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CONSTRUCTING TRADE OPENNESS INDEX FOR PAKISTAN

This article constructs a trade policy openness index for Pakistan using quarterly data for the period 1981/82 to 2007/08. For this purpose theoretical and empirical literature on trade orientation measures is critically reviewed. It is found that every measure of trade orientation has some pros and cons. Therefore, one measure cannot be preferred to other measures nor any measure can be altogether relegated in favour of other measures. Following Wacziarg (2001), a trade policy openness index is calculated for Pakistan. This measure is objective, continuous and free from the omitted variable bias problem. Unlike other measures of trade openness in Pakistan, this measure is based on solid theoretical grounds as it incorporates both export and import tariffs and quantitative restrictions. It is concluded that this measure has considerable potential in empirical work regarding the trade openness-growth nexus in Pakistan.

Keywords: exports, imports, trade openness
JEL Classification: C13, C22, F13

1. INTRODUCTION

One of the most serious problems that researchers are currently confronting while empirically evaluating trade openness and growth relationship is the absence of any theoretically plausible and econometrically consistent measure of trade openness.[1] As a result, different researchers have

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[1] Trade openness refers to laissez-faire situation or a situation in which there is no government intervention in the flow and pattern of international trade. In this sense, liberalization is not synonymous with outward orientation as countries can be highly outward-oriented while at the same time trade is highly interventionist. By the same token, openness is also not synonymous with outward orientation since a country can get a high ratio of trade to GDP with highly interventionist and distorted trade pattern (Pritchett, 1991). On the other hand, openness to trade is a stock variable, while trade liberalization is a flow variable which refers to its change (Winters, 2004). A country can be highly open but at the same time may have high government trade interventionist policies. Thus, theoretically, openness and liberalization cannot be used synonymously. However, in this study both terms are being used interchangeably unless indicated otherwise.

used different measures to examine the effects of trade openness on economic growth, which has delivered contradictory effects of openness on growth. However, it does not mean that there are not suitable measures of trade openness in literature. There are, but as innovative as they may be, researchers have raised a number of questions on the theoretical foundations of these measures upon which they are built and have expressed concerns regarding the consistency of the estimated relationship that they deliver. Rodriguez and Rodrick (2000) argue that much of the work regarding the (positive) relationship between trade openness and economic growth has been plagued with subjective and collinear measures of openness and emphasize the need for a better measure of openness to get a consistent association between openness and output growth.

The literature contains two broad categories of trade openness measures: (a) Outcome-Based Measures and (b) Policy-Based Measures. Outcome-based measures assess the deviation of the observed outcome from the outcome without trade barriers. Outcome-based measures contain two sub-categories: i) Flow-Based Measures, and ii) Price-Based Measures. Flow-based measures include trade intensity ratio (including import and export penetration ratios) and structure-adjusted trade intensity ratio. These measures gauge actual exposure to trade interactions and, therefore, may account quite well for the effective level of integration. Price-based measures include implicit tariff rates (differences between domestic prices and world prices of the same products), effective rates of protection or assistance and the spread of the black market premium of exchange rates. The policy-based measures, also known as incidence-based measures, such as tariff rates, non-tariff barriers, etc., describe the institutional features of a country's attitude towards the rest of the world. They are likely to be important determinants of outcome-based measures.

According to Pritchett (1991) both categories of trade openness measures lack any theoretical foundation and are subject to theoretical and practical drawbacks. Therefore, some researchers have attempted to construct subjective country specific measures of trade orientation. Although these measures have the advantage of incorporating important local considerations, they are inherently difficult to replicate for countries or time periods other than those for which they were originally designed. Greenaway *et al.* (2002) have concluded that the use of such diverse measures of trade policy orientation accounts for much of the inconclusiveness in the recent empirical analysis of the effects of trade liberalization on economic growth.

In this paper the question is not whether a particular method produces perfect measures of openness, since none will. The real question is which method seems likely to produce the best measures. This method will be used to develop trade openness measures for Pakistan, which can be used to examine the empirical relationship between trade openness and output growth in Pakistan. The paper reviews all those prominent measures of trade openness that are currently prevalent in literature and are much used in empirical analysis discussing the way in which the measuring of trade openness has evolved over the last few years. It is critical to understand various trade openness measures in order to apprehend the conceptual problems inherent in these measures, and to construct a measure for Pakistan that seems theoretically to be a plausible measure.

The rest of the paper is organized as follows. Section 2 briefly reviews the openness measures that have been developed over time in literature. Section 3 provides the theoretical basis for the construction of trade openness measures for Pakistan. Section 4 empirically constructs a trade policy openness index for Pakistan. The final section concludes the paper.

2. OPENNESS MEASURES: A BRIEF REVIEW

2.1. Flow-Based Trade Openness Measures

Flow-based measures describe trade openness in terms of volume of existing trade or its components. Actual trade performance, as denominated in the (unadjusted) rate of total trade to GDP, is the simplest measure of openness and perhaps the most obvious indicator of outward orientation. A large number of studies used the trade to GDP ratio as a measure of openness and found, as reviewed in Harrison (1996), its positive and strong relationship with growth. Exports and imports penetration ratios were also used as openness measures in earlier studies. The high values of these variables are considered to indicate that the economy is more open relative to other economies. These variables have the advantage of capturing a broad definition of openness. Furthermore, data on these measures are available for a broad set of countries.

In practice, however, these trade variables are affected for reasons having nothing to do with trade policies like structural factors, e.g. geographical characteristics of an economy (large countries have small trade shares), population size (highly populated countries trade less), economic size (GDP), foreign capital flows, etc. As a result, these measures can be viewed

as imperfect proxies for trade openness. These indicators are not necessarily related to policy – a country can distort trade heavily by considerable intervention – and still have high trade volumes. Moreover, these variables are subject to endogeneity problems with respect to growth.

2.2. Balassa's (1985) Trade Openness Index

Balassa (1985) has developed a trade openness index as the difference between actual exports and the volume of exports predicted by an export model for 43 countries, for the period 1973 to 1979. Balassa estimates an export model using the variables per capita GDP, population and availability of mineral resources. Residuals from the regression are taken as a measure of trade orientation. Positive values of residuals are deemed as an indication of outward-oriented policy, and vice versa.

The limitation of this measure is that it is an atheoretic measure and is not based on any sound economic theory (Pritchett, 1991). Balassa does not consider this index of trade orientation as a variable measured with errors, nor does he check onthe robustness of the results with alternative specifications of export equations. Furthermore, Balassa does not include capital accumulation and labour force growth as regressors.

2.3. Leamer's (1988) Trade Openness Measures

Leamer (1988) estimates trade intensity ratios using nine variables, i.e. capital, three types of labor, four types of land and oil.[2] Leamer takes the residual term as an indicator of trade restriction. By applying this method Leamer generates two types of trade policy indicators, i.e. openness and interventions measures.

2.3.1. Openness Measures

Leamer (1988) develops two types of openness measures: i) an adjusted trade intensity ratio (TIR) and ii) the ratio of actual to predicted trade. The TIR is the actual trade intensity ratio minus the trade intensity ratio predicted by the model. Mathematically

[2] In addition to these nine factors, Leamer uses distance to markets and net trade balance in his regressions.

$$TIR_i = \frac{\sum_j |N_{ij}| - \sum_j |\hat{N}_{ij}|}{GNP_i} \tag{2.1}$$

where i (j) refers to country (set of commodity type), N_{ij} is the value of net exports and $\hat{N}_{ij}$ is the value of net exports predicted by the model.

A country is considered open if its trade volume is greater than the one predicted by the model. The intuition is that most policies have the effect of deterring trade. Greater trade is, therefore, associated with less intervention. Large residuals in absolute value indicate omitted variables or policy interventions that affect trade either positively or negatively.

An alternative measure of openness ($Open_i$) is the ratio of actual trade to predicted trade. Mathematically

$$Open_i = \frac{\sum_j |N_{ij}|}{\sum_j |\hat{N}_{ij}|} \tag{2.2}$$

The ratio of actual to the predicted trade is analogous to a tariff average that suggests how much trade is deterred by barriers. We can relate two measures as $TIR_i = (Open_i - 1)\hat{TIR}$, where $\hat{TIR}$ is the predicted trade intensity ratio, i.e. $\hat{TIR}_i = \sum_j |\hat{N}_{ij}| / GNP_i$.

2.3.2. Intervention Measures

Contrary to a trade openness index, Leamer also provides the concept of a trade intervention index. This index is different from the adjusted trade intensity ratio in the sense that both positive and negative variations of actual trade from the predicted levels increase the intervention indices. Leamer constructed two types of intervention (INT) measures for country i.[3] Mathematically

$$INT_i^1 = \frac{\sum_j |E_{ij}|}{GNP_i} \tag{2.3}$$

[3] According to Pritchett (1991), a third measure of Leamer's trade intervention is the country R^2, the proportion of the countries trade pattern predicted by the model.

$$INT_i^2 = \frac{\sum_j \left|E_{ij}\right|}{\sum_j \left|\hat{N}_{ij}\right|} \tag{2.4}$$

where $E_{ij} = N_{ij} - \hat{N}_{ij}$ is the size of the residuals. An important weakness of these intervention indicators is that they take as a norm the average level of policy intervention, whereas in practice zero residuals do not necessarily imply the absence of any trade barriers. Further, the data do not exhibit actual policy intervention, and it is not possible to estimate the effect of removing the interventions that contaminate the data. Additionally, these intervention rates are only measures of the size of the residuals and may also be called measures of peculiarity as the difference between the two measures (2.3 and 2.4) is only in the denominator (for details, see Leamer, 1988).

The main advantage of Leamer's indicators is that they are i) objective indices, ii) continuous indices that allow for different degrees of openness, and iii) comparable across countries (Edwards, 1989). They reflect all types of trade interventions and hence can be useful to test the liberal trade regime hypothesis (Edwards, 1989). These indices are derived from an empirical application of a pattern of trade theory that captures each country's comparative advantage and that is quite as sophisticated as one could possibly expect (Edwards, 1992; Pritchett, 1991; Santos-Paulino, 2005).

However, Leamer's indices have limited intrinsic credibility and plausibility for numerous reasons. Firstly, the assumptions that trade barriers are the only important omitted variables and that they are uncorrelated with the included variables strain the credibility of these measures. Secondly, these measures are very sensitive by construction as any trivial modification in their construction may result in a huge difference in country rankings. Thirdly, the measures have some limitations in measuring the endowments of factors (like skilled labour), which determine the trade pattern (Pritchett, 1991). Finally, the indices have been constructed only for one time period (i.e. for 1982); hence these indices can be viewed as imperfect proxies for trade intervention.

2.4. Lee's (1993) Trade Openness Index

To construct a trade openness index, Lee (1993) regresses the ratio of total imports to GDP on structural features of the economy such as natural resource endowments (area) and natural trade barriers (distance) using instrumental variable estimates for a cross section of 81 countries over the

1960-85 period. Trade distortion measures such as tariff and black market premium (BMP) were also included in the regression as import ratios are also influenced by these measures. By taking the estimated coefficients of tariff and BMP as zero in the regression equation, the fitted values for the dependent variable were taken as a measure of trade openness. However, this measure of openness has not incorporated nontariff barriers (NTBs), which cover a significant fraction of import categories in most countries (Pritchett, 1991).

2.5. Wacziarg's (2001) Trade Policy Openness Index

Wacziarg's (2001) trade policy openness index is a weighted average of three variables, i.e. imports duty rates, Pre-Uruguay NTB coverage ratio, and Sachs and Warner (1995) dichotomous variable.[4] This index is constructed for 57 countries for the period 1970-89. The weights used to develop the index came from a regression of trade volumes (as a ratio to GDP) on these three indicators plus some gravity variables, i.e. population, area and per capita income growth.

An important benefit of this method is that it overcomes both the problems of measurement errors arising due to the construction of the deviations between the observed and potential trade ratios and the problem of collinearity between gravity variables and policy factors. Further, it possesses the features of objectivity, continuity and comparability across countries. However, this index also includes the Sachs and Warner liberalization status so it can also be criticized on the same grounds as the Sachs and Warner liberalization index.

2.6. Tariffs

One of the most widely used measures of trade openness is tariff revenues. Researchers prefer tariff revenues as a measure of trade restrictiveness over tariff rates for a variety of reasons. Firstly, the data on tariff revenues are more easily available for long time periods and for a wider range of countries than tariff rates. Secondly, tariff revenues better indicate the degree of tariff restrictions because they are by construction weighted by the composition of exports and imports while tariff rates are unweighted averages of goods-specific tariff rates. Thirdly, tariff rates are

[4] See Section 2.12 for a critical review of the Sachs and Warner (1995) dichotomous variable.

ad-hoc measures of trade protection that lack any theoretical foundation and are subject to theoretical and political drawbacks. The Pritchett and Sethi (1994) document the wide divergence between officially declared tariff rates and tariff rates that are practically implemented and conclude that the latter tariff rates may be misleading as they underestimate the actual tariff rates (also see Pritchett, 1991). Further, the effective rates of protection may differ from tariff rates due to the protection of imported inputs. Therefore, tariff rates again will understate the actual rates of protection. Tariff revenues once again avoid this problem by measuring the amount of tariff revenues actually collected.

The main disadvantage of using tariff revenues is that prohibited tariff rates will decrease tariff revenues. In this case tariff revenues may undervalue the actual level of tariff barriers. Tariff rates also ignore the distortive effects of NTBs. When tariffs and NTBs are substitutes, tariff rates will be a poor proxy for trade restriction (Rodriguez and Rodrik, 2000). Moreover, aggregating tariffs correctly is very complex.

2.7. Rates of Protection

2.7.1. Nominal Rate of Protection

The nominal rate of protection is the difference between the domestic price level and the world price level of the finished product, expressed as a proportion of the latter. The nominal rate of protection (NRP) to industry j can be defined as

$$NRP_j = \frac{P_j - P_j^*}{P^*_j} \tag{2.5}$$

where P_j (P_j^*) is the domestic (world) price level of the finished product of industry j. High tariff rates will increase the nominal rate of protection via high domestic prices of final products while the reverse will happen for the provision of subsidies to import final products.

However, protection depends not only on the nominal protection granted to the product itself, but also on any taxes or subsidies levied on intermediate inputs. Thus, nominal rate of protection fails to take into account these taxes and subsidies. For this reason, nominal rate of protection has been rejected in favour of effective rate of protection.

2.7.2. Effective Rate of Protection

The concept of effective rate of protection is due to Corden (1966), Balassa (1965) and Johnson (1965). It is defined as the difference between the value added (per unit of output) in domestic prices and value added in world prices, expressed as a ratio to the latter. The effective rate of protection (ERP) to jth industry can be defined as

$$ERP_j = \frac{\upsilon a_j - \upsilon a_j^*}{\upsilon a_j^*} \tag{2.6}$$

where υa_j (υa_j^*) is the value added in industry j measured in domestic (world) prices. If we assume a linear relationship between inputs and output then ERP_j can be expressed as

$$ERP_j = \frac{t_j - \sum_i c_{ij}\, t_i}{1 - \sum_i c_{ij}} \tag{2.7}$$

where t_i is the rate of tariff on input i and c_{ij} denotes an input-output coefficient. Since tariffs on final goods exceed the tariffs on intermediate inputs, the activities with low value added (e.g. a high $\sum c_{ij}$) will tend to have higher effective protection than what the nominal tariff would indicate. In those sectors where intermediate inputs are subject to tariffs, the rate of effective protection would be negative, i.e. $t_j < \sum c_{ij} t_i$.

On the positive side, this index incorporates the role of distortions caused by tariffs on intermediate inputs. It provides information on the extent of inefficiency in resource allocation. This index also has some weaknesses. Firstly, the data requirements for calculating this indicator at a given moment are very large. Secondly, different studies may find important differences in the effective rate of protection calculations for the same country in the same year (Edwards, 1993). Thirdly, this indicator does not include the effect of NTBs. Fourthly, the fact that this index is not continuous reduces its usefulness further (Edwards, 1992). Finally, if there are more than two final goods the effective rate of protection will give no information on the way in which resources will be reallocated in the case of changes in the tariff structures (Edwards, 1989).

2.8. Krueger-Bhagwati Trade Openness Measure

Krueger (1978) and Bhagwati (1978) have invented the term *bias* to classify a country as liberalized or protected. The term bias (B) at time t is calculated as follows:-

$$B_t = \frac{EER_M}{EER_X} = \frac{E_M(1+t+n+p)}{E_X(1+s+r)} \tag{2.8}$$

The equation stipulates that bias is calculated as the effective exchange rate paid by importers (EER_M) to the effective exchange rate paid by exporters (EER_X), where EER_M is defined as the exchange rate applied to imports (E_M), corrected by import tariff (t), other import charges (n), and the premium (p) related to quantitative restrictions. Similarly, EER_X is measured as the exchange rate applied to exports (E_X), corrected by export subsidies (s) and other incentives to exports (r).

If this ratio is greater than unity $(B > 1)$ it implies that the trade regime is biased against exports, that is, the country is following an import substitution policy. If the ratio is equal to unity $(B = 1)$ it means that there are unified nominal exchange rates for commercial transactions, so the trade regime is regarded as trade neutral. Finally, if the ratio is less than unity $(B < 1)$ then the country is assumed to be following an export promotion strategy.[5] Krueger and Bhagwati, therefore, define trade liberalization as any policy that reduces the degree of anti-export bias. This index is a continuum index as B can be high, low, somewhat high or relatively low. So this approach has the advantage that it avoids a dichotomized view of trade regimes (Edwards, 1989, 1993). One limitation of this index is that it is difficult to construct a series of the bias (B) index due to the absence of reliable data on premium and import tariffs.

[5] Bhagwati (1988) proposes another classification of the definition of trade regimes. If bias is greater than unity $(B > 1)$ then the country is following an import substitution strategy. If it is equal to unity $(B = 1)$ then there is an export promotion strategy. Finally, if bias is less than unity $(B < 1)$ then the country is following an ultra export promotion policy.

2.9. Foreign Exchange Market Distortions

Foreign exchange market distortions, proxied by the black market premium (BMP) or the parallel market premium, indicate the excess demand for tradables and for foreign assets that the official foreign exchange market cannot satisfy. The greater the control on the use of official foreign exchange, the larger is the premium on the black market exchange rate because the greater is the excess demand for tradables. BMP is, therefore, directly related to trade restrictiveness (Matin, 1992; Sachs and Warner, 1995). A number of studies have used BMP as a trade policy index (see, for instance, Edwards, 1992; Harrison, 1996; Harrison and Hanson, 1999; Lee, 1993; Levine and Renelt, 1992).

Edwards (1992) supports this measure as it captures the effect of distortions not only to trade but also to capital flows and other markets. However, Levine and Renelt (1992) and Rodriguez and Rodrik (2000) argue that it might be misleading to use BMP as a measure of the severity of trade barriers as it does not represent any policy due to its high correlation with other bad macroeconomic policies and outcomes unrelated to trade policy. Further, BMP does not incorporate the trade restriction caused by tariffs and NTBs.

2.10. Nontariff Barriers

Coverage ratio for nontariff barriers (NTBs) is another form of direct measure of trade barriers and is considered as an austere trade restiveness measure in less developed countries. Many studies have considered this variable as a measure of trade restriction along with tariffs (see, for instance, Edwards, 1992, 1998; Wacziarg, 2001). Coverage ratios are calculated in two different ways. Firstly, it is calculated as a percentage of imports covered by trade barriers. Secondly, it is calculated as a percentage of products which are subject to import licenses.

The existing measures of nontariff barriers are usually not perfect. For instance, coverage ratio only suggests that barriers to trade exist but cannot measure the severity of distortion imposed. Therefore, it is possible that the coverage of the import licenses is broad but their restrictiveness is almost nonexistent (Edwards, 1992, 1998; Pritchett, 1991; Rodriguez and Rodrik, 2000). Similarly, coverage ratios aggregate different types of nontariff barriers (quotas, licenses, quality controls, etc.), which may exert quite different effects on imports. Data on coverage ratios are difficult to obtain as no continuous time-series data exist and the data that exist are not free from

measurement errors. It is very difficult to express weights of NTBs coverage ratio in a trade policy measure because they are country specific, and because the information is not always readily published, particularly for developing countries. Further, NTBs cannot capture the variations in implementation of import policy across countries. All these factors reduce the usefulness of coverage ratio as a measure of trade policy.

2.11. Dollar's (1992) Trade Openness Index

Dollar (1992) constructs a cross-country measure of outward orientation for 117 countries for a short run period of 10 years (1976-85) based on the notion of relative price levels using the United States as the benchmark country. The index of country i's relative price level (RPL) is defined as

$$RPL_i = NER_i \left(\frac{P_i}{P_{US}} \right) 100 \tag{2.9}$$

where NER_i is nominal exchange rate (dollars per unit of domestic currency) of country i and P_i (P_{US}) is the consumption price index for country i (the United States). The above equation is nothing but the real exchange rate; however, the price indices bear the same weight in each country. If all goods are tradable and there are no trade impediments then this measure would all be equal to 100. Hence, according to Dollar, if there are no non-traded goods then cross country variations in the price levels may be considered as a measure of restricted or open trade policy. For instance, a country having a high price level for a long span of time may be taken as a trade protected country (also see Pritchett, 1991).

The relative price level indices will not all be 100 and will vary even with free trade in the presence of non-tradables.[6] Dollar removes this relative price level variation by regressing it on country endowments proxied by per capita income (PGDP) and population density (DENS) in panel data, i.e.

$$RPL_{it} = \alpha + \beta_t d_t + \gamma PGDP_{it} + \lambda DENS_{it} \tag{2.10}$$

where the d_t's are year dummies for each year (except for the base year 1976). Eight different specifications were estimated for the above equation.

[6] If factor price equalization holds among countries with different endowments then the prices of nontradables would turn out to be the same. Then again RPL indices will become 100. However, if factor price equalization does not hold then prices of nontradables would vary systematically with endowments, causing variations in the relative price level as well. Dollar followed the same argument.

However, the final specification that Dollar adopted is the one which includes the level and square of PGDP along with regional dummies for Latin America and Africa and year dummies, and excludes density variable as it appeared to be insignificant. The residuals thus obtained indicate the extent to which a country's prices are high or low, given its endowments, and from these residuals Dollar constructed a cross country index of real exchange rate distortion, discussed in detail below.

2.11.1. Index of Real Exchange Rate (RER) Distortion

Dollar finds the distortion index by dividing actual price level by the predicted price level. He averages these measures over 10 years to eliminate the effect of short term fluctuations. However, Dollar admits that there are data measurement problems involved in this index and that there are some relevant country characteristics which are difficult to control for, thereby diluting the results.

RER distortion index is a theoretically reliable index under the assumptions that (a) there are no export taxes or subsidies, (b) the law of one price holds continuously, and (c) there are no systematic differences in national price levels due to transportation costs and other geographical factors. The intuition behind the first assumption is that the export sector has to play a comparatively minor role, which is not a sufficient condition. Similarly, the law of one price does dot hold in practice due to a number of reasons (see Rogoff, 1996). The last assumption absorbs the idea that purchasing power parity holds continuously. But there can be a substantial divergence from purchasing power parity in the presence of nominal shocks. So variations in price levels exhibited in the distortion index would not only be due to trade policies but also due to monetary and nominal exchange rate policies and geographical variables. Countries where the nominal exchange rate is not allowed to depreciate in line with domestic inflation will result in real exchange rate appreciation and will be rated high on the distortion index and vice versa (for details on this issue, see Rodriguez and Rodrik, 2000).

Further, Dollar uses regression residual to construct a real exchange rate distortion index which can be acceptable only if the regression equation is correctly and fully specified, otherwise, excluded variables will become the part of index thereby providing spurious results (Rodriguez and Rodrik, 2000). For instance, other endowment measures (especially capital stocks) are missing in the regression equation. Similarly, it is not clear that distortions (residuals) themselves are unrelated to endowments, so that the

residuals may be leaving out an important variation in price distortions. Further, this index does not consider directly tariffs, export duties and taxes, export subsidies and nontariff barriers (Santos-Paulino, 2005).

2.11.2. Index of Real Exchange Rate (RER) Variability

This measure is simply the coefficient of variation of each country's real exchange rate (RER) distortion index. However, RER variability measures more economic and political instability than solely economic openness (Rodriguez and Rodrik, 2000; Santos-Paulino, 2005). Real exchange rate variability index is criticized on the same ground as the real exchange rate distortion index.

Dollar also combined the distortion index with the variability index to construct an outward orientation index because the country ratings using distortion index only produced counter-intuitive country rankings. Dollar ranks the 95 developing countries based on a weighted average of the distortion and variability indices in decreasing order of openness and then divides them into four quartiles. This method succeeds fairly well in sorting countries into broad categories of trade orientation. It has the advantage of being easily applied to a larger number of countries.

2.12. Sachs and Warner's (1995) Trade Openness Index

Sachs and Warner (1995) have constructed a new composite trade policy openness index for 111 countries for the period 1970 to 1989.[7] Their indicator is a dichotomous variable that takes the value zero if an economy is closed and one if it is open. This index is developed using tariff rates, NTBs, black market premium, socialist economic system and monopoly in major exports. Since this index uses more variables other than just tariffs and NTBs, a number of studies have used this index to examine the openness-growth relationship – see e.g. Edwards (1998), Greenaway *et al.* (2002), Wacziarg (2001), and Wacziarg and Welch (2003).

The disadvantage of this index is that it is a dichotomous variable and a subjective index which is not based on any economic theory (Rodriguez and Rodrik, 2000). Further, tariff rates and NTBs are suitable indicators of trade policy, while the remaining variables reflect macroeconomic policies and institutional characteristics that have nothing to do with trade policy (Harrison, 1996; Harrison and Hanson, 1999).

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[7] Wacziarg and Welch (2003) have updated this index for the 1990s (i.e. 1990 to 1999) for 141 countries.

2.13. The Heritage Foundation's Economic Freedom Index

The Heritage Foundation has been constructing an index of economic freedom since 1995. The index is based on variables like law and order condition, fiscal and monetary policies, financial distortions, corruption, trade restrictions, regulatory laws, labour market interventions and black market behaviour. The index takes the value from one to five and measures the extent to which government policy distorts trade. Countries are classified as (a) free – if the value of index is 1.95 or less, (b) mostly free – if the value of index is 2.00 – 2.95, (c) mostly unfree – if the value of index is 3.00 – 3.95 and, (d) repressed – if the value of index is 4.00 or higher. The main weakness of this index is that it is a subjective index. That is why only few studies have used this index as a measure of trade freedom.

2.14. Greenaway and Nam's (1988) Trade Openness Measure

An important trade policy openness measure is developed by Greenaway and Nam (1988)[8] for 41 developing countries for two subperiods, 1963-73 and 1973-85. This openness measure takes into account variables like effective rate of protection, quotas and import licensing schemes, export incentives, and exchange rate alignment. Using these variables, the authors have calculated four trade-orientation regimes, i.e. strong and moderate outward orientations**,** and moderate and strong inward orientations. The major drawback of this measure is that it is a subjective measure which is not based on any economic theory (for details, see Edwards, 1998; and Rodriguez and Rodrik, 2000). As a result, this index gained only limited attention of researchers for empirical analysis.

2.15. Guttmann and Richards' (2004) Trade Openness Measure

Following the Economic Freedom of the World Index produced by the Institute for Economic Freedom (IEF), Guttmann and Richards (2004) constructed a trade openness measure for 173 countries for the period 1970 to 2000. This measure is based on four variables, i.e. trade taxes, regulatory trade barriers, black market premium and restriction on capital mobility. This measure is developed for five-year intervals and takes the values from 1 to 10, the higher the value the more trade liberalization is. The disadvantage

[8] This paper has also been published in World Bank (1987) as a background paper. That is why in literature this index is also known as World Bank (1987) inward-outward orientation index.

of this measure is that it is a simple average of four variables and is not based on sound economic theory.

This section has reviewed a number of trade openness measures used in the literature. No measure has been developed that is comparable both across countries and over time. Each of the measures reviewed was constructed to compare countries during a different time period. Thus, it is clear from our explanation that despite considerable endeavour, there is not much uniformity on the topic. Every openness measure contains methodological issues. Thus, we cannot completely favour one measure over the other nor can we discard any measure altogether. Nonetheless, openness measures constructed on reasonable theoretical grounds can be employed to create a consistent trade openness measure. Under this wisdom, Wacziarg's (2001) trade policy openness index is deemed to be theoretically sound.

3. ANALYTICAL FRAMEWORK

This section provides the theoretical underpinnings for the construction of a trade policy openness index for Pakistan. Construction of trade policy openness index is based on the concept of export and import demand functions. Therefore it is important to first formulate export and import demand functions expressed as the ratio to domestic income along with their theoretical interpretations.

3.1. The Export Function

Traditionally, the export demand of a country is presumed to depend primarily on international competitiveness, measured by relative prices at home and abroad denominated in common currencies, and world demand. If the relative price and the world income coefficients are assumed to be constant, the export demand as ratio to domestic income can be expressed as

$$\frac{X_t}{Y_t} = \alpha_0 + \alpha_1 RER_t + \alpha_2 Y_t^* + \mu_t \tag{3.1}$$

where X_t is domestic exports, Y_t is domestic income (GDP), RER_t is real exchange rate[9], and Y_t^* is foreign income level, α_1 is the coefficient of

[9] Throughout this study the exchange rate is taken in direct quote, that is, domestic currency per unit of foreign currency where an increase (decrease) in exchange rate indicates depreciation (appreciation) of the local currency.

RER and α_2 is the parameter of world demand and both are assumed to be positive, i.e. $\alpha_1 > 0$ and $\alpha_2 > 0$. Finally, μ_t is white noise stochastic error term with the usual properties, i.e. $\mu_t \overset{iid}{\sim} N(0,\sigma^2)$.

By introducing the trade liberalization variables in the export demand equation we will get the following augmented version of equation (3.1):

$$\frac{X_t}{Y_t} = \alpha_0 + \alpha_1 RER_t + \alpha_2 Y_t^* + \alpha_3 TRF_t^x + \alpha_4 D_t + \mu_t \tag{3.2}$$

where TRF_t^x is average export tariff rate and D_t is a liberalization dummy variable that takes the value 1 for the period in which significant liberalization took place and zero otherwise. The coefficient of TRF_t^x is expected to be negative $(\alpha_3 < 0)$ while the coefficient of D_t is expected to be positive $(\alpha_4 > 0)$.

Trade liberalization is also likely to affect both price and income elasticities of exports. For example, liberalization may increase the sensitivity of exports to price and income changes by allowing producers to move resources into the traded goods sector by generating structural change and creating allocative efficacy. These interaction effects are captured by introducing two interaction terms in the above equation. Now equation (3.2) can be written as

$$\frac{X_t}{Y_t} = \alpha_0 + \alpha_1 RER_t + \alpha_2 Y_t^* + \alpha_3 TRF_t^x + \alpha_4 D_t + \alpha_5 D_t RER_t + \alpha_6 D_t Y_t^* + \mu_t \tag{3.3}$$

The coefficients of both $D_t RER_t$ and $D_t Y_t^*$ are expected to be positive, i.e. $\alpha_5 > 0$ and $\alpha_6 > 0$. Basically, the coefficient of the shift dummy (D_t) should be considered as the 'pure' liberalization effect on export performance, independent of the effect of liberalization working through its impact on relative prices or world demand.

To check the robustness of the results the following augmented versions of export demand equations (3.2) and (3.3) will also be estimated.

$$\frac{X_t}{Y_t} = \alpha_0 + \alpha_1 RER_t + \alpha_2 Y_t^* + \alpha_3 TRF_t^x + \alpha_4 D_t + \alpha_5 TOT_t + \alpha_6 FEMD_t + \mu_t \tag{3.4}$$

$$\frac{X_t}{Y_t} = \alpha_0 + \alpha_1 RER_t + \alpha_2 Y_t^* + \alpha_3 TRF_t^x + \alpha_4 D_t + \alpha_5 D_t RER_t + \alpha_6 D_t Y_t^* + \alpha_7 TOT_t + \alpha_8 FEMD_t + \mu_t \quad (3.5)$$

where TOT_t denotes terms of trade and $FEMD_t$ represents foreign exchange market distortions (proxied by black market premium). As terms of trade increases exports will fall because export prices are increasing relatively more than import prices. Thus, TOT_t is expected to have a negative effect on exports. High foreign exchange market distortions will increase smuggling and will decrease exports. Thus, $FEMD_t$ is also expected to have a negative effect on exports.

3.2. The Import Function

Like the export demand function, a standard import demand function is considered. Following the same methodology as in export demand function, we have modeled the following import demand function.

$$\frac{M_t}{Y_t} = \beta_0 + \beta_1 RER_t + \beta_2 Y_t + \upsilon_t \quad (3.6)$$

where M_t is imports, RER_t is real exchange rate, Y_t is domestic output (GDP). The parameters $\beta_1 (< 0)$ and $\beta_2 (> 0)$ are price and income coefficients respectively. Finally, υ_t is white noise stochastic error term with usual properties, i.e. $\upsilon_t \overset{iid}{\sim} N(0, \sigma^2)$.

To check the effects of trade liberalization on import demand we will estimate the following equation:

$$\frac{M_t}{Y_t} = \beta_0 + \beta_1 RER_t + \beta_2 Y_t + \beta_3 TRF_t^m + \beta_4 D_t + \upsilon_t \quad (3.7)$$

where TRF_t^m is average import tariff rates and D_t is the liberalization dummy variable. The coefficient of TRF_t^m is presumed to be negative $(\beta_3 < 0)$ while the coefficient of D_t is expected to be positive $(\beta_4 > 0)$.

By introducing the interaction terms in the import equation we will get the following augmented version of equation (3.7):

$$\frac{M_t}{Y_t} = \beta_0 + \beta_1 RER_t + \beta_2 Y_t + \beta_3 TRF_t^m + \beta_4 D_t + \beta_5 D_t RER_t + \beta_6 D_t Y_t + \upsilon_t \quad (3.8)$$

As liberalization proceeds, the relative price coefficient of import demand increases since the ability to substitute domestic production for imports (import substitution) becomes easier (Melo and Vogt, 1984). Therefore, the coefficient of $D_t\ RER_t$ is assumed to be negative $(\beta_5 < 0)$. Further, as the degree of import liberalization enlarges, the coefficient on income demand also increases i.e. the removal of trade controls will tend to increase the income coefficient automatically (Melo and Vogt, 1984). Therefore, the coefficient of $D_t Y_t$ is assumed to be positive $(\beta_6 > 0)$. Basically, the coefficient of the shift dummy (D_t) should be considered as the 'pure' liberalization effect on imports, independent of the effect of liberalization working through its impact on relative price changes or growth performance. To check the robustness of the results the following augmented versions of import demand equations (3.7) and (3.8) will also be estimated.

$$\frac{M_t}{Y_t} = \beta_0 + \beta_1 RER_t + \beta_2 Y_t + \beta_3 TRF_t^m + \beta_4 D_t + \beta_5 TOT_t + \beta_6 FEMD_t + \upsilon_t \quad (3.9)$$

$$\frac{M_t}{Y_t} = \beta_0 + \beta_1 RER_t + \beta_2 Y_t + \beta_3 TRF_t^m + \beta_4 D_t + \beta_5 D_t RER_t + \beta_6 D_t Y_t + \beta_7 TOT_t + \beta_8 FEMD_t + \upsilon_t \quad (3.10)$$

where as before TOT_t is terms of trade and $FEMD_t$ is foreign exchange market distortions. As terms of trade increases imports will increase since export prices are increasing relatively more than import prices. Thus, TOT_t is expected to have a positive effect on imports. With the increase in foreign exchange market distortions, imports will fall. Thus, $FEMD_t$ is expected to have a negative effect on imports.

3.3. Construction of Trade Policy Openness Index

This section discusses theoretical concepts for the construction of a trade policy openness index. Total trade of a country is the sum of exports and imports. By normalizing total trade with respect to income, we obtain total trade as a ratio of income. By regressing total trade, as a ratio of income, on trade policy variables along with other determinants of trade we can obtain

weights of trade policy variables. By utilizing these (trade policy variables') weights we can construct a trade policy openness index, which is basically the weighted average of trade policy variables. In other words, a trade policy openness index will be constructed by insulating the variation in trade due to a variety of trade policy variables.

The concept can be greatly eased by if we use export and import ratio equations. If we take the sum of export ratio equation (3.5) and import ratio equation (3.10) we will obtain total trade ratio equation (3.11).

$$\frac{TR_t}{Y_t} = \theta_0 + \theta_1 RER_t + \theta_2 Y_t^* + \theta_3 Y_t + \theta_4 TRF_t^x + \theta_5 TRF_t^m + \theta_6 D_t + \theta_7 TOT_t + \theta_8 D_t RER_t + \theta_9 D_t Y_t^* + \theta_{10} D_t Y_t + \theta_{11} FEMD_t + \varepsilon_t \quad (3.11)$$

where $TR_t = (X_t + M_t)$ is total trade, $\theta_0 = (\alpha_0 + \beta_0)$, $\theta_1 = (\alpha_1 + \beta_1)$, $\theta_2 = \alpha_2$, $\theta_3 = \beta_2$, $\theta_4 = \alpha_3$, $\theta_5 = \beta_3$, $\theta_6 = (\alpha_4 + \beta_4)$, $\theta_7 = (\alpha_7 + \beta_7)$, $\theta_8 = (\alpha_5 + \beta_5)$, $\theta_9 = \alpha_6$, $\theta_{10} = \beta_6$, and $\theta_{11} = (\alpha_8 + \beta_8)$.

By estimating equation (3.11) we can obtain coefficient estimates of the variables. However, for our purpose, that is for the construction of trade policy openness index $(Openness_t)$ we will pick up only the parameter estimates of trade policy variables, that is, parameter estimates of export duties (TRF_t^x), import duties (TRF_t^m) and trade liberalization dummy (D_t) These estimated values are basically the weights assigned to each trade policy variable as follows:

$$Openness_t = \hat{\theta}_4 TRF_t^x + \hat{\theta}_5 TRF_t^m + \hat{\theta}_6 D_t \quad (3.12)$$

Each weight indicates the power of a variable with which it influences total trade. Thus, multiplying each trade policy variable by its weight, that is with its predicted coefficient for the entire sample period and adding up all these series will provide us with a trade policy openness index.[10] This index is equal to the portion of observed trade shares attributable to the effective impact of trade liberalization policies.

An important benefit of this method is that it circumvents both the harms of measurement errors due to the construction of a trade policy openness

[10] Also see, among others, Balassa (1985), Leamer (1988), Lee (1993) and Wacziarg (2001) for the construction of such types of trade policy openness indices.

index as the deviation of actual and potential trade shares (because it is not constructed as a residual) and the problem of collinearity between trade policy variables and other determinants of trade volumes. It also confines the possible effects of excluded variables in the equation that can determine trade volumes, insofar as these excluded variables may be assumed to bear a weak connection with the policy variables which are incorporated in the regression equations.

4. DATA AND ESTIMATION OF THE MODEL

4.1. Data

Quarterly time-series data are collected for Pakistan for the period 1981/82 to 2007/08. Export (import) duty is measured as the ratio of export (import) duty revenues to the value of exports (imports). Following Sachs and Warner (1995) and Wacziarg and Welch (2003), liberalization is proxied by a dummy variable that takes the value 1 for the period of liberalization and thereafter (in our case it is 2001 and thereafter) and 0 otherwise.[11] The Unites States is taken as a foreign country. Foreign exchange market distortion is proxied by black market premium, which is the difference of the black market and official exchange rate expressed as a percentage of the latter. All other variables are defined as previously. The data are taken from International Financial Statistics, Government Finance Statistics, Pakistan Economic Survey and the State Bank of Pakistan.

4.2. The Export Function

The export model is estimated using the Generalized Method of Moments (GMM) estimation technique, which controls for the potential endogeneity of the explanatory variables. The instruments used are lagged values of the explanatory variables. Table 1 provides the results of export demand model. Columns (1) and (2) of the table give the results of equations (3.2) and (3.3), while columns (3) and (4) give the results of the equations (3.4) and (3.5), which are basically the augmented versions of the equations (3.2) and (3.3) in which two additional explanatory variables, terms of trade (TOT_t) and foreign exchange market distortions $(FEMD_t)$ have been introduced. Export

[11] Dummy variable, in fact, refers to all measures other than tariff reductions, which includes non-tariff barriers, exchange rate distortions, etc.

demand responds significantly both to price and income levels. Low price coefficients, which do not confirm the 'small' country assumption of trade theory, are often found in time series estimates (Senhadji and Montenegro, 1999; Perraton, 2003). The magnitude of the coefficient implies that export competitiveness does not rely merely on price indicators. Also, there is a small difference between the short run (RER_t) and the long run price $(RER_{t\ LR})$ coefficients with the latter being somewhat greater than the former. The same holds for short run (Y_t^*) and long run income $(Y_{t\ LR}^*)$ coefficients. [12]

If we take the estimates of column (2) for instance, the export duty coefficient is statistically significant, however, the estimated coefficient of -0.0003 shows that the negative effect of duties on export is minimal. This can be attributed to the observation that most of the export tariff reforms have already occurred during the period under consideration. Therefore, any further reduction in export duty rate will have minimum effects on exports. The liberalization coefficient shows that there is a significant export response to trade reforms. The direct impact of liberalization on export growth is 9.9 percent, which confirms the noteworthy influence that trade reforms have on the export performance of Pakistan. The interaction term $D_t RER_t$ appears with negative coefficient (-0.0026), which means that depreciation of domestic currency deteriorates Pakistan's export demand as its economy becomes more liberalized.

The coefficient of the interaction between trade liberalization and income is positive and statistically different from zero (0.0008). This implies that trade liberalization process has increased the world income coefficient. This indicates that an increase in world income increases Pakistan's exports as its economy becomes more liberalized. Terms of trade significantly and negatively affects exports demand. However, foreign exchange market distortions significantly positively affects export demand in one equation. Further, exports are positively affected by previous period exports.

[12] In Table 1 short-run price coefficient is the value of coefficient of the variable RER_t, which is 0.0014, while the value of long-run price coefficient $(RER_{t\ LR})$, which is 0.0026, is calculated as the ratio of short-run price coefficient (0.0014) to 1 minus the value of coefficient of lagged dependent variable $(X/Y)_{t-1}$, which is 0.4577. In other words, long-run price coefficient is calculated as $RER_{t\ LR} = 0.0014/(1-0.4577) = 0.0026$. The same holds for short-run and long-run income coefficients.

Table 1
Empirical Findings of Export to Income Ratio Model (1981/82Q1-2007/08Q4)

	Dependent variable X_t/Y_t			
	Original Specifications		**Augmented Equations**	
	(1)	(2)	(3)	(4)
Constant	-0.0011	-0.0439	0.0382	-0.0732
	(-0.1524)	(-3.5248)*	(2.6209)*	(-8.4492)*
RER_t	0.0014	0.0034	0.0014	0.0046
	(4.8457)*	(7.7773)*	(3.3606)*	(19.7007)*
Y_t^*	0.0045	0.0008	0.0048	0.0014
	(2.3520)*	(4.0150)*	(2.2203)*	(11.3572)*
TRF_t^x	-0.0003	-0.0003	-0.0003	-0.0003
	(-2.7186)*	(-2.2468)*	(-2.0858)*	(-1.8122)**
D_t	0.0047	0.0991	0.0140	0.1374
	(2.4085)*	(2.5620)*	(2.7547)*	(8.1457)*
$D_t\ RER_t$		-0.0026		-0.0035
		(-4.4465)*		(-13.6959)*
$D_t\ Y_t^*$		0.0008		0.0011
		(2.3361)*		(5.0693)*
TOT_t			-0.0256	-0.0031
			(-3.6047)*	(-0.7112)
$FEMD_t$			-0.2437	0.5185
			(-1.1557)	(5.6358)*
$(X/Y)_{t-1}$	0.4577	0.3029	0.3973	0.2619
	(9.6943)*	(9.1856)*	(8.5482)*	(8.7964)*
$RER_{t\ LR}$	0.0026	0.0049	0.0023	0.0062
$Y_{t\ LR}^*$	0.0083	0.0011	0.0080	0.0019
R^2	0.6733	0.7052	0.6938	0.6445
Adjusted R^2	0.6558	0.6831	0.6708	0.6089
Durbin *h* Test	-0.7461	0.3531	-0.4279	0.3174
No. of Obs.	99	101	101	100

Notes: Values in parentheses denote underlying Student t-values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and ** respectively.

Source: author's own

4.3. The Import Function

The results of the import model are reported in Table 2. Columns (1) and (2) of the table give the results of equations (3.7) and (3.8), while columns (3) and (4) gives the results of the equations (3.9) and (3.10), which are the augmented versions of the equations (3.7) and (3.8), in which two additional explanatory variables, terms of trade (TOT_t) and foreign exchange market distortions $(FEMD_t)$ have been introduced.

It is evident from the table that the price and income variables are both statistically different from zero and have the theoretically expected signs. The coefficient of lagged import shows that, like exports, the long-run price and income coefficients are somewhat greater than the corresponding short-run coefficients. The value of price coefficients is low which is consistent with other studies in this field (Senhadji, 1998; Perraton, 2003). If we take the estimates of column (2) for instance, it indicates that import duties have a significant negative effect on import demand (-0.0007) and the implementation of liberalization itself is estimated to have raised imports by 12 percentage points. The low value of the import duty coefficient verifies our previous argument that Pakistan has already liberalized its economy to a considerable level by reducing import tariffs and eliminating NTBs. The positive effect of liberalization on import demand indicates that trade openness has increased imports into Pakistan.

The table also shows the interaction effects involving trade liberalization, income and price variables. The results show an increase both in income and price effects following import liberalization. Terms of trade significantly and negatively affect imports while foreign exchange market distortions significantly and positively affect imports. Imports are also positively affected by previous period imports.

Table 2

Empirical Findings of Import to Income Ratio Model (1981/82Q1 – 2007/08Q4)

	Dependent variable M_t/Y_t			
	Original Specifications		**Augmented Equations**	
	(1)	(2)	(3)	(4)
Constant	0.1107	0.1042	0.1802	0.1313
	(9.7591)*	(13.5785)*	(8.3572)*	(12.8949)*
RER_t	-0.0015	-0.0006	-0.0013	-0.0004
	(-4.4442)*	(-1.6462)**	(-3.2766)*	(-2.1158)*
Y_t	0.0001	0.0043	0.0047	0.0035
	(4.3156)*	(2.4373)*	(2.8801)*	(3.2494)*
TRF_t^m	-0.0005	-0.0007	-0.0004	-0.0004
	(-5.2836)*	(-7.8516)*	(-2.1072)*	(-5.2576)*
D_t	0.0109	0.1207	0.0029	0.1192
	(2.5675)*	(1.9271)**	(2.6294)*	(2.9421)*
$D_t\ RER_t$		-0.0033		-0.0028
		(-4.2512)*		(-5.2922)*
$D_t\ y_t$		0.0001		0.0001
		(2.1606)*		(2.4443)*
TOT_t			-0.0507	-0.0269
			(-3.5923)*	(-4.4543)*
$FEMD_t$			0.1656	0.4661
			(0.4964)	(4.8391)*
$(M/Y)_{t-1}$	0.4568	0.4747	0.4054	0.4456
	(7.1359)*	(13.3486)*	(7.0319)*	(15.0999)*
$RER_{t\ LR}$	-0.0028	-0.0011	-0.0022	-0.0007
$Y_{t\ LR}$	0.0002	0.0082	0.0079	0.0063
R^2	0.6813	0.7134	0.6989	0.7035
Adjusted R^2	0.6645	0.6916	0.6762	0.6738
Durbin *h* Test	-0.4752	0.3103	-0.0826	0.2742
No. of Obs.	101	100	101	100

Notes: Values in parentheses denote underlying student-*t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and ** respectively.

Source: author's own

4.4. Construction of a Trade Policy Openness Index

Section 3.3 provides the theoretical basis of constructing a trade policy openness index. We now carry out the actual computation of the index. Table 3 displays the results of total trade to income ratio model as given by equation (3.11) that will be used to construct the weights on the three components of the trade policy openness index; namely export duties, import duties and (Sachs-Warner) liberalization status indicator as given by equation (3.12). The table reveals that a decrease in relative prices and an increase in domestic and world income will increase total trade to GDP ratio. An increase in export and import duties will decrease total trade to GDP ratio. A liberalization of the regime has increased trade intensity in Pakistan. Liberalization negatively affects price elasticities while it positively affects both world and domestic income elasticities. Terms of trade significantly and negatively affects total trade, while foreign exchange market distortions have a significant positive effect on total trade. Both the one-period lagged export and import to income ratios have significant positive effects on total trade to GDP ratio.

Table 3

Empirical Findings of Total Trade to Income Ratio Model (1981/82Q1 – 2007/08Q4)

	Dependent variable $X_t + M_t / Y_t$			
	Original Specifications		**Augmented Equations**	
	(1)	(2)	(3)	(4)
Constant	0.1096	0.0603	0.2184	0.0581
	(9.7216)*	(4.3909)*	(7.6551)*	(3.8054)*
RER_t	-0.0001	0.0028	0.0001	0.0042
	(-1.6761)**	(4.7903)*	(0.2504)	(11.2608)*
Y_t^*	0.0045	0.0008	0.0048	0.0014
	(2.3520)*	(4.0150)*	(2.2203)*	(11.3572)*
Y_t	0.0001	0.0043	0.0047	0.0035
	(4.3156)*	(2.4373)*	(2.8801)*	(3.2494)*
TRF_t^x	-0.0003	-0.0003	-0.0003	-0.0003
	(-2.7186)*	(-2.2468)*	(-2.0858)*	(-1.8122)**
TRF_t^m	-0.0005	-0.0007	-0.0004	-0.0004
	(-5.2836)*	(-7.8516)*	(-2.1072)*	(-5.2576)*
D_t	0.0156	0.2198	0.0169	0.2566
	(2.4000)*	(2.3222)*	(2.0653)*	(6.1215)*

$D_t\ RER_t$		-0.0059 (-4.7673)*		-0.0063 (-9.8189)*
$D_t\ y_t^*$		0.0008 (2.3361)*		0.0011 (5.0693)*
$D_t\ y_t$		0.0001 (2.1606)*		0.0001 (2.4443)*
TOT_t			-0.0763 (-4.0484)*	-0.0300 (-3.7216)*
$FEMD_t$			-0.0781 (-0.1908)	0.9846 (5.6080)*
$(X/Y)_{t-1}$	0.4577 (9.6943)*	0.3029 (9.1856)*	0.3973 (8.5482)*	0.2619 (8.7964)*
$(M/Y)_{t-1}$	0.4568 (7.1359)*	0.4747 (13.3486)*	0.4054 (7.0319)*	0.4456 (15.0999)*
R^2	0.6874	0.7000	0.6937	0.6726
Adjusted R^2	0.6492	0.6477	0.6402	0.5968
DW	2.0975	1.9223	2.0295	1.9537
No. of Obs.	102	102	102	102

Notes: Values in parentheses denote underlying Student t-values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and ** respectively.

Source: author's own

As both export and import duties receive negative weights, while the liberalization variable receives a positive weight. Since specification in column (4) includes a large number of explanatory variables which limits the problem of omitted variable bias, we have taken the values of weights from this specification. Minor variations in these weights as explained by other specifications are not likely to affect the final results. For each period, the trade policy openness index $(Openness_t)$ is computed as

$$Openness_t = -0.0003\ TRF_t^x - 0.0004\ TRF_t^m + 0.2566\ D_t \qquad (3.12)$$

The correlation coefficients between the resulting trade policy openness index and its various components are displayed in Table 4. The table shows that liberalization status receives the greatest weight in the index followed by import duties and export duties. The signs of correlations are as expected. Trade policy openness index is negatively correlated with both export and import duties and is positively correlated with liberalization status. Export and import duties are positively correlated with each other, while liberalization status is negatively correlated with both export and import duties.

Table 4

Correlations between the Components of Trade Policy Openness Index and the Index Itself (1981/82Q1 – 2007/08Q4)

	Index	**Export Duties**	**Import Duties**	**Liberalization**
Index	1			
Export Duties	-0.2613	1		
Import Duties	-0.7411	0.5077	1	
Liberalization	0.9996	-0.2443	-0.7218	1

Source: author's own

5. CONCLUSION

The paper empirically examines the effects of trade liberalization on exports and imports in Pakistan and constructs a trade policy openness index using quarterly data for the period 1981/82 to 2007/08. For this purpose export and import demand equations are estimated. The findings of the estimates show that trade liberalization has stimulated both exports and imports in Pakistan. Parameter estimates of relative price changes, domestic and foreign income, terms of trade and foreign exchange market distortions fall within the boundaries found in the previous empirical literature. These variables are found to affect exports and imports in the theoretically expected directions in most of the estimations and, in general, are statistically significant. From these export and import demand equations a total trade equation is estimated. Using the estimates of this equation the paper has constructed a trade policy openness index based on a weighted average of three indicators; export duties, import duties, and (Sachs-Warner) liberalization status indicator. The weights show that liberalization status receives the greatest weight in the index followed by the import duties and export duties. The calculated index seems to be theoretically sound as it is based on trade theory and is easy to calculate with available data for a wide variety of countries over long periods of time. It also has the ability to establish the stylized facts about the most open and closed economies, and to track over time the policy reforms that have been made in many less developed countries in recent decades.

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