Testifying the role of regulatory environment in trade facilitation: Impact on intra-regional trade in South-Asia

Tanya GANDHI
Jamia Millia Islamia, New Delhi, India
Tanya.gandhi123@gmail.com
Shahid AHMED
Jamia Millia Islamia, New Delhi, India
sahmed@jmi.ac.in

Abstract. *The intraregional trade in South-Asia region is only 6.1 percent of its total trade due to a number of factors, including Regulatory environment governing international trade. This study examines the impact of trade facilitation in Regulatory environment on bilateral exports within the region. A panel gravity model augmented with a self-composed index for Regulatory environment for both exporting and importing countries in South-Asia is estimated. It reveals that enhanced regulatory environment of importing country impacts intra-regional trade positively whereas, that of the exporting country impacts the same negatively. The estimates of trade potential within the region are significantly encouraging. The simulations' results reveal that by making collective efforts in trade facilitation in regulatory environment, the intra-regional exports could increase tremendously in a range of scenarios which could not be achieved even by phasing out of tariffs within the region.*

Keywords: trade facilitation; regulations; South-Asia; augmented panel gravity model; trade potential; simulations.

JEL Classification: C23, F10, F15, F17, L51.

1. Introduction

Reducing tariff rates in consecutive WTO rounds, growing worldwide supply chain management procedures, and continuing development of global trade have resulted in increased discourse on the issues of "on-the border" and "behind-the border" trade transaction costs and their repercussions on global trade. Trade transaction costs are asserted to be an important element in describing the arrangement of foreign investment and trade flows (Deardorff, 1998, 2014; Obstfeld and Rogoff, 2000). As the pace of institutional globalization increases, the capacity of developing nations to integrate with worldwide and regional markets is rapidly impaired by the cost of trade procedures incurred by the private sector.

Economic conditions such as lopsided trade facilitation framework, trade-related infrastructure deficiencies or a cumbersome regulatory environment create a negative externality on business enterprises, increase the cost of trade procedures and deviate industrial structure with detrimental consequences on trade and economic growth. Therefore, a country's institutions and regulatory environment has a lot to do with its propensity to trade and trade performance.

A country's institutions are described as the provisions that shape its members ' social, economic and political interplay. North (1990) states that the primary role of institutions is to decrease ambiguity arising out of asymmetric information and transaction costs. This promotes market interplay and generally improves market functioning. Whereas, imperfectly devised institutions can escalate costs crucially and impede economic ventures and specialization (Borrmann et al. 2006).

The political institutions of a country frame its economic institutions and a significant component of these institutions is the regulatory environment of that country (Acemoglu et al. 2001). During the last two decades, researchers, policymakers and international organizations have significantly emphasized the role of a strong regulatory framework in the development of a country. The trade related regulatory environment is particularly important for an open economy that is in constant contact with the outside world and depends upon it for optimal outcomes.

Trade openness or economic integration is strongly connected to regulatory environment as it can magnify the repercussions of good or bad regulations. With rising integration of world economies, factors of production and units of production are becoming increasingly mobile. Therefore, regulatory environment of a country can either attract firms or lead them to move to another country where regulations are more favourable so it can either be a competitive advantage or disadvantage for a country. Hence, the consequences of regulations on economic growth of a nation depends upon its level of economic integration (Silberberger & Königer, 2016).

It is therefore a challenge to design regulatory environment of a country that ensures quality, transparency, stringency and enforcement of policies along with providing competitive advantage to a country in terms of trade. This is where Trade facilitation comes into the picture. Trade facilitation is usually expected to decrease the cost of transit of goods and services across borders and the procedural costs associated with enforcing, regulating

and administering of trade guidelines (Staples, 2002). From a narrow perspective, trade facilitation is defined as improving logistics for efficient movement of goods through ports and easing the documentation related to international trade. The broader rendition of trade facilitation spans the atmosphere provided for trade undertakings made up of transparency of customs and regulatory environments, besides harmonisation of regulations as well as requirements for trade with international standards (Engman, 2005).

In spite of the undeniable advantages of the trade facilitation reform, it is unlikely that implementing these measures alone will bring notable improvements to export efficiency in developing nations. To achieve this, an integrated strategic investment program directed at strengthening the overall regulatory atmosphere along with tangible infrastructure will be required, that could address the supply side barriers which prevent the economy from responding to growing trade incentives. Integrative measures that increase the effectiveness of the entire export supply chain are essential for a successful reform of trade facilitation. Therefore, any decrease in trade costs arising out of improvements in trade facilitation might produce comparatively lower impact on export outcomes if enacted without parallel reforms aimed at relaxing the constraints on export production capability.

Despite soaring expectations of returns to trade facilitation in regulatory environment, the empirical evidence of impact of reforms on trade volumes is limited and robust supporting testimony of trade facilitation measures positively influencing trade volume is proved hard to provide. As a result, nearly all the research pertaining to trade facilitation in regulatory environment is concentrated on procedural improvements instead of trade performance results. The purpose of this article is to tackle this limitation in the current literature by supporting the trade facilitation argument with empirical analysis. In particular, the study reports the outcomes of econometric tests reckoning the response of trade facilitation measures on South-Asia's intraregional trade. From a policy standpoint, the study's results are aimed to assess the trade growth limitations, so that the prospective role of trade facilitation reforms in regulatory environment in enhancing export performance compared with other factors of trade development could be ascertained.

The Section 2 of this study narrates a review of the recent literature concerning trade facilitation in regulatory environment apart from additional drivers of export performance in South-Asia. Section 3 depicts the data used and methodology opted to fulfil the objectives. Section 4 contains the discussion of results of the econometric model. Section 5 provides the methodology and the estimates of the trade potential among countries in South-Asia. Section 6 discusses the various scenarios of improvement in the regulatory environment of the region and simulation results of the same. Section 7 compares the simulation results of tariff reduction and trade facilitation in regulatory environment in the region. Finally, Section 8 concludes.

2. Review of literature

The estimation of economic outcome of trade facilitation is a significant analytical task. The description and quantification of trade facilitation and the selection of a suitable methodology for modelling the reaction of trade flows arising from trade facilitation is

quite challenging (Wilson et al., 2005). Djankov et al. (2010) noted that one extra day a shipment is postponed on average lowers trade by around one per cent. Nordas et al. (2006) examined the association among time taken to export and import, logistic facilities and international trade to conclude that time delays lead to decreased volume of trade along with decreasing likelihood of enterprises dealing in time-sensitive commodities for entering export markets.

The significant part institutions play in dictating the success of reforms in policy measures is widely recognised globally, and the 'new' Washington consensus provides enough weightage to capacity building and institutional revamping (Rodrik, 2006). However, the concept of institutions is still very abstract, since the notion of "successful governance" itself is a multifaceted phenomenon. In a narrow framework, it could be said that institutions determine the "rules of the game" for a community or, as per the popular definition given by North (1990), are "the formal and informal constraints on political, economic, and social interactions." Through the aforementioned standpoint, "good" institutions deploy a favourable framework which minimises uncertainty along with improving productivity, thereby stimulating economic performance. In a broader spectrum, institutions represent the discrete organizational bodies, procedural mechanism, and regulatory environment that influences economic performance by endorsing superior policy alternatives (IMF, 2003).

Based on the research of North (1990), numerous studies are now investigating the influence of institutional features on international trade flows. In a study using gravity model, Anderson and Marcouiller (2002) illustrate that robust institutions, specifically, legal institutions efficient to enforce business agreements and unbiased devising and implementing of state economic policy, promote growth in trade. Depken and Sonora (2005) estimated the impact of economic freedom in the U.S. on exports and imports for the years 1999 & 2000 using a gravity equation and observed that U.S. exports are relatively more to the countries with better institutional quality. Iwanow and Kirkpatrick (2007) used an augmented gravity model including variables pertaining to trade facilitation, infrastructure and regulatory quality to measure their influence on export outcomes and observed that 10 per cent growth in regulatory quality leads to 9-11 per cent increase in exports.

Dollar and Kraay (2002) investigated the influence of institutional quality on external trade and found positive high correlation between the two. Therefore, they further examined the decadal changes in economic growth triggered by changes in institutions and trade. Their study concluded that trade and institutions both influence economic growth in the long-run, however growth in trade induces temporary benefits above institutional improvements in stimulating economic growth. Jensen and Nordas (2004) also empirically verified that overall level of openness is positively influenced by institutional quality of trading countries. Chang et al. (2009) took a sample of large number of countries and ran growth regression model using panel-data to conclude that the outcome of trade liberalization is influenced a great deal by a comprehensive combination of institutions and policies.

Differences in behind-the-border infrastructure and regulatory quality along with on-the-border procedures of trade facilitation supposedly cause considerable divergence in

transaction costs related to trade across countries. Levchenko (2007) states that divergence in institutional quality of trading partners is a significant factor in determining trade patterns which may originate comparative advantage on its own. On the other hand, another study by De Groot et al. (2004) discerned that economies having similar attributes of institutions tend to trade more.

Francois and Manchin (2007) examined the role of institutional quality, infrastructure, trade preferences, and colonial and geographic backdrop in defining the structure of bilateral trade. Emphasizing on those country pairs which do not actually trade and controlling for other variables in this study, the authors suggested that institutional quality and infrastructure are not just important determinants of volume of exports, but of the possibility of exports happening at all as well. The study argues that both export performance and the propensity to trade at all, is influenced by institutional quality.

Borrmann et al. (2006) examined the linkage between institutions, income and trade for a sample of nations using ordinary least squares (OLS) approach and the findings of the study depict that nations having poor status of institutions find it difficult to increase international trade. Also, the regulatory quality (e.g., tax structure, market entry and labor market) plays a greater role than good governance.

Apart from overall significance of institutions and regulatory quality, certain specific aspects of institutions and regulatory environment are also studied by researchers to measure their impact on trade. Bolaky and Freund (2004) singled out regulations that affect business entry, bankruptcy and labour market flexibility and employed those in a growth regression model that depicts that economies with good quality regulations experience rise in growth rates due to international trade. By examining a particular aspect of institutions, i.e. the impact of contract enforcement regulation on transaction cost of trade using a gravity model, Ranjan and Lee (2007) reported that procedures of contract enforcement influence the trade volumes of differentiated as well as homogenous products, largely for differentiated goods.

3. Methodology

3.1. Data for regulatory environment indicator and its construction

To denote regulatory environment of a country, a Regulatory environment indicator (index) is formulated in this study to evaluate the economy's transparency, stringency, implementation and quality of regulations and their impact on trade flows between that country and its trading partner. This indicator is computed from data pertaining to each South-Asian economy. Based on this indicator, a country can compare the level of its own regulatory environment to that of other countries in South-Asia.

The most challenging aspect of research on trade facilitation is the lack of data series corresponding to different measures of trade facilitation. Despite, the emergence of various new data sources in the previous decade, the unavailability of historical data series, inadequate coverage of LDC's and discontinuation of several data series with time remain the underlying problems in this research. Owing to these limitations, this analysis of South-

Asian region had to be constricted to five economies (India, Pakistan, Bangladesh, Nepal and Sri Lanka) for which panel data of the variables used in computing the regulatory environment indicator were available and the other member countries (Afghanistan, Bhutan and Maldives) of the region were omitted. The sample of the economies taken in the study is yet quite representative of the entire region as these are the largest five countries of South-Asia with regards to trade volume and collectively represent 93.27 percent of South-Asia's overall intra-regional trade.

Also, the data series used in the computation of the indicator underwent major changes in the methodology of their measurement in the year 2006 which makes the data preceding 2007 incomparable with the data of succeeding years, so the panel data analysed in this study is from the year 2007 to 2016.

The data series employed in computation of regulatory environment indicator in this analysis are drawn from two major databases – Worldwide Governance Indicators database developed by World Bank (henceforth WGI) and Global Competitiveness Index database of World Economic Forum (henceforth GCI). The structure of regulatory environment indicator are as follows:

Regulatory environment for a country J is the average of five following "indexed inputs":
- Transparency of government policy making (GCI).
- Stringency of environmental regulations (GCI).
- Enforcement of environmental regulations (GCI).
- Regulatory quality (WGI).
- Control of Corruption (WGI).

The description of the indices ("indexed inputs") comprising above mentioned regulatory environment indicator is provided in the Appendix.

The regulatory environment indicator in this analysis is computed with composite data of five indices sourced from two different databases so as to restrict the impact of any particular index on our composite index. However, the data belonging to the indices with which the composite indicator is computed are measured on distinct scales and ranges (1 to 7, and -2.5 to 2.5). Therefore, the raw data must be normalized so as to make it comparable.

Taking z-scores of the data series is one way of normalization but the limitation of this technique is that it transforms the data and produces both positive and negative data inputs and negative values are not compatible with log-log specification of the model that we intend to use. So, here we decided on the normalization technique followed by Wilson et al. (2003), which requires indexing of all the observations of a raw data series to the mean of the raw data series' values of each country pertaining to every year, producing an "indexed input". Therefore, an "indexed input" for a member country E (E = 1,2,3,4,5) is computed as:

$$\bar{\Pi}_E = \Pi_E \left/ \left(\sum_{E=5}^{5} \Pi_E / 5 \right) \right.$$

where Π_E indicates the raw data for a member country E. In this way, the countries performing above the average of South-Asia shall have "indexed input" greater than 1 and those performing below the average of South-Asia shall have "indexed input" less than 1.

These "indexed inputs" of each of the five indices used in the composite index are then averaged with aggregation method of providing equal weights to each index to calculate the regulatory environment indicator of trade facilitation.

Regulatory environment indicator constructed in this study finds its roots in Article X of GATT pertaining to "Publication and Administration of Trade Regulations" rooted on fundamental transparency obligation that calls for timely publication of regulations governing exports and imports in order to provide a clear understanding of them to stakeholders like governments, agents and traders of partner countries.

3.2. Data for trade flows and other variables

For the estimation of the model, the bilateral exports data for five economies in South-Asia, namely, India, Bangladesh, Pakistan, Sri Lanka and Nepal is used in this study which are in USD millions accessed through World Integrated Trade Solution (WITS) software from the Commodity and Trade Database (COMTRADE) of the United Nations Statistics Division.

The data for gross domestic product (GDP) and per capita GDP at constant prices is taken from World Bank's World Development Indicators (WDI) database which makes them real GDP & real per capita GDP and are expressed in USD millions.

The data pertaining to tariffs are drawn from World Trade Organisation (WTO) Tariff database on Free-Trade Agreement duty rates for the agreement on SAFTA and weighted average of all traded items are taken for each year. The data for tariff rates often has missing values and to avoid a considerable fall in observations, the tariff data for the previous year is taken in case of missing data for one year and the data is linearly interpolated or extrapolated for a particular pair of trading countries when values for two or more consecutive years remain missing.

The data for other variables used in the gravity model that are country specific, namely, distance, and dummy variables including common language and common colony, are obtained from Centre D' Etudes Prospectives et D' Informations Internationales (CEPII).

Missing values in trade data is an inevitable issue which is usually dealt with by replacing all such values with minuscule values of trade flows, thereby depicting the values as nil trade. Nevertheless, in case of logarithmic conversion of the series of data, the problem of selection bias will arise. As suggested by Pusterla (2007), this problem could be curtailed if all the missing values of trade data series are replaced with a very small figure and subsequently it is added to one and then logarithmic conversion of this data series should be done. This produces the final variable used in the model as log (T_{ie} + 1), which will be equal to zero in case T_{ie} = 0. T_{ie} represents trade data series here and it could be both exports or imports.

By using the data series for GDP at current prices and GDP at constant prices, we calculated the GDP deflator for each economy with their respective base years with the help of the following formula:

$$\text{GDP Deflator} = \frac{\text{GDP}_{\text{Current Prices}}}{\text{GDP}_{\text{Constant Prices}}} \times 100$$

With the help of the data series for GDP deflator for each economy with their respective base years, we convert the nominal bilateral exports (NX_{IEt}) from country I to country E in year t into real bilateral exports (X_{IEt}) by using the following formula:

$$X_{IEt} = \frac{\text{NX}_{\text{IEt}}}{\text{GDP}_{Deflator}} \times 100$$

3.3. The econometric model

Tinbergen (1962) and Pöyhönen (1963) propounded and developed gravity model used in international trade research to examine bilateral trade flows by geographic distance between the trading partners and their GDP (or GNP), on the premise of gravity equation of physics given by Newton (1687). The theoretical foundations of this model were further strengthened by Bergstrand (1985, 1989), Deardorff (1998), Anderson and Wincoop (2003) and Helpman et al. (2008). Gravity model is one of the most frequently used technique of modelling bilateral trade flows. The gravity equation hence derived from the newton's gravity equation is as follows:

$$F = G \frac{m_1 \times m_2}{r^2} \Rightarrow Bilateral\ Trade_{ij} = \alpha \frac{GDP_i \times GDP_e}{Distance_{ie}}$$

In accordance with the standard regression analysis, the above equation is thereby converted into linear form as follows:

$$\log(Bilateral\ Trade_{ie}) = \alpha + \beta_1 \log(GDP_i \times GDP_e) + \beta_2 \log(Distance_{ie}) + \mu_{ie}$$

In the standard gravity model specification, the logarithmic values of bilateral trade flows are regressed on logarithmic values of distance between the exporting and importing country pairs and the logarithmic values of their GDPs, and other variables explaining the remaining variation (Maskus et al., 2001). Apart from distance and GDP, other factor explaining bilateral trade flows could be per capita GDP, population, regional trade agreements, common colony, common borders, common language or ethnic similarities.

The model used in this study includes primary economic variables of the gravity model, i.e. the geographic distance between the country pairs and real GDP and real GDP per capita of both importing and exporting countries. The standard gravity model specification is further augmented with the corresponding tariff rate imposed by the importing country on the exporting country and the regulatory environment indicator of trade facilitation propounded in the study for both exporting and importing country along with the dummy variables depicting common language and common colony. The augmented gravity model used here is as follows:

$$\begin{aligned} \text{Ln}(V_{IE}^t) = \ &\beta_0 + \beta_1 \ln(100 + \text{TARIFF}_{IE}^t) + \beta_2 \ln(RE_I^t) + \beta_3 \ln(RE_E^t) + \beta_4 \ln(\text{GDP}_I^t) \\ &+ \beta_5 \ln(\text{GDP}_E^t) + \beta_6 \ln(\text{GDPPC}_I^t) + \beta_7 \ln(\text{GDPPC}_E^t) \\ &+ \beta_8 \ln(\text{DISTANCE}_{IE}) + \beta_9 (D_{CLANG}) + \beta_{10} (D_{CCOL}) + \varepsilon_{IE}^t \end{aligned}$$

where I is the importing country and E is the exporting country, β terms are coefficients and t represents years of trading (i.e., t = 2007, ... 2016). The value of real bilateral exports from country E to country I in the year t is represented as V_{IE}^t. The term TARIFF_{IE}^t indicates the weighted average FTA tariff rate imposed by country I on country E in the year t. The tariff variable is included in the model to decrease the excluded variable biases and it is specifically important because in South-Asia (or SAFTA) FTA tariff rates are not completely harmonized and they often vary across member countries and trading partners. The term RE_I^t and RE_E^t depict the level of trade facilitation in regulatory environment pertaining to the importing country I and the exporting country E in the year t. GDP_I^t and GDP_E^t are the real GDP and GDPPC_I^t and GDPPC_E^t are the real GDP per capita of countries I and E respectively for the year t. The geographic distance between the capital cities of countries I and E is referred to as DISTANCE_{IE}. Dummy variables D_{CLANG} and D_{CCOL} reflect the impact of having a common language and being a common colony on the bilateral trade flows between I and E. The dummy variables take the value 1 if country I and E have a common language and were a common colony and 0 otherwise. ε_{IE}^t depicts the error term.

Typically, conventional gravity models utilize cross-section data for evaluating trade ties during a specific timespan, be that as it may, it has its own negative points. On the other hand, panel datasets i.e. cross-sectional variables recorded for various timeframes are considered better than cross-sectional datasets while evaluating trade relations among multiple pairs of trading partners in a time-frame as panel data models are the most efficient models in separating time-invariant effects from the country-specific effects (Egger, 2002). So, a panel gravity model is estimated in this study.

Additionally, the estimation of a panel regression model requires a decision among the random effects model and fixed effects model to be used depending on the research objectives and the variables included in the model. The fixed effects model has a limitation that it cannot measure the time-invariant effects as it omits the time-invariant variables before estimation, so if the objective is to measure the time-variant as well as invariant effects in trade potential, then fixed effects model cannot be used and random effects model has to be employed (Ozdeser & Ertac, 2010). Since, the distance and the dummy variables pertaining to common language and common colony augmented in our regression model are time-invariant variables which have fixed values over-time for a particular country pair, fixed effects model cannot be employed in this scenario. Hence, a random effects model is employed for estimation in this study.

4. Empirical results and analysis

It is significant to analyse the data series of "indexed inputs" used in composition of regulatory environment indicator of trade facilitation first. Table 1 presents the descriptive

statistics for the regulatory environment indicator and the "indexed inputs". The descriptive statistics of the "indexed input" series and the aggregated indicator portray the range of each "indexed input" and the indicator. It could be observed where an economy lies in that range from highest to lowest value of the region. India has the highest level of transparency and stringency in regulatory standards, whereas Nepal has the lowest. Sri Lanka is the best performing country in terms of enforcement of these standards. Bangladesh has the highest level of regulatory quality and control of corruption. Bangladesh is also the country having the highest value of overall regulatory environment indicator, whereas Sri Lanka has the lowest overall value.

Table 1. *Descriptive statistics of regulatory environment indicator and its components*

Indicator and components	Source	Sta Dev	Min	Economy	Max	Economy
Regulatory Environment						
Transparency of government policy making	WEF: GCI	0.09	0.85	Nepal	1.21	India
Stringency of regulatory standards	WEF: GCI	0.16	0.77	Nepal	1.31	India
Enforcement of environmental regulations	WEF: GCI	0.17	0.72	Bangladesh	1.33	Sri Lanka
Regulatory quality	WB: WGI	0.46	0.09	Sri Lanka	1.79	Bangladesh
Control of corruption	WB: WGI	0.41	0.24	Sri Lanka	1.64	Bangladesh
Aggregate Index		0.10	0.79	Sri Lanka	1.19	Bangladesh

Note: Mean of all indexed inputs is 1. WEF: World Economic Forum; GCI: Global Competitiveness Index database; WB: World Bank; WGI: Worldwide Governance Indicators database.
Source: Authors' computations based on data from sources mentioned.

Table 2 provides the correlation matrix of the "indexed inputs" pertaining to the aggregate regulatory environment indicator. The correlation matrix indicates the optimum use of multiple indices in quantifying regulatory environment indicator of trade facilitation to restrict the influence of a single index in its quantification. The high value of correlation (as high as 0.95) of the "indexed inputs" series indicates the robustness of the regulatory environment indicator in regards to source of data and since the correlation values are not perfect 1 in any case, it rationalizes the use of multiple indices (or "indexed inputs") for calculation of the indicator.

Table 2. *Correlation matrix of indexed inputs of regulatory environment indicator*

Indexed inputs of Regulatory Environment					
	Transparency of government policy making	Stringency of regulatory standards	Enforcement of environmental regulations	Regulatory Quality	Control of corruption
Transparency of government policy making	1.00				
Stringency of regulatory standards	0.77	1.00			
Enforcement of environmental regulations	0.69	0.95	1.00		
Regulatory Quality	0.61	0.88	0.92	1.00	
Control of corruption	0.72	0.81	0.88	0.85	1.00

Source: Authors' computations.

An augmented panel gravity model is estimated by integrating self-constituted trade facilitation indicator (regulatory environment indicator for both exporting and importing countries), tariff variable and dummy variables along with basic variables of gravity model, i.e. GDP, per capita GDP of trading countries and the distance between them. Table 3 displays the regression results which exhibits that the value of overall R^2 of the estimated model is 0.79 which is quite high and it reflects that the regression model is successful.

Unlike other indicators of trade facilitation including transport efficiency, customs environment and service-sector infrastructure which always yield positive outcomes for bilateral trade flows, the regulatory environment indicator could yield positive as well as negative outcomes for the importing or exporting countries. According to the "sanders" and "greasers" hypothesis of corruption, quality regulations on one hand work as a "greaser" for the wheels of the economy through faster movement of goods, whereas, on the other hand the improved quality of regulations and their stringency and transparency could work as a "sander" for movement of goods across borders.

Those who advocate the "greasers" hypothesis proclaim that corruption and flaws in regulations facilitate trade by improving efficiency by enabling private sector entities to evade burdensome regulations (Leff, 1964; Méon and Weill, 2010). Others who endorse the "sanders" hypothesis state that rampant corruption and lenient and ambiguous regulations repel traders and investors from the economy (Mauro, 1995). This debate is still ongoing and a number of studies like Bardhan (1997), Pande (2008), Aidt (2009) are dedicated to it. However, it has largely been inconclusive.

In our analysis, the estimated coefficients of regulatory environment indicator for both the exporting as well as the importing countries are significant and of high magnitude but of opposite signs, i.e. negative for exporting country and positive for importing country. This suggests that regulatory environment will distinctively affect trade flows of individual countries depending upon whether it is an importing country or an exporting country in a specific scenario. From a policy perspective, this approach is much more beneficial as it provides specific directions to work upon.

Table 3. *Augmented panel gravity model results*

Variable	Coefficient	P Values
Constant	1.249	0.961
Regulatory Environment of exporting country	-5.214***	0.000
Regulatory Environment of importing country	3.229**	0.014
Tariff	-5.461*	0.056
Real GDP of exporting country	1.317***	0.000
Real GDP of importing country	0.902**	0.015
Real GDP per capita of exporting country	-1.243**	0.014
Real GDP per capita of importing country	-0.630	0.207
Geographic Distance	-0.919	0.493
Common Language dummy variable	2.744*	0.078
Common Colony dummy variable	2.447*	0.081
R^2 within	0.1304	
R^2 between	0.8163	
R^2 overall	0.7942	
Prob > Chi^2	0.000	
No. of observations	200 (20 groups)	

Note: *Significant at the 10 percent level. **Significant at the 5 percent level. ***Significant at the 1 percent level. All the variables (dependent and independent) are in logarithms.
Source: Authors' calculation.

Coefficient of regulatory environment indicator of trade facilitation for exporting country is (-5.21) which means that bilateral trade flows to importing country from exporting country are negatively associated with regulatory environment of exporting country and one percent improvement in regulatory environment indicator of trade facilitation of

exporting country will reduce bilateral trade flows by five percent. On the other hand, coefficient of regulatory environment indicator of trade facilitation for importing country is (3.22) which means that bilateral trade flows are positively associated with regulatory environment of importing country and one percent improvement in regulatory environment indicator of trade facilitation of importing country will increase bilateral trade flows by three percent. As predicted, tariffs affect bilateral trade flows negatively and significantly.

On the whole, the analysis implies that trade facilitation in regulatory environment generate opposite outcomes for a country in case of exports and imports. If a country ensures improvement in its regulatory environment in terms of transparency, stringency, enforcement and quality of regulations along with controlling corruption, then it leads to increase in its imports as it facilitates the exporters from other countries to export their goods to this country easily.

However, this improvement in regulatory environment of a country works the other way around for its own exports to other countries as the transparency, stringency and strict enforcement of regulations with low level of corruption could hinder the faster movement of goods from the home country to the other countries. These results are in line with the results of Van Beers and van den Bergh (1997) who examined the consequence of environmental regulations on a nation's imports and exports using a gravity model and concluded that precisely defined environmental stringency variable significantly affects a country's exports negatively. Similarly, the results of the present study are supported by the results of Lee and Weng (2013) who scrutinized the effect of bribery in a country on firm exports of that country by following three-stage least squares method to test the contrasting hypotheses. One of the hypotheses formulated by the study stated that bribery leads to preferential treatment to firms by government officials which enhances their efficiency to perform competently in foreign markets. Whereas, the other hypothesis stated that bribery provides preferential treatment within domestic market and it reduces the firm's incentive to dig into foreign markets, thereby reducing exports. The study concluded that bribery reduces the firm exports from home country instead of increasing them.

The estimated coefficients of basic variables also confirm to the ordinary features of gravity model. The coefficients of real GDP of both the importing and exporting countries in the model are positive and significant showing that exports and imports of a country tend to rise with increase in the size of the economy. The coefficient of real GDP of exporting country is 1.3 and that of importing country is 0.9 suggesting that the elasticity of trade volume corresponding to GDP of exporting country is higher as compared to that of GDP of importing country. The coefficients of real per capita GDP of both the exporting and importing country are negative depicting that it negatively affects trade flows. The estimated coefficient of distance in the model is negative (-0.91) as anticipated which implies that trade flows are negatively associated with distance and a country is more inclined to trade with countries that are closer than with the far ones. The dummy variables depicting the common official language and common colonial history of trading partners also possess positive and significant coefficients, i.e. 2.74 and 2.44, respectively. This reflects that countries with same official language and common colonial background are likely to trade more.

5. Estimating trade potential within South-Asia

For further analysis, the results of augmented panel gravity model for intraregional trade in South-Asia displayed in Table 3 are used to estimate trade potential of each member country in the study within South-Asia. Trade potential could be defined as maximum level of trade possible between two countries which have liberalized their trade restrictions (Kalirajan, 1999). Based on the estimated coefficients of augmented panel gravity model, the trade potential (P) for each of the five countries with one another within South-Asia is calculated. The recorded actual trade (A) represents the present volume of trade taken place with ongoing set of restrictions and institutions. The difference between potential (P) and actual (A) trade arises due to several institutional and socio-economic factors that impede actual trade to rise to the highest point of export production frontier.

To evaluate whether a pair of two countries has unrealised or untapped trade potential between them, the ratio of trade potential (P) and actual trade (A) is calculated, i.e. (P/A) as per Batra (2006). If this ratio (P/A) exceeds 1 then we interpret this as unrealised or untapped trade potential between a member country of South-Asia with its trading partner country within South-Asia and that the trade can be expanded. On the other hand, if the ratio (P/A) is less than 1 for a given country then it implies that this country has exceeded its trade potential with its trading partner. So, this ratio (P/A) indicates whether a country has potential for increasing trade with other countries or not.

Further, to estimate the actual figure of how much the trade between two countries could be expanded we have calculated the difference between the potential trade (P) and the actual trade (A), i.e. the magnitude of (P-A). This figure (P-A) depicts whether a country has potential for expanding its trade with its partner country or it has exceeded its potential for trade with the partner country. If (P-A) is positive, it indicates that the country has unrealised trade potential and there exists an opportunity for this country to realise this untapped trade potential with its trading partner. Contrarily, if (P-A) is negative, it indicates that the country has already exceeded its potential for trade with its partner country. The absolute figures denote the magnitude of possible expansion of export trade (if positive) or the magnitude of over-trade (if negative) within two countries in US $ millions.

5.1. Analysis of estimated trade potential within South-Asia

The results of estimated trade potential within South-Asia are displayed in Table 4 and Table 5. The results depict the export potential of each of the five countries of South-Asia taken in analysis with the rest of the four countries within the region.

Table 4 displays the results of trade potential (measured by the ratio P/A) within the region. The results depict that out of the five countries, Bangladesh is the only country which has potential of expanding its exports to all the four countries as the ratio values are greater than one for all the four countries. It means that Bangladesh is the country with the greatest potential. On the other hand, Pakistan has unrealised export potential only with Nepal and it is outperforming its export potential with the other three countries. Sri Lanka has unrealised export potential with all the three countries (Bangladesh, Nepal and Pakistan) except India. Nepal has export potential with Pakistan and Sri Lanka as it does not share a common border with these two countries, whereas it is surpassing its export potential with

India and Bangladesh. Despite sharing a land border with Bangladesh and Pakistan, India has untapped export potential with both the neighbouring countries, however it is exceeding its export potential to Nepal and Sri Lanka.

Table 4. *Trade potential of countries within South-Asia in ratios (P/A)*

	Bangladesh	India	Nepal	Pakistan	Sri Lanka
Bangladesh	-	2.56	3.68	6.27	1.05
India	4.94	-	0.14	2.04	0.38
Nepal	0.49	0.06	-	4.81	2.13
Pakistan	0.70	0.73	9.87	-	0.13
Sri Lanka	1.05	0.51	1.05	1.23	-

Source: Author's computations based on augmented panel gravity model results.

The results of actual trade potential (P-A measured in US$ millions) of member countries with each other in South-Asia are given in Table 5. As revealed by the ratio analysis of trade potential, Bangladesh has positive export potential with all the four countries of the region. The magnitude of expanding exports from Bangladesh is also quite huge, i.e. approximately US$ 1.36 billion out of which US$ 1.14 billion arises only out of its exports to India. Not only this, India also shows tremendous gap between potential trade and actual trade, i.e. US$ 16.92 billion with Bangladesh. This reflects the dire need of facilitating trade between these two countries from both the sides, i.e. exporter's side as well as importer's side. Facilitation of trade between these two countries could ensure major contribution to intra-regional trade in South-Asia. Apart from this, India also has export potential with Pakistan of US$ 1.35 billion. Nepal has positive export potential only with Pakistan of about US$ 2.99 million which is a small amount owing to its economy size. Pakistan too has a small magnitude of positive export potential only with Nepal, i.e. US$ 6.77 million. Likewise, Sri-Lanka also has small positive export potential with Bangladesh of US$ 4.58 million, Pakistan of US$ 12.47 million and Nepal of US$ 0.06 million.

Table 5. *Trade potential of countries within South-Asia in value (US$ millions) (P-A)*

	Bangladesh	India	Nepal	Pakistan	Sri Lanka
Bangladesh	-	1,149.80	6.48	209.00	1.34
India	16,927.53	-	-3,667.10	1,355.08	-2,486.05
Nepal	-22.38	-395.73	-	2.99	0.23
Pakistan	-146.94	-101.22	6.77	-	-202.95
Sri Lanka	4.58	-403.17	0.06	12.47	-

Source: Author's computations based on augmented panel gravity model results.

The trade potential analysis provides us with a significant conclusion that trade facilitation provides tremendous scope in South-Asia in increasing intra-regional trade and country pairs like India-Bangladesh, India-Pakistan, Bangladesh-Pakistan and Sri Lanka-Pakistan are the most promising ones if they facilitate trade across the borders for their regional trading partners.

6. Estimating potential gains from trade facilitation in regulatory environment in South-Asia: Simulation approach

In this section, we quantify the potential gains in intra-regional trade in South-Asia by exploring few scenarios of trade facilitation initiatives concentrated on regulatory environment. The objective is to estimate the gains in intra-regional trade arising out of different scenarios of trade facilitation in regulatory environment, so as to inform the

policy-makers about the underlying potential of each initiative of trade facilitation in increasing trade flows within the region.

6.1. Simulation design

The augmented panel gravity model operated in the previous section of the study enable us to carry out simulations to quantify the gains in intra-regional trade in South-Asia resulting from specific scenarios of improved regulatory environment indicator of trade facilitation. The simulations conducted in this section are based on three different scenarios. First scenario is the basic scenario which requires that out of all the member countries taken in the analysis, the countries with below average Regulatory environment indicator should be brought up to the regional average of the indicator and the countries already performing above regional average of the indicator should not be altered, so that all the countries are either at the regional average or above average of the Regulatory Environment indicator as done by Wilson et al. (2003).

The emphasis here, is on below-average performers in the region since these countries bear lower scores of Regulatory Environment indicator and need substantial efforts for capacity-building as compared to above-average performers. The drawback of this scenario is that it does not necessitate the improvement in regulatory environment of the countries which are already performing above average which may get even better results for increasing trade volumes if improved. Therefore, the next two scenarios root on uniformly improving trade facilitation indicator of Regulatory Environment of all the countries in the region by a common percentage.

Second and the third scenarios dictate that the Regulatory Environment indicator of trade facilitation of all the countries taken in the analysis should be improved by ten per cent and fifteen per cent of the original values, respectively. The important thing to note here is that in all the three scenarios of improving Regulatory environment indicator, improvement means increasing the value of the indicator for importing country and decreasing the value of the indicator for exporting country at the same time. This is because the variable Regulatory environment indicator has positive coefficient for importing country and negative for exporting country. Therefore, improvement in regulatory environment for importing country means increase in the value of the indicator and that for the exporting country means decrease in the value of the indicator.

6.2. Simulation analysis

Simulations results for three scenarios of improved Regulatory Environment indicator of trade facilitation to quantify the gains in intra-regional trade in South-Asia are displayed in Table 6. The first scenario which required that the countries with below average Regulatory environment indicator within the region are brought up to the regional average of the indicator and the countries already performing above regional average of the indicator are not altered, led to gain in total trade flows across the region by US\$ 17.06 billion, which accounts for 99.30 percent of the total intraregional trade in South-Asia. Such a phenomenal change in the total intra-regional trade resulting from improving the regulatory environment of only the below average countries has taken place partly because three out of five countries taken in analysis were lying below regional average in actual scenario and

partly because of the large gap in the score of regulatory environment indicator of worst performing economy and the regional average. However, the limitation of this scenario is that the above average performing countries are not improving their regulatory environment.

Table 6. *Results for simulations done on regulatory environment indicator of trade facilitation*

Trade facilitation measure of simulation	Goal	Change in trade flow	
		Amount ($ billion)	Share of total trade (%)
All Countries at South-Asia's Average	Below average countries increase RE of importing countries up to South-Asia's average and above average countries decrease RE of exporting countries to South-Asia's average	17.06	99.30
All Countries at 10% Improved RE	Increase RE of all the importing countries by 10% and decrease RE of all the exporting countries by 10%	52.22	303.95
All Countries at 15% Improved RE	Increase RE of all the importing countries by 15 % and decrease RE of all the exporting countries by 15%	90.75	523.86

Source: Author's computations based on augmented panel gravity model results.

The second and the third scenarios of simulations are based on uniformly improving trade facilitation indicator of Regulatory Environment of all the countries by a common percentage. In the second scenario, we improve the Regulatory Environment indicator of all countries by 10 percent which brings all the member countries above regional average except one country despite improvement in their Regulatory Environment indicator. In this scenario, the gain in South-Asia's total intra-regional trade is US$ 52.22 billion, which constitutes 303.95 percent of total intra-regional trade. This indicates that when all the countries of the region including the below average, above average and the best performer in the region further improve their Regulatory Environment by merely 10 percent, then it results in intra-regional trade becoming four-times of the actual trade.

In the third scenario, we improve the Regulatory Environment indicator of all the member countries by 15 percent which brings all the five countries in the region above regional average of Regulatory Environment indicator. In this scenario, the gain in South-Asia's total intraregional trade is US$ 90.75 billion, which claims a rise in 523.86 percent. This gain is more than five-times the actual level of South-Asia's intraregional trade. It depicts that when all the countries in the region further improve their Regulatory Environment so much so that all of them reach a level that is above current regional average, then the gains in intra-regional trade are enormous.

The results of these simulations suggest that considering South-Asia already has a very low share of intra-regional trade to that of its total trade, i.e. 6.1 percent, there exists enormous scope for increasing this share through trade facilitation measures aimed at improving Regulatory Environment of the countries in the region.

7. Tariff reduction versus trade facilitation

It is often assumed that tariff barrier to trade is the most significant barrier to trade since it is the most tangible form of impediment to trade in terms of trade costs. However, in the past few decades after phasing out of tariff barriers owing to WTO obligations and several regional trade agreements, the emphasis has been shifted to other non-tariff barriers

including regulatory measures. In this section, we conduct yet another set of simulations to calculate the gains in intra-regional trade in South-Asia arising from the scenarios of tariff reduction so as to compare the gains with those arising from trade facilitation in regulatory environment. The two scenarios of simulations examined here are reduction of weighted average FTA tariffs in South-Asia by half and up to zero. This analysis helps us to quantify the gains in intra-regional trade owing to reduction of tariffs by half and by completely phasing out of tariffs from the region.

The results of the tariff simulations are provided in Table 7. The results indicate that if the bilateral tariffs in the region applied by the member countries on each other are reduced by half, then it leads to gain in intra-regional trade in South-Asia by US$ 23.14 billion which accounts for 134.69 percent of total intra-regional trade. It is interesting to note that these gains are comparable to the gains in intra-regional trade achieved by trade facilitation in regulatory environment indicator of below average member countries of the region up to the regional average. Now, the policy makers can decide as to which measure would they be opting to generate these gains in intra-regional trade and it depends upon the cost to be incurred on achieving this kind of Regulatory environment trade facilitation. Whichever option out of the two demands least cost shall be chosen and followed.

Table 7. *Results for simulations done on tariff rate imposed by member countries in South-Asia (or SAFTA)*

Measure of simulation	Goal	Change in trade flow	
		Amount ($ billion)	Share of total trade (%)
Half Tariff	Decrease the actual bilateral Applied Tariff Rate imposed by member countries on each other by half	23.14	134.69
Zero Tariff	Decrease the actual bilateral Applied Tariff Rate imposed by member countries on each other to zero	39.21	228.23

Source: Author's computations based on augmented panel gravity model results.

The next scenario of tariff reduction for simulation dictates complete phasing out of bilateral tariffs for member countries of South-Asia. This scenario generates gains in intra-regional trade of about US$ 39.21 billion which constitutes about 228.23 percent of the actual intra-regional trade in South-Asia at present. If we compare this gain with the gain in intra-regional trade resulting out of trade facilitation in Regulatory environment of all the countries by 10 percent, then it depicts that gains from trade facilitation are larger than gains in intra-regional trade achieved by completely phasing out of bilateral tariffs within the region. This suggests that in case tariff abatement or phasing out is not possible then trade facilitation could prove to be a favourable alternative policy. This also suggests that reducing tariffs to increase the trade within the region are not sufficient enough to realise full potential of intra-regional trade. Phasing out of tariffs is in fact less effective than trade facilitation in regulatory environment and if the two measures are implemented simultaneously, then the potential gains in intra-regional trade could be phenomenal.

8. Summary and conclusion

Being the least integrated region of the world with total intra-regional trade amounting to just 6.1 percent of the total world trade of the region, South-Asia retains enormous scope

for collective gains in international trade and economic growth for all the member countries of the region. Other than phasing out bilateral tariffs within the region, the commitment towards capacity building in trade facilitation is inescapable to increase regional trade. The formation of the South Asian Association for Regional Cooperation (SAARC) and its further extension to South Asian Free Trade Area (SAFTA) was perceived as a positive step in this direction. However, it could not yield the desired results due to the presence of intangible barriers to trade within the region like regulatory barriers. The removal of these barriers requires strategic efforts in the direction of trade facilitation.

There were three main objectives behind this study. The primary objective of the analysis was to assess the impact of trade facilitation in regulatory environment on South-Asia's intraregional trade. To achieve this objective, an augmented panel gravity model was run to estimate the bilateral trade flows within the region depending upon basic variables of gravity model and regulatory environment indicator of trade facilitation for both importing and exporting countries. The results of the regression model suggest that regulatory environment indicator of trade facilitation is an important variable in determining the trade flows within the region and there exists immense potential for gains in intra-regional trade in South Asia emerging from collective efforts to boost capacity in trade facilitation in regulatory environment. The regulatory environment indicator of the importing country impacts trade flows positively, whereas, the regulatory environment indicator of the exporting country impacts trade flows negatively. One percent improvement in regulatory environment indicator of trade facilitation of exporting country will reduce bilateral trade flows by five percent and that of importing country will increase bilateral trade flows by three percent.

The second objective of the analysis was to estimate the trade potential of South-Asian countries with each other. The results of trade potential analysis reveal that facilitation of trade between India and Bangladesh from both exporter's side as well as importer's side could generate gains in intra-regional exports by US$ 18.28 billion combined. Apart from this, India and Bangladesh both have immense export potential to Pakistan of US$ 1.35 billion and US$ 209 million respectively. Therefore, the most promising countries in South-Asia for increasing intra-regional trade through trade facilitation in Regulatory environment are India, Bangladesh and Pakistan.

The third and the final objective of the study was to estimate the payoffs in South-Asia's total intraregional trade by running simulations on several scenarios of improving the Regulatory Environment indicator through trade facilitation and reduction in tariffs within the region and by comparing the outcomes of the two measures. The simulations results indicate that if only the below average performing countries in South-Asia in Regulatory Environment indicator improve their score for Regulatory Environment by trade facilitation up to the regional average score then it can increase the intra-regional trade by US$ 17.06 billion, which accounts for 99.30 percent of South-Asia's total intraregional trade. Further, if all countries in the region improve their Regulatory Environment indicator by 10 percent and 15 percent through trade facilitation then the gains are nearly US$ 52.22 billion and US$ 90.75 billion, which constitutes 303.95 and 523.86 percent of total intra-regional trade, respectively. Apart from this, slashing the bilateral applied tariffs in the

region by half could foster gains in intra-regional trade by US$ 23.14 billion, i.e. 134.69 percent of total intra-regional trade and complete phasing out of tariffs can generate gains of US$ 39.21 billion, i.e. 228.23 percent of total intraregional trade in the region at present.

The overall analysis highlights the significant part to be played by India in carrying out trade facilitation reforms in South-Asia as it represents 82.53 percent of the aggregate GDP of South-Asia and could lead by example to promote the agenda of collective trade facilitation in the region. Bangladesh's economy seems to be having hostile regulatory environment for India's exports which needs to be corrected through trade facilitation. Other significant deterrent in intraregional trade in South-Asia is posed by Pakistan as both India and Bangladesh have immense potential for expanding exports to Pakistan. So, Pakistan should focus on trade facilitation in regulatory environment for its own interest as well as for larger gains to the region as a whole. Macroeconomic stability and bilateral cooperation between India and Pakistan is also very important for encouraging regional cooperation. It is obvious as per the statistics that regional integration can be promoted, however, with coherent efforts of all the countries in the region to address barriers to trade facilitation in regulatory environment.

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Appendix

1. **Transparency of government policy making** (WEF) measures how easy is it for businesses to obtain information about changes in government policies and regulations affecting their activities in a country, ranging from 1=extremely difficult to 7=extremely easy.

2. **Stringency of environmental regulations** (WEF) measures perceived stringency of a country's environmental regulations, ranging from 1=very lax to 7=among the world's most stringent.

3. **Enforcement of environmental regulations** (WEF) measures perceived rigorousness of enforcement of a country's environmental regulations, ranging from 1=very lax to 7=among the world's most rigorous.

4. **Regulatory quality** (World Bank WGI) captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development, ranging from -2.5=very low to +2.5=very high.

5. **Control of corruption** (World Bank WGI) captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests, ranging from -2.5 – very low to +2.5 –very high.