costs implied by these barriers. The bilateral component of the Gravity equation across models with and without fixed trade costs can be expressed as

$$\phi_{ij,t} = (\tilde{f}_{ij,t})^{\delta} (\tau_{ij,t})^{-\varepsilon} \ , \tag{7}$$

where $\tilde{f}_{ij,t} \equiv f_{ij,t}^{-\left(\frac{\theta}{\sigma-1}-1\right)}$, ε represents the elasticity of trade with respect to variable trade costs and δ is a dummy variable. In the Anderson-van Wincoop model, $\varepsilon = \sigma - 1$ and $\delta = 0$ as there are no fixed trade costs. In the Melitz model with untruncated Pareto distribution, on the other hand, $\varepsilon = \theta$ and $\delta = 1$. Variable trade costs consist of transportation costs, tariffs and a variety of non-tariff barriers. We thus express the iceberg trade cost index (which captures variable trade costs) as

$$\tau_{ij,t} = \exp[tr_{ij,t} + ta_{ij,t} + nte_{ij,t}], \tag{8}$$

where, $tr_{ij,t}$, $ta_{ij,t}$ and $nte_{ij,t}$ represent transportation costs (as a proportion of price), tariffs and the tariff equivalent of non-tariff barriers for trade between i and j. These trade costs can be related to the variables explaining the bilateral component in the Gravity model. Distance and the existence of a common border (which facilitates overland trade) are key determinants of transportation costs. Having a common language and colonial history reduces informational barriers (which are a type of non-tariff barriers). Belonging to an RTA reduces tariffs as well as policy-based non-tariff barriers. Fixed exporting costs may also depend on some or all of these variables.

We attribute special barriers to trade between Pakistan and China to obstacles to overland trade which increase overall transportation costs between these countries. We can use estimates of our gravity model to calculate the effect of these barriers on the bilateral component for Pakistan and China. Letting a prime denote the value of a variable in the absence of special barriers (i.e., the value obtained when Pak-China dummy variable is set equal to zero), we have

$$\ln \phi_{PC,t} - \ln \phi'_{PC,t} = \beta_{PC}, \tag{9}$$

where subscripts P and C stand for Pakistan and China, and β_{PC} is the coefficient of Pak-China dummy variable. Using (7) and (8) after expressing these equations in logs, and assuming that special barriers affect only tr_{PC},[14] we also have

$\ln \phi_{PC,t} - \ln \phi'_{PC,t} = -\varepsilon(\ln \tau_{PC,t} - \ln \tau'_{PC,t}) = -\varepsilon(tr_{PC,t} - tr'_{PC,t})$. Then letting $\Delta tr_{PC,t} \equiv tr_{PC,t} - tr'_{PC,t}$ denote the extra transportation costs between Pakistan and China, we can use (9) to calculate this cost as

[14] Barriers to land transportation could possibly also influence fixed trade costs, but we ignore this possibility here.

$$\Delta tr_{PC,t} = -\beta_{PC} / \varepsilon . \tag{10}$$

As noted above, the trade elasticity, ε, depends on the substitution elasticity (σ) in the Anderson-van Wincoop model and the shape parameter (θ) in the Melitz model.

A number of studies have used disaggregated trade data to estimate σ and have produced a wide range of estimates for this parameter.[15] Under Pareto distribution, it can be shown that $\theta = \sigma - 1 + \xi$, where parameter ξ can be estimated from the distribution of firm sales. Estimates of ξ suggest that θ is close to σ.[16] Another approach is to use procedures based on the Gravity model to directly estimate ε without identifying the underlying parameter. Head and Mayer (2014) review Gravity-based estimates of ε and report that the median value of these estimates equals 5.03. Assuming this value for illustrative purposes, we can use our estimates of the coefficient of the Pak-China dummy variable to readily calculate the additional costs attributed to land transportation barriers. In percentage points, the additional cost ($\Delta tr_{PC,t} \times 100$] is as high as 37% if we use the OLS estimates of the coefficient in the import regression. The additional cost would be higher for the EK Tobit and lower for the PPML estimate of the coefficient.

In contrast, special barriers to trade between Pakistan and India are the result of policy restrictions on trade that involve higher tariff as well as non-tariff barriers. These restrictions could also have increased fixed exporting costs. Again use a prime to denote the value in the

[15] See, for example, Broda and Weinstein (2006) and Imbs and Mejean (2009).

[16] Under the assumption of Pareto distribution, ξ equals the inverse of the standard deviation of the log of firm sales. Estimates of ξ by Helpman, Melitz and Yeaple (2004) for the United States (based on plant data) and Europe (based on firm data) imply a range from 0.6 to 0.8.

absence of policy restriction (with Pak-India dummy variable set equal to zero). Our Gravity model then implies

$$\ln\phi_{PI,t} - \ln\phi'_{PI,t} = \beta_{PI}\,, \tag{11}$$

where subscript I represents India. In the simple case of no fixed trade costs ($\delta = 0$), the removal of policy restriction would only decrease $ta_{PI,t}$ and $nte_{PI,t}$. For this case, defining $te_{PI,t} \equiv ta_{PI,t} + nte_{PI,t}$ as the tariff equivalent of both tariff and non-tariff barriers, and using (7) and (8), we obtain: $\ln\phi_{PI,t} - \ln\phi'_{PI,t} = -\varepsilon(te_{PI,t} - te'_{PI,t})$. Now letting $\Delta te_{PI,t} \equiv te_{PI,t} - te'_{PI,t}$ denote the tariff equivalent of policy-induced extra barriers for Pakistan-India trade, we can use (11) to calculate it as

$$\Delta te_{PI,t} = -\beta_{PI} / \varepsilon\,. \tag{12}$$

If we again assume a value of 5.03 for ε and use OLS estimate of the coefficient of Pak-India dummy variable from the import regression, then (12) implies that special restrictions on trade between Pakistan and India are equivalent to a 100% tariff. As would be expected, policy barriers for Pakistan and India lead to higher trade costs than Pak-China barriers to land transportation. Use of alternative values of β_{PI} based on EK Tobit or PPML methods would lead to different estimates of $\Delta te_{PI,t}$.

In the presence of fixed trade costs ($\delta = 1$), we can use (7) and (8) to revise the change in the log of the bilateral component as $\ln\phi_{PI,t} - \ln\phi'_{PI,t} = -\left(\frac{\theta}{\sigma-1} - 1\right)\Delta\ln f_{PI,t} - \varepsilon\Delta te_{PI,t}$., where $\Delta\ln f \equiv \ln f_{PI,t} - \ln f'_{PI,t}$. Letting $\rho_t = \frac{\Delta\ln f_{PI,t}}{\Delta te_{PI,t}}$ and defining $\tilde{\varepsilon} \equiv \left[\varepsilon + \rho_t\left(\frac{\theta}{\sigma-1} - 1\right)\right]$, we can simplify this expression as $\ln\phi_{PI,t} - \ln\phi'_{PI,t} = -\tilde{\varepsilon}\Delta te_{PI,t}$. Now using (11), we have $\Delta te_{PI,t} = -\beta_{PI} / \tilde{\varepsilon}$. Thus we can still calculate $\Delta te_{PI,t}$, but would need additional information to determine $\tilde{\varepsilon}$.

5.2 Partial and General Equilibrium Effects

In view of the costs of special barriers to Pakistan's trade with China and India, it is interesting to examine the potential trade effects of reductions in these costs. In this section, we discuss the methodolgy for constructing counterfactuals to explore such effects. Suppose that CPEC leads to lower transportation costs, which are a proportion λ of $\Delta tr_{PC,t}$. What would be the effect of this decrease on the bilateral trade between Pakistan and China? We can use our estimates of the Gravity equation to readily determine the effect on the bilateral component. Equations (9) and (10) imply that the proportional change in $\phi_{ij,t}$ will equal $-\lambda\beta_{PC}$ and will be positive as $\beta_{PC} < 0$.[17] If Pakistan and China specific components of the Gravity equation do not change, the proportional increase in Pakistan's exports to China will also equal $-\lambda\beta_{PC}$. Note that since the effect of the reduction in transport costs on the bilateral component is symmetrical, the proportional increase in Pakistan's imports from China would also be the same. We can similarly derive the effect of a specific reduction in equivalent tariff on the trade between Pakistan and India. These changes, however, represents a partial-equilibrium trade effect as they do not account for changes in country specific components induced by reduction in trade costs.

A general equilibrium analysis is needed to determine how a trade cost reduction would affect bilateral trade both directly (though the bilateral component) and indirectly (via the

[17] Multiplying both sides of (9) and (10) by λ and combining these equations, we obtain $\lambda(\ln\phi'_{ij,t} - \ln\phi_{ij,t}) = -\lambda\beta_{PC} = \lambda\varepsilon\Delta tr_{PC,t}$

country-specific components). The indirect effects are generally sensitive to the model chosen. However, a procedure originating from Dekle et al. (2007) can be used to derive general equilibrium effects for a range of models underlying the structural gravity equation.We first explain this procedure for models with homogeneous firms and without fixed trade costs and then discuss conditions under which it also accommodates models with heterogeneous firms and fixed exporting costs.

A basic building block of the structural gravity equation is a relation explaining the share of country i's exports in country j's expenditure based on CES preferences. In the Armington model it can be expressed as

$$\frac{X_{ij,t}}{E_{j,t}} = \left(\frac{\psi_i p_{i,t} \tau_{ij,t}}{P_j} \right)^{1-\sigma}, \tag{13}$$

where ψ_i is a taste parameter, $p_{i,t}$ denotes the home price for i's product (in the presence of variable trade costs, $p_{i,t}\tau_{ij,t}$ is the price of i's exports in j), and

$P_j = \left(\sum_k (\psi_k p_{k,t} \tau_{kj,t})^{1-\sigma} \right)^{1/(1-\sigma)}$ is j's price index. Note that using the market clearing condition that $Y_{i,t} = \sum_j X_{ij,t}$, the Anderson-van Wincoop formulation of the structural gravity relation (2) can be derived from (13).[18]

[18] Use the market clearing condition and (13) to obtain $(\psi_i p_{i,t})^{1-\sigma} = Y_{i,t} / \Pi_{j,t}$, and then substitute this expression in (13) to derive (2).

Letting Q_i denote i's real income (a function of the endowment of one factor or multiple factors used in fixed proportions), we can express $p_{i,t} = Y_{i,t} / Q_{i,t}$. Use this relation, let $\varepsilon = \sigma - 1$, and rewrite (12) as

$$X_{ij,t} = \frac{(Y_{i,t}\tau_{ij,t})^{-\varepsilon}\chi_i}{\sum_k (Y_{k,t}\tau_{kj,t})^{-\varepsilon}\chi_k} E_{j,t}, \tag{14}$$

where $\chi_i = (Q_i / \psi_i)^{\sigma-1}$. Relation (14) also holds for Krugman model, in which case p_i denotes the home price of i's varieties and χ_i also depends on factors determining the number of firms. Costinot and Rodríguez-Clare (2013) show that this relation can also be generalized under certain conditions to the Melitz model with (untruncated) Pareto distribution that includes fixed trade costs.[19] In this generalization, the form of (14) is the same, but the value of ε is different and χ_i is replaced by χ_{ij}, which also depends on bilateral parameters.

In our counterfactual, we examine the general equilibrium effect of a specific change in the trade cost index for Pakistan and China or Pakistan and India on the bilateral trade flows for these countries, As (14) indicates, to derive this effect, we need to determine how a bilateral change in the trade cost index affects each country's income.

Following Dekle et al. (2007), let a hat denote the ratio of the counterfactual value to the initial value. Thus using a prime to denote the counterfactual value, we have $\hat{Y}_{i,t} = Y'_{i,t} / Y_{i,t}$.

[19] The conditions for the generalization to the Melitz model are that fixed exporting costs are incurred in the importing country and trade in goods (excluding payments of fixed costs abroad) is balanced.

Letting $\pi_{ij,t} = X_{ij,t} / E_{j.t}$ represent i's share in j's aggregate expenditure, and using the hat notation, we can express (14) as[20]

$$\hat{\pi}_{ij,t} = \frac{(\hat{Y}_{i,t}\hat{\tau}_{ij,t})^{-\varepsilon}}{\sum_k \pi_{kj}(\hat{Y}_{k,t}\hat{\tau}_{kj,t})^{-\varepsilon}}. \tag{15}$$

If trade is unbalanced (as is generally the case in data), we can write $E_{i,t} = Y_{i,t}(1+def_{i,t})$, where $def_{i,t}$ is the share of trade deficit in income (the share is negative if there is a trade surplus). We make the simplifying assumption that this share is exogenously determined and is not affected by the counterfactual. In this case, $\hat{E}_{i,t} = \hat{Y}_{i,t}$. Using this equality and the market clearing condition, we can express $\hat{Y}_{i,t} = \frac{1}{Y_{i,t}}\sum_j X'_{ij,t} = \frac{1}{Y_{i,t}}\sum_j \hat{\pi}_{ij,t}\pi_{ij,t}\hat{Y}_{j,t}E_{j,t}$. Using (15) to substitute for $\hat{\pi}_{ij,t}$ in this expression, we obtain

$$\hat{Y}_{i,t} = \frac{1}{Y_{i,t}}\sum_j \frac{\pi_{ij,t}(\hat{Y}_{i,t}\hat{\tau}_{ij,t})^{-\varepsilon}}{\sum_k \pi_{kj}(\hat{Y}_{k,t}\hat{\tau}_{kj,t})^{-\varepsilon}}\hat{Y}_{j,t}E_{j,t}. \tag{16}$$

For an exogenous change in a bilateral trade cost (as in our counterfactual), (16) can be used to solve for the income change for each country using data only for bilateral trade flows (including a country's trade with itself, that is, sales of the country's goods in the domestic market) and aggregate expenditures in a particular period. The values of $\hat{Y}_{i,t}$ solved from (16)

[20] To derive (15), let $Z_{j,t} \equiv \sum_k (Y_{k,t}\tau_{kj,t})^{-\varepsilon}\chi_k$ .Then from (14), we have $\pi_{ij,t} = (Y_{i,t}\tau_{ij,t})^{1-\sigma}\chi_i / Z_{j,t}$ and $\pi'_{ij,t} = (Y'_{i,t}\tau'_{ij,t})^{1-\sigma}\chi_i / Z'_{j,t}$. Note that $Z'_{j,t} = \sum_k (Y'_{k,t}\tau'_{kj,t})^{-\varepsilon}\chi_k = \sum_k (\hat{Y}_{k,t}\hat{\tau}_{kj,t})^{-\varepsilon}\pi_{kj,t}Z_{j,t}$. Substituting this value of $Z'_{j,t}$ in the equation for $\pi'_{ij,t}$, and dividing $\pi'_{ij,t}$ by $\pi_{ij,t}$, we obtain (15).

can be used in (15) to derive $\hat{\pi}_{ij,t}$ and $\hat{X}_{ij,t} (= \hat{\pi}_{ij,t} / \hat{Y}_{j,t})$. We use this methodology below to construct our counterfactuals for the bilateral trade effects of hypothetical changes in Pakistan-China or Pakistan-India trade costs.

5.3 Counterfactuals

In our counterfactuals, we use the values for year 2013 (the last year of our sample) as our initial values. In our discussion below, we let $t = 2013$, and simplify the notation by dropping the time subscript. Our trade data set does not provide data on X_{ii} (internal flows representing sales to home market) needed to calculate $\pi_{ii,t}$. We measure internal flows as $X_{ii} = Y_i - \sum_j X_{ij}, i \neq j$, where Y_i represents GDP. A limitation of this measure is that GDP includes service sectors with little or no trade and is estimated on a value-added basis while trade data represents gross values that include purchase of intermediates. However, our internal flow measure is consistent with models underlying (15) and (16), which do not include nontraded and intermediate goods. The aggregate expenditure is measured as $E_i = Y_i + \sum_j M_{ij} - \sum_j X_{ij},\ j \neq i$. To implement (15) and (16), we assemble a square table for export flows (including internal flows) for 133? countries for which data on all trade cost indexes are available.

We first explore the potential effect of CPEC on trade between Pakistan and China via a reduction in cost of transportation by land. The reduction would depend on how well the main corridor is connected with large markets and production centers in different provinces in Pakistan. It would also depend on the improvement of transportation links between Xinjiang region (which CPEC would connect to) and the industrialized Eastern region in China. It is difficult to accurately measure the decrease in overland transportation costs due to CPEC. For illustrative purposes, we consider two scenarios: (1) a modest 10% decrease of land transportation barriers, and (2) a more substantial 25% decrease in these barriers.

The bilateral component for Pakistan and China can be expressed as $\phi_{PC} = \exp[\Gamma_{PC} + \beta_{PC}]$, where Γ_{PC} represents the effect of all trade cost indexes other than Pak-China dummy variable. Our counterfactuals change the coefficient of the bilateral dummy variable, and we have $\phi'_{PC} = \exp[\Gamma_{PC} + \lambda\beta_{PC}]$, where λ is equal to 0.9 in the first and 0.75 in the second scenario. Thus noting that $\hat{\tau}_{PC}^{-\varepsilon} = \hat{\phi}_{PC}$ and $\hat{\phi}_{PC} = \hat{\phi}_{CP}$, we set $\hat{\tau}_{PC}^{-\varepsilon} = \hat{\tau}_{CP}^{-\varepsilon} = (\lambda - 1)\beta_{PC}$ and $\hat{\tau}_{ij}^{-\varepsilon} = 1\,(ij \neq PC, CP)$ for all other trading pairs. Then using our data for Y_i, E_i and π_{ij} and our estimates of β_{PC} from Table 2, we solve (15) and (16) to obtain counterfactual changes in Pak-China bilateral trade flows, $\hat{X}_{PC}$ and $\hat{X}_{CP}$.[21]

For each scenario, Table 3 shows the proportional increases in Pakistan's exports to China as well as China's exports to Pakistan. The table displays a wide range of values for export expansion in each country based on the procedure used to estimate the coefficient of the Pak-China dummy variable, β_{PC}. However, even for the PPML procedure that yields the lowest estimates of the coefficient, the counterfactual suggests significant increases in exports. In this case, for instance, Pakistan's exports to China would increase by 8% for the modest 10% reduction of trade costs in scenario 1, and by 19% for the larger 25% trade cost reduction in scenario 2. The export expansion is much larger, if we use higher estimates of β_{PC} as suggested by other procedures. For example, OLS estimate of β_{PC} suggests a 20% increase in Pakistan's exports to China in scenario 1 and a 50% increase in scenario 2.

[21] For this solution, we use the online program based on Stata code provided in Head and Mayer (2014).

Since Pak-India barriers to trade are based on policy restrictions, they can be potentially reduced by any amount or even eliminated completely. Again for illustrative purposes, we explore two scenarios that lower trade barriers by 10% and 25%, respectively. We focus on the simple case where trade costs consist of only variable costs. For this case, we can set $\hat{\tau}_{PI}^{-\varepsilon} = \hat{\tau}_{IP}^{-\varepsilon} = (1-\xi)\beta_{PI}$ and $\hat{\tau}_{ij}^{-\varepsilon} = 1$ for non-Pakistan-India trading pairs, and use the procedure discussed above to obtain counterfactual changes in Pak-India bilateral trade flows, $\hat{X}_{PI}$ and $\hat{X}_{IP}$. Since policy barriers to trade with India are clearly much higher than land transport barriers with China - - as indicated by estimates of the coefficients of Pak-India and Pak-China dummy variables for each estimation procedure - - trade liberalization with India has greater potential for trade expansion. Indeed, our counterfactuals in Table 4 show that even for the low PPML estimate of β_{PI}, Pakistan's exports to India would increase by 15% in scenario 1 and 38% in scenario 2. Much larger increases of 50% and 127% in the two scenarios are predicted under OLS estimates of β_{PI}.

6. Conclusions and Policy Implications

Recently, there has been much concern about the poor performance of Pakistan's exports and several measures have been proposed to stimulate exports. This paper points to barriers to trade with neighbors - - policy barriers to trade with India and transportation barriers to trade with China - - as major long-term obstacles to Pakistan's export expansion. The evidence presented in the paper suggests that not only are the policy barriers to Pakistan-India trade very high, but also that land transportation barriers to Pakistan-China trade are substantial and equivalent to sizable tariffs.

Although attempts have been made to liberalize trade between Pakistan and India, there has not been much progress so far. Improvement in Pakistan-India relations would be needed to bring about a significant reduction in trade restrictions.

CPEC presents an important opportunity for Pakistan to realize its potential as a regional trading hub that connects markets across the border in the North-East (China) and North-West (Afghanistan and Central Asia) with the Arabian sea. Although it is difficult to accurately measure the decrease in transportation costs due to CPEC, our estimates suggest that even a modest reduction in transportation costs would lead to a substantial expansion in trade between Pakistan and China. If and when trade relations with India improve, paving the way for East (India) - West (Iran) trade routes, the cross-roads effect will be fully realized yielding sustained high economic benefits to Pakistan in terms of employment and income growth (Nabi, 2013).

Over the last several decades, low private and public investments have resulted in Pakistan's lacklustre economic performance. CPEC's massive $46 billion investment programme can help redress this. Although energy projects dominate the CPEC package, its main goal is to revolutionise regional connectivity via Gwadar port and the road/rail network that leads up to the port.

To realize the full impact of CPEC, the provinces will be pivotal (Nabi, 2016). The centre — responsible for trade, credit and fiscal policy — is important for ensuring that CPEC-related public investment attracts significant flows of private investment. However, the provinces must create the right investment climate to physically host such investments. In doing so, they will become partners with the federal government in managing the economy as envisaged in the 18th Amendment, and not as mere appendages as they are now.

CPEC-related provincial investment strategies would have the following four elements:

(i) align ongoing provincial development initiatives with CPEC investments. This includes establishing economic enclaves that are consistent with demographic changes in the provinces. Provinces should invest in excellent roads to connect the enclaves to CPEC road/rail networks. They must facilitate land acquisition, provide key infrastructure (electricity, gas, water, waste treatment) and promote skills development in close proximity to the economic enclaves. The National Finance Commission should design the NFC award to compensate the provinces where the cost of connecting to CPEC highways is high.

(ii) reform provincial regulations and upgrade institutions to strengthen economic sectors of comparative advantage. Detailed studies have already been carried out in all four provinces, and in Gilgit-Baltistan, which specify reforms that will maximise CPEC benefits. These need to be implemented. The studies include provincial growth strategies for KP and Punjab; various KP sector studies prepared by the USAID Pakistan Firms Project; and World Bank economic reports for Sindh, Balochistan and GB. Provincial studies on the cost of doing business are also available. The studies identify regularity and institutional hurdles that discourage investment and need to be jettisoned. They also recommend ways of engaging with the federal government to remove the hurdles under its mandate. Provincial governments must set up task forces to monitor progress on implementing the recommendations.

(iii) strengthen local firms to forge joint ventures with foreign firms (including Chinese firms). Forward-looking provincial economies enabled by energy projects and Gwadar port will strengthen the negotiating power of local firms, making them attractive partners in joint ventures. Well-funded, well-staffed, modern and efficient investment authorities must be established to facilitate the joint ventures.

(iv) strengthen federal-provincial coordination to develop a nationwide investment programme. Platforms such as the Council of Common Interests and the National Economic Committee need to be strengthened for effective federal-provincial coordination in designing and implementing a countrywide investment strategy associated with CPEC. The Planning Commission, with adequate capacity and in close coordination with the provincial planning and development departments, should be the technical secretariat to CCI and the NEC. CPEC provides an opportunity to revamp these institutions.

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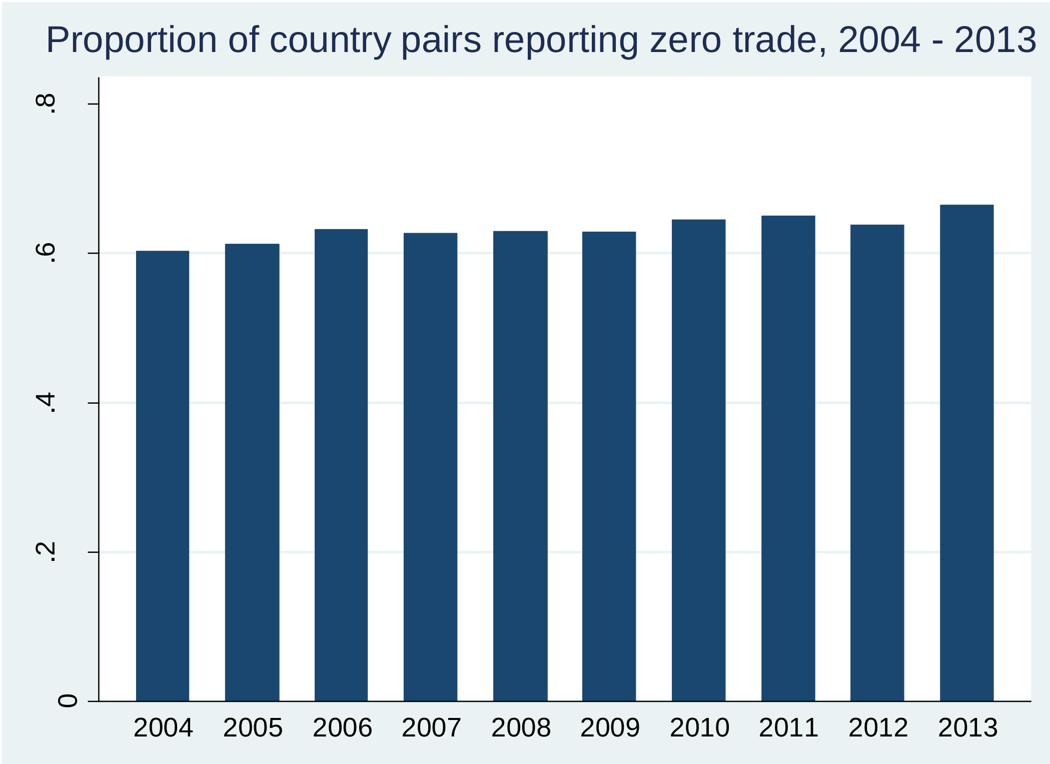
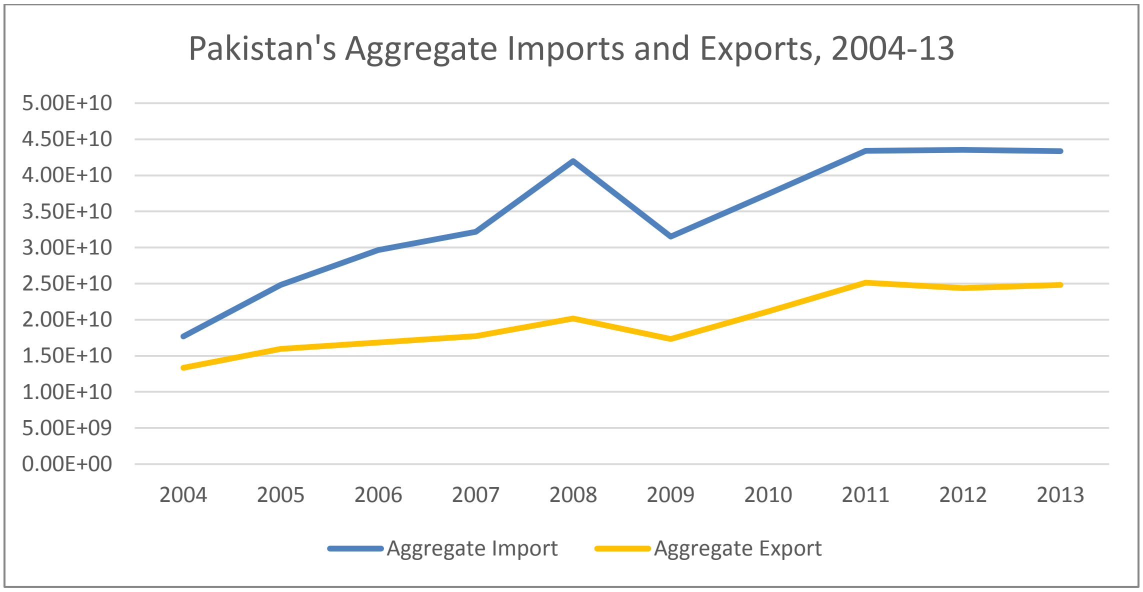
Figure 1

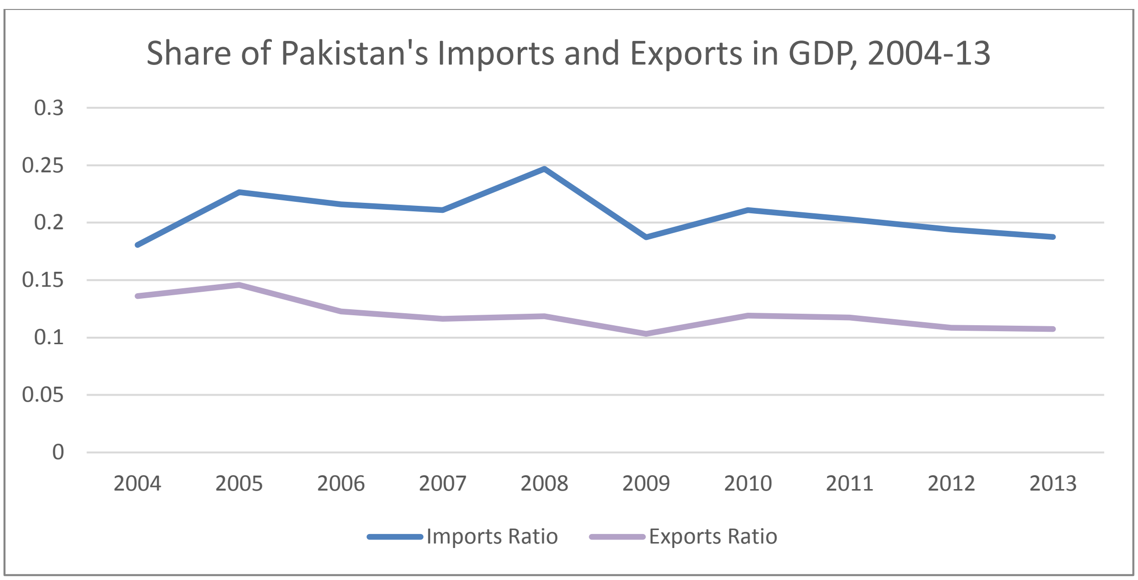


Proportion of country pairs reporting zero trade, 2004 - 2013
0
.2
.4
.6
.8
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

Figure 2

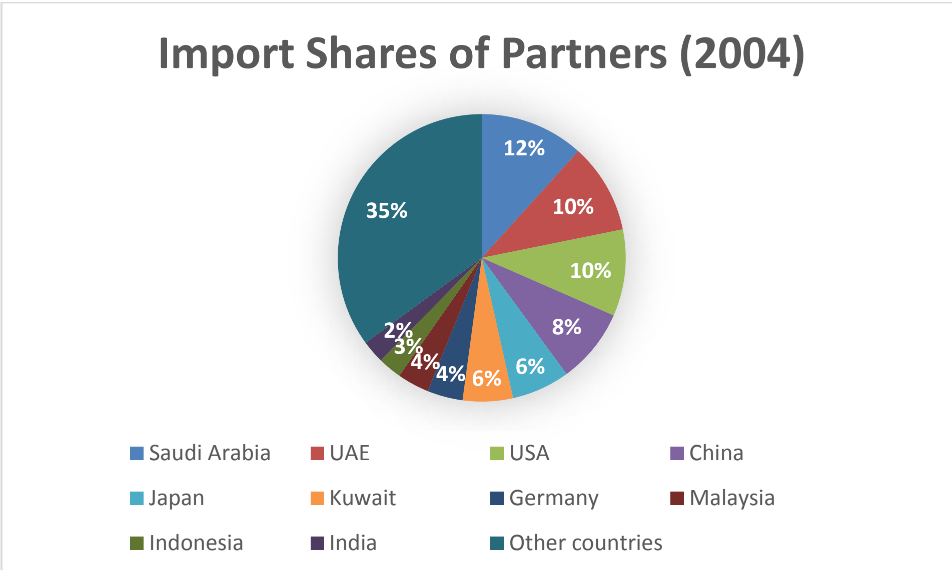


Pakistan's Aggregate Imports and Exports, 2004-13
5.00E+10
4.50E+10
4.00E+10
3.50E+10
3.00E+10
2.50E+10
2.00E+10
1.50E+10
1.00E+10
5.00E+09
0.00E+00
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Aggregate Import
Aggregate Export



Share of Pakistan's Imports and Exports in GDP, 2004-13
0.3
0.25
0.2
0.15
0.1
0.05
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Imports Ratio
Exports Ratio

Figure 3


Import Shares of Partners (2004)
12%
10%
10%
8%
6%
6%
4%
4%
3%
2%
35%
Saudi Arabia
UAE
USA
China
Japan
Kuwait
Germany
Malaysia
Indonesia
India
Other countries

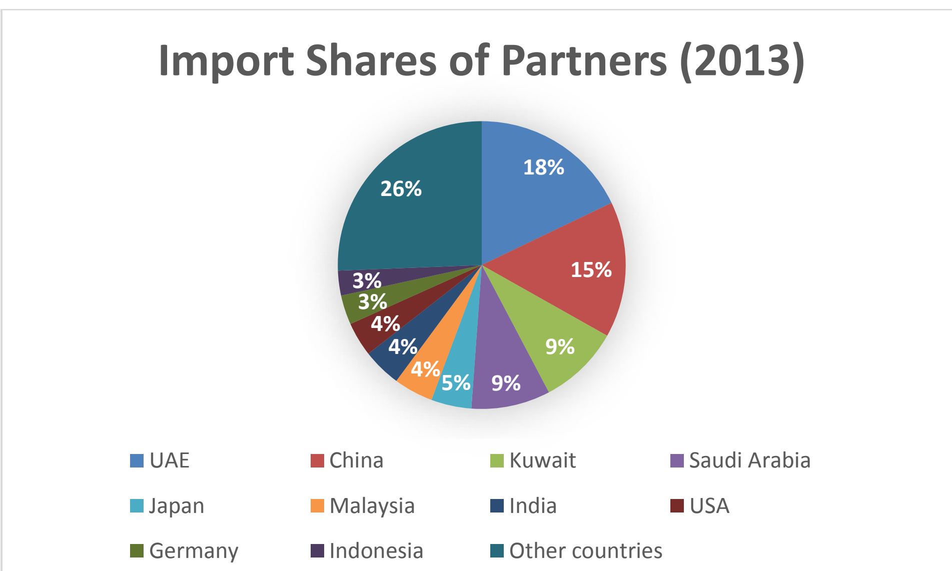
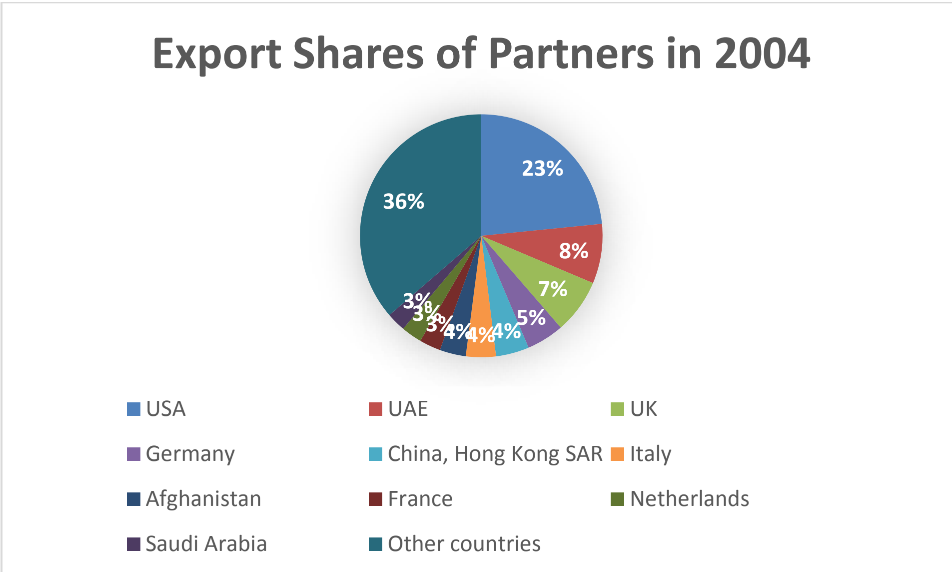
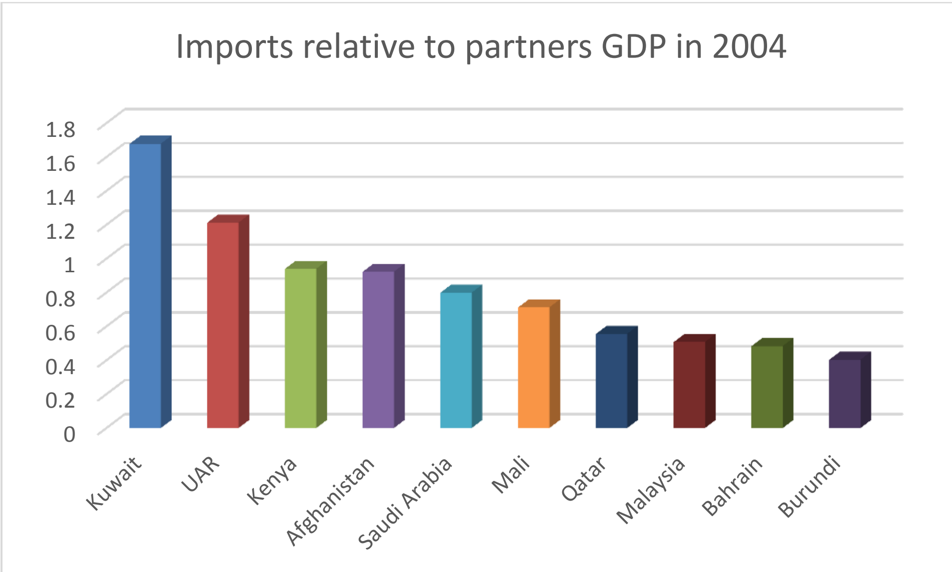

Import Shares of Partners (2013)
18%
15%
9%
9%
5%
4%
4%
4%
3%
3%
26%
UAE
China
Kuwait
Saudi Arabia
Japan
Malaysia
India
USA
Germany
Indonesia
Other countries

Figure 4


Export Shares of Partners in 2004
23%
8%
7%
5%
4%
4%
4%
3%
3%
3%
36%
USA
UAE
UK
Germany
China, Hong Kong SAR
Italy
Afghanistan
France
Netherlands
Saudi Arabia
Other countries


Export Shares of Partners in 2013
15%
11%
8%
7%
6%
4%
3%
3%
3%
2%
38%
USA
China
Afghanistan
UAE
UK
Germany
Bangladesh
Italy
Netherlands
Spain
Other Countries

Figure 5


Imports relative to partners GDP in 2004
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Kuwait
UAR
Kenya
Afghanistan
Saudi Arabia
Mali
Qatar
Malaysia
Bahrain
Burundi

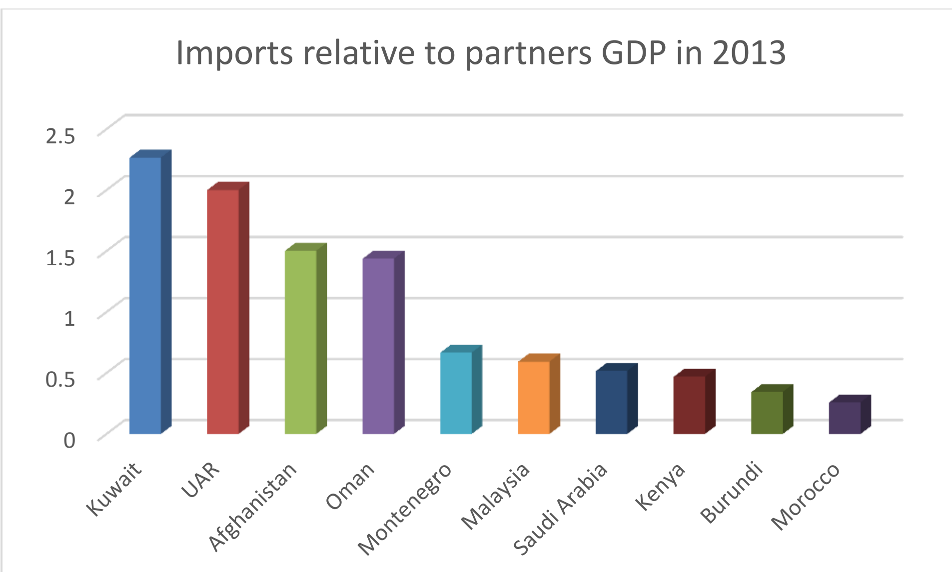
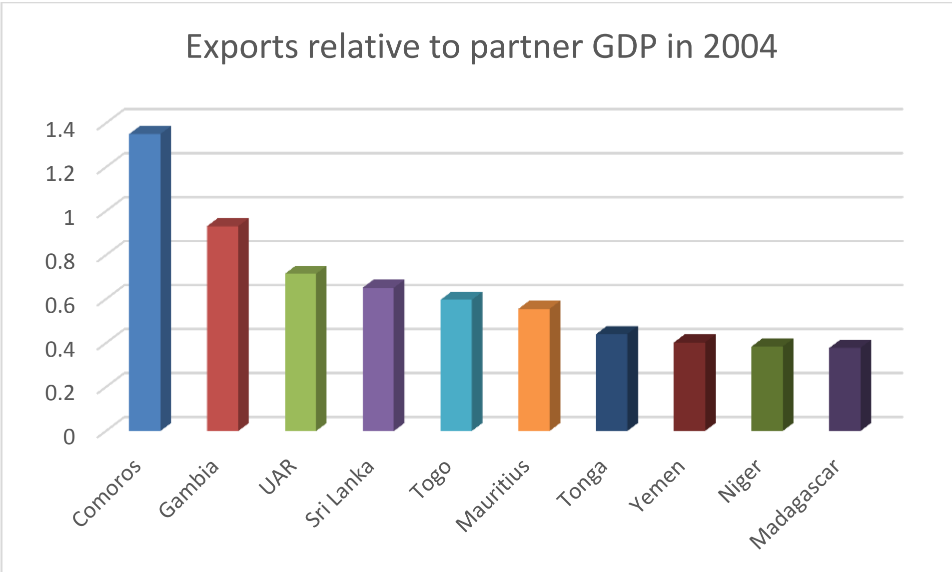
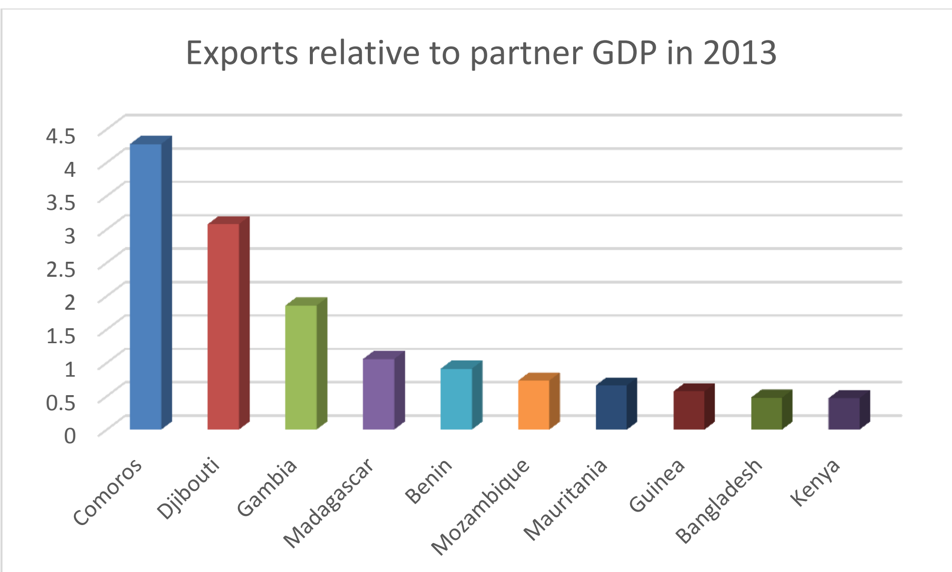

Imports relative to partners GDP in 2013
2.5
2
1.5
1
0.5
0
Kuwait
UAR
Afghanistan
Oman
Montenegro
Malaysia
Saudi Arabia
Kenya
Burundi
Morocco

Figure 6



Exports relative to partner GDP in 2004
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Comoros
Gambia
UAR
Sri Lanka
Togo
Mauritius
Tonga
Yemen
Niger
Madagascar



Exports relative to partner GDP in 2013
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Comoros
Djibouti
Gambia
Madagascar
Benin
Mozambique
Mauritania
Guinea
Bangladesh
Kenya

Table 1. Regressions Explaining Bilateral Imports

		1	2	3	4
VARIABLES		OLS	OLS	EK-Tobit	PPML
ln_dist		-1.093***	-1.505***	-1.917***	-0.597***
		-0.00841	-0.00932	-0.0137	-0.0115
pak_india		-4.043***	-5.035***	-7.064***	-1.747***
		-0.143	-0.194	-0.194	-0.143
pak_china		-0.914***	-1.869***	-3.068***	-1.063***
		-0.203	-0.0919	-0.138	-0.0749
pak_afg		1.414***	1.971***	3.068***	2.976***
		-0.105	-0.127	-0.388	-0.151
pak_Iran		-0.197	0.928***	1.351***	-0.228
		-0.242	-0.261	-0.253	-0.208
contig		0.817***	0.490***	0.0975	0.404***
		-0.0369	-0.039	-0.0606	-0.0268
comlang_off		0.878***	0.824***	1.362***	0.0951***
		-0.017	-0.0177	-0.0258	-0.0267
comcol		0.892***	0.822***	0.906***	0.558***
		-0.0243	-0.0236	-0.0352	-0.0539
rta		0.867***	0.549***	0.818***	0.493***
		-0.0163	-0.0169	-0.0237	-0.0216
ln_reporterGDP		1.044***			
		-0.0026			
ln_partnerGDP		1.264***			
		-0.00257			
reporter dummies		No	Yes	Yes	Yes
partner dummies		No	Yes	Yes	Yes
year dummies		No	Yes	Yes	Yes
Observations		188,438	192,421	237,369	232,156
R-squared		0.68	0.758		0.861
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 2. Regressions Explaining Bilateral Exports

	1	2	3	4
VARIABLES	OLS	OLS	EK-Tobit	PPML
ln_dist	-1.146***	-1.597***	-2.193***	-0.629***
	(0.00858)	(0.00938)	(0.0140)	(0.0105)
pak_india	-4.081***	-4.818***	-7.078***	-1.469***
	(0.137)	(0.189)	(0.231)	(0.151)
pak_china	-0.905***	-1.744***	-2.821***	-0.674***
	(0.172)	(0.143)	(0.218)	(0.0997)
pak_afg	1.810***	1.745***	2.186***	2.951***
	(0.212)	(0.212)	(0.369)	(0.157)
pak_Iran	-0.733***	0.295	0.561**	-0.0746
	(0.213)	(0.257)	(0.241)	(0.194)
contig	1.132***	0.669***	0.0102	0.506***
	(0.0351)	(0.0382)	(0.0643)	(0.0265)
comlang_off	0.882***	0.867***	1.491***	0.136***
	(0.0172)	(0.0177)	(0.0261)	(0.0267)
comcol	0.824***	0.674***	0.978***	0.408***
	(0.0249)	(0.0237)	(0.0351)	(0.0512)
rta	0.745***	0.531***	0.952***	0.590***
	(0.0167)	(0.0170)	(0.0247)	(0.0216)
ln_reporterGDP	1.300***			
	(0.00294)			
ln_partnerGDP	0.901***			
	(0.00261)			
reporter dummies	No	Yes	Yes	Yes
partner dummies	No	Yes	Yes	Yes
year dummies	No	Yes	Yes	Yes
Observations	165,853	169,083	216,036	211,445
R-squared	0.650	0.749		0.870
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 3. General-Equilibrium Trade Effects of Reductions in Pak-China Barriers

	$\lambda = 0.9$	$\lambda = 0.9$	$\lambda = 0.75$	$\lambda = 0.75$
	$\ln \hat{X}_{PC}$	$\ln \hat{X}_{CP}$	$\ln \hat{X}_{PC}$	$\ln \hat{X}_{CP}$
OLS	0.199	0.139	0.501	0.343
EK Tobit	0.323	0.224	0.815	0.546
PPML	0.077	0.054	0.193	0.135

Note: $\lambda = 0.9$ represents 10% reduction and $\lambda = 0.75$ represents 25% reduction in Pak-China land transportation barriers.

Table 4. General-Equilibrium Trade Effects of Reductions in Pak-India Barriers

	$\lambda = 0.9$	$\lambda = 0.9$	$\lambda = 0.75$	$\lambda = 0.75$
	$\ln \hat{X}_{PI}$	$\ln \hat{X}_{IP}$	$\ln \hat{X}_{PI}$	$\ln \hat{X}_{IP}$
OLS	0.501	0.456	1.272	1.113
EK Tobit	0.739	0.665	1.894	1.598
PPML	0.152	0.140	0.381	0.348

Note: $\lambda = 0.9$ represents 10% reduction and $\lambda = 0.75$ represents 25% reduction in Pak-India policy-based trade restrictions

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