Trade Liberalisation and Export Demand Function: The Case of South Asia

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ABSTRACT. *A large number of studies have estimated export price and income elasticities for many different countries utilising various econometrics techniques. This paper seeks to add to this literature by estimating export demand elasticities of selected South Asian countries, India, Bangladesh, Pakistan, Sri Lanka, and Nepal by using cointegration and error correction methods. The study attempts to find if the sample countries share the same features in their export demand function after their trade reforms. The income elasticity varies considerably among the sample countries ranging from 0.17 to 4.23 in the long run and from 0.79 to 3.61 in the short run. Price elasticity estimates for all sample countries are inelastic, varying from 0.17 to 0.5 in the long run and from 0.13 to 0.78 in the short run.*

INTRODUCTION

Numerous studies have attempted to estimate export demand elasticities across a wide range of developed and developing countries (Johnson, 1958, Santos-Paulino and Thirlwall, 2004). Houthakker and Magee (1969) showed that for a small country export demand is a function of the world price, the price of export products and the income levels of countries where exports are sent. A better understanding of export price and income elasticities is important because they directly impact on trade policies and strategies. For example, if a country enjoys an elastic export income elasticity it can expect considerable growth in export earnings and export volumes whenever there is an economic boom in its major purchasing countries. On a similar note, we can expect increase in export earnings in response to currency devaluation if the country has an elastic export price.

This study endeavours to empirically estimate and analyse the aggregate export price and export income elasticities for some selected South Asian countries, namely; Bangladesh, India, Pakistan, Nepal and Sri Lanka considering trade liberalisation reforms of each country using Engle and Granger Cointegration and an Error Correction methods. Although Nguyen and Bhuyan (1977), as well as Ahmed *et al.* (1993) estimated export and import demand elasticities for some South Asian countries, none of the investigated countries have initiated trade liberalisation reforms at the time of study. Among other notable studies, Choudhury (2001) conducted a single country analysis and estimated the export demand function of

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Bangladesh while Nur *et al.* (2007) examined the likely impacts of trade liberalization policies on the disaggregated export function in Bangladesh for the period 1973 to 2004.

METHODOLOGY

Model specification

This study estimates income and price elasticities associated with the export demand function for five South Asian countries which have undergone considerable changes in their trade policies in the recent past. Due to its flexibility in accommodating many economic situations, and following the existing literature (Pacheco-Lopez 2005; Sahinbeyoglu and Ulasan 1999; Santos-Paulino and Thirlwall 2004), The standard export demand function is used to obtain the export price and income elasticities. The export demand is modelled following the standard export demand function which is written as:

$$r\exp = t\left(\frac{p_f\ er}{p_d}\right)^{\alpha_1} rgdp^{\alpha_2} \qquad (1)$$

where, *rexp* is the real exports of a country; *t* represents a constant time trend; P_f is the foreign price, *er* is the nominal exchange rate measured as the domestic price of foreign currency; P_d is the domestic price which are used to derive real exchange rate *(rer); rgdp* is the real foreign income and α_1 and α_2 are coefficients to be estimated. The standard export demand function is augmented by incorporating a dummy (*lib)* to capture the effect of trade liberalisation policies of the sample countries. The dummy variable takes a zero value prior to the effective liberalisation year and a value of one in the post liberalisation period.

The extended export demand function with the double log transformation is expressed as:

$$\ln r\exp_t = \beta_0 + \beta_1 \ln rer_t + \beta_2 \ln rgdp_t + \beta_3 lib + e_t \qquad (2)$$

Variables are self explanatory with log values. The United States (US) Consumer Price Index and Gross Domestic Product are taken to derive foreign price level and foreign income in the respective countries' export demand equations. The coefficients to be estimated are β_0, β_1, β_2, β_3 and e_t is the disturbance/noise term. Due to this double log transformation, the coefficients are the elasticities. For a normal good, price and income elasticity (β_1 and β_2) are expected to be positively related to exports. A positive sign is expected for β_3, considering trade liberalisation may promote economic growth through increasing export demand of countries.

Data

Data for this research were mainly obtained from the International Financial Statistics (IFS) data base of the International Monetary Fund (IMF). The effective year of trade liberalisation was obtained from each country's external trade reports of the World Trade Organization. The income level of the USA i.e GDP and the price level i.e CPI were taken

as proxies for the rest of the world income and price respectively, considering the contribution of export share by each sample country to the USA[3].

The time period of analysis depends on the data availability for each country. Accordingly, the annual data periods for each country for the periods are specified in the parenthesis: Bangladesh (1972-2005); India (1950-2005); Nepal (1964-2005); Pakistan (1970-2005) and Sri Lanka (1950-2005).

Unit root testing

Since the study uses time series data, it is important to identify whether the series is stationary before using them in the estimation process. Stationary process necessitates having a constant mean, variance and auto-covariance. The Augmented Dickey Fuller (ADF) unit root test is used to examine stationarity of the variables. The null hypothesis of the ADF test is that the series contains a unit root. Since the true data generating process of these variables was not known, ADF tests were conducted on the three model specifications; as a pure random walk (ADF1), a random walk with drift (ADF2) and a random walk with drift and a trend (ADF3). The Schwartz Bayesian Criteria is used to determine the optimal lag length. ADF test results suggest that all of the variables contain a unit root in either one of the model specifications in levels and is non-stationary, but are stationary in first differences (Table 1).

Table 1. Augmented Dickey Fuller unit root test

Country	ln*rexp*			ln*rgdp*			ln*rer*		
level	ADF1	ADF2	ADF3	ADF1	ADF2	ADF3	ADF1	ADF2	ADF3
Sri	-1.06	-0.87	-2.80	11.03*	1.25	-2.23	1.66	-1.03	-1.03
Ban	0.15	-1.04	-2.94	8.37*	-0.04	4.96*	0.57	-1.26	-2.15
Ind	1.41	-0.11	-1.66	10.86*	-1.54	-4.29*	1.20	-0.79	-2.86
Nep	-0.56	-3.68*	-3.91**	10.04*	-1.00	-4.99*	1.44	-1.11	-3.21
Pak	0.29	-2.91	3.80**	10.73*	-0.92	-2.52	0.96	-0.79	-3.62**
Country	Δ ln*rexp*			Δ ln*rgdp*			Δ ln*rer*		
1st dif	ADF1	ADF2	ADF3	ADF1	ADF2	ADF3	ADF1	ADF2	ADF3
Sri	-7.49*	-7.63*	-7.55*	-3.27*	-7.20*	-7.17*	-6.23*	-6.51*	-6.51*
Ban	-4.52*	-4.46*	-4.77*	2.35**	-4.86*	-4.82*	-6.32*	-6.47*	-6.36*
Ind	-5.12*	-5.27*	-5.46*	2.16**	-4.85*	-4.98*	-8.22*	-8.56*	-8.46*
Nep	-7.12*	-7.04*	-7.12*	-2.48**	-5.23*	-5.15*	-7.21*	-7.74*	-7.72*
Pak	-5.63*	-5.59*	-5.53*	-2.54**	-5.91*	-5.95*	-8.07*	-8.26*	-8.18*

*, ** denotes statistical significance at the 1 and 5% levels, respectively. The critical values for 50 observations as reported in Engle and Yoo (1987) at 1, 5 and 10% levels of significance : ADF1(τ statistics) -2.62, -1.95, and -1.61 : ADF2 (τ_μ statistics) -3.58, -2.93 and -2.60: ADF3(τ_t statistics) -4.15, -3.50 and -3.18.

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[3]   In year 2000 the proportion of export shares sent to USA from Bangladesh, India, Nepal, Pakistan and Sri Lanka were 31.8, 32.6, 25.2, 40.1 and 44.2% respectively. (Direction of Trade Statistics, IMF data, various issues).

Engle-Granger (EG) methodology

Engle and Granger (1987) suggested that a linear combination of nonstationary variables may produce a stationary series. In order to empirically estimate the cointegration relationship, the Engle and Granger (EG) method suggests a two step procedure. Firstly, if the variables are nonstationary and are integrated in the same order, then the best linear equation is estimated using standard regression techniques. Secondly, the residuals from the best linear equation are tested for the unit root. If the residuals do not contain a unit root, it can be determined that the variables are cointegrated and share a long run equilibrium relationship.

As discussed before, the first step of EG method is to estimate the best possible linear equation for the standard export demand function. However, our initial diagnostic tests suggest that the same specification would not be appropriate for estimating export elasticities for the selected countries. Therefore, the test was carried out incorporating a trend (*t*) and Auto Regressive (*ar*) variable into the model. This resulted in three alternative model specifications (Model 1, Model 2, and Model 3) for the export demand function. Finally, based on the expectation of the sign of the coefficients, Model 1 for India and Pakistan, Model 2 for Bangladesh and Sri Lanka, and Model 3 for Nepal were selected in estimating export demand functions of these countries.

Model 1: $\ln rexp_t = \beta_o + \beta_1 \ln rer_t + \beta_2 \ln rgdp_t + \beta_4 lib + e_t$ (3)

Model 2: $\ln rexp_t = \beta_o + \beta_1 \ln rer_t + \beta_2 \ln rgdp_t + \beta_4 lib + \alpha_2 t + e_t$ (4)

Model 3: $\ln rexp_t = \beta_o + \beta_1 \ln rer_t + \beta_2 \ln rgdp_t + \beta_4 lib + \alpha_1 ar + \alpha_2 t + e_t$ (5)

Error correction model (ECM)

Cointegration is only related to the long run relationship of the variables. In order to examine the short run relationship we estimate an ECM. The EG cointegration methodology provides an easier way to obtain the error correction model. Once the cointegration relationship of the variables is confirmed, the saved residuals $\{e_{t-1}\}$ are used to estimate the ECM as shown in equation (6).

$$\Delta \ln rexp_t = \alpha_1 + \beta_1 \Delta \ln rer_t + \beta_2 \Delta \ln rgdp_t + \gamma e_{t-1} + \varepsilon_t \qquad (6)$$

All of the variables, except the error correction term, are differenced once to make them stationary. The coefficient of the error correction term (γ) in this model is referred to as the speed of adjustment parameter.

RESULTS AND DISCUSSION

The aim of this study is to estimate short run and long run export elasticities for some selected South Asian countries. Engle and Granger cointegration method indicates that long-run equilibrium relationship in fact exists for all five countries. The cointegration results and ADF unit root test on residuals obtained for each country are summarised in Table 2. ADF unit root test on residuals (e_t) show that cointegration relationships do exist for all five

countries. Table 3 summarises error correction coefficients. As the results indicate, the error correction term is statistically significant for all of the countries except India.

As far as long run equilibrium results are concerned, export demand equation of Sri Lanka explains 77 percent of variation by the variables and both price and income elasticities carry expected signs, but are statistically insignificant at 5 percent level of significance. A low price elasticity of export demand which is 0.19 suggests that Sri Lanka is basically exporting inelastic goods. Hence, price cutting policies such as devaluation may not be appropriate for increasing export earnings. The income elasticity of demand is only 0.36 which suggests that exports prospects from high income growth countries are gloomy. It is generally expected that trade reforms would have a significant impact on the export demand of Sri Lanka as reforms were initiated well ahead of the other South Asian countries in the region although trade liberalisation coefficient is negative but statistically insignificant. This might be due to its inability to attract considerable amounts of foreign investment inflows, its frequent internal political instability and its long running internal conflicts with a separatist movement hampering the country's ability to reap the real benefits of the trade liberalisation policies. However, error correction model results show relatively high short run income and price elasticities which suggest that export opportunities exist in the short run and any deviation from the long run equilibrium is partially adjusted with the adjustment speed of 0.29.

Table 2. Results of the cointegrated relationship

Country	Constant	ln*rer*	ln*rgdp*	*lib*	R^2	ADF on resid (e_t)
Sri Lanka	0.5 (0.09)	0.19 (1.50)	0.36 (0.63)	-0.01 (0.07)	0.77	-2.96+
Bangladesh	-37.7 (2.14)	0.04 (0.15)	3.86 (2.37)*	0.58 (4.41)*	0.66	-2.99+
India	3.4 (4.13)	0.17 (0.68)	0.17 (1.57)	0.06 (0.37)	0.43	-2.12++
Nepal	-43.5 (2.45)	0.50 (1.46)	4.23 (2.49)*	0.18 (0.99)	0.42	-6.73+
Pakistan	1.7 (1.57)	0.29 (2.06)*	0.10 (1.36)	-0.32 (3.86)*	0.51	-4.40+

* 5%, ** 10%, significance in OLS estimates, *t* statistics are given in parenthesis
+, ++ and statistical significance at the 1 and 5% according to the Dickey Fuller critical values. The critical values for τ statistics as reported in Engle and Yoo (1987) for 50 observations are -2.62, -1.95, and -1.61 at 1, 5 and 10% levels of significance respectively.

Table 3. Results of error correction model

Country	Constant	Δln*rer*	Δln*rgdp*	e_{t-1}
Sri Lanka	-0.06 (-2.53)	0.31 (2.47)*	1.08 (1.88)**	-0.29 (-3.14)*
Bangladesh	-0.11 (-2.65)	0.15 (0.87)	3.59 (3.18)*	-0.29 (-2.19)*
India	-0.01 (-0.40)	0.18 (1.00)	0.79 (1.05)	-0.12 (-1.29)
Nepal	-0.14 (-2.67)	0.78 (2.69)*	3.61 (2.50)*	-0.52 (-3.08)*
Pakistan	-0.03 (-0.73)	0.13 (0.91)	0.94 (0.99)	-0.34 (-2.75)*

* 5%, ** 10%, level of significance

In Bangladesh, the income elasticity of the export demand has been found to be highly income elastic. To illustrate, our results suggest that a 1 percent increase in the foreign income level would increase Bangladesh export demand by 3.86 percent although the statistically insignificant smaller price elasticity implies that depreciation of the currency in Bangladesh may not lead to higher export earnings. Therefore, frequent devaluation is not

advisable for Bangladesh to try and enhance its export earnings. However, trade liberalisation has been found to be very effective which suggests that trade liberalisation policies have been able to raise demand for exports by 0.58 percent on average. The coefficient of the error correction term implies that 29 percent of the discrepancy between the actual and the equilibrium value of the export demand is corrected within a year. The short term income elasticity of 3.59 is slightly less than long term income elasticity of demand, implying the short run effects of world income on Bangladesh exports are less than the long run effects.

The foreign income elasticity of Nepal export demand is highly income elastic. As foreign income increases by 1 percent, the demand for Nepal exports increases by 4.23 percent. This is mainly due to the nature of the export basket of Nepal. More than one third of its export basket consists of 'rising star' goods such as, ready-made garments, textiles and jewellery which have a high demand, mostly from rich countries such as USA and Germany. Following market oriented economic reforms during the 1990s, Nepal substantially increased its integration into the world economy. However, the trade liberalisation dummy is statistically insignificant. Out of the many reasons, trade restrictions imposed by some developed countries and frequent internal conflicts might have exerted some impacts on effective trade liberalisation policies. Therefore, it seems that the trade liberalisation dummy variable is unable to explain the true impact of trade liberalisation on export demand in Nepal. Short run estimates suggest that devaluations are relatively effective as 1 percent change in price level would increase export demand by 78 percent. The relatively high rate of adjustment parameter indicates that how well consumers and producers respond to market signals which is at an annual rate of 52 percent.

Pakistan exports are price inelastic. A one per cent increase in the price will increase export demand by 0.28 percent. The relatively low price elasticity means that Pakistan does not gain much in export demand through price changes. Therefore, devaluation alone cannot boost export demand in Pakistan. The coefficient of trade liberalisation is surprisingly negative and statistically significant. This implies liberalisation has reduced Pakistan export demand by 0.32 percent on average. This unexpected result can be explained in two ways. Firstly, the current data set is not sufficient to capture the full impact of trade reforms on export growth. Secondly, even though Pakistan declared trade reforms in 1998, the existence of trade barriers remain high. Tariffs and other protective instruments still provide substantial protection to domestic industries creating strong disincentives for exports, causing significant anti export bias.

None of the coefficients are statistically significant for India. Therefore, care should be taken in interpreting these elasticities and using them in trade policies. The standard export demand function may not be the best specification to model the Indian export sector. Our doubt over the suitability of the model is further confirmed by the error correction model results. We found that the speed of adjustment parameter is insignificant at conventional levels, contradicting the cointegration results. India began its trade liberalisation policies in the mid 1990s. Therefore, the current data set may not be large enough to capture the long run properties and short run dynamics of the export demand function.

CONCLUSIONS

This study estimated both short run and long run income and price elasticities of the export demand functions for five selected South Asian countries. A number of conclusions can be drawn from this research. First, the long run income elasticities have the expected sign, and in most cases are statistically significant. According to our estimations, the income elasticities vary from 0.17 to 4.23 in the long run and from 0.79 to 3.61 in the short run. The relatively high variability of income elasticities between these five countries suggests the need for a number of different and comprehensive policies to promote exports of these countries. This may be attributed to the nature of the commodities exported by those countries for a long time. Imperfect income variable proxy could be another reason for this variation. The USA income is used as a proxy for foreign income, so that these values directly related to income changes of the USA.

Second, we find that the absolute values of price elasticities are inelastic and vary from 0.17 to 0.5 in the long run and 0.13 to 0.78 in the short run. These inelastic estimates suggest that frequent devaluations are not proven to be an appropriate policy in promoting exports in these countries. This is mainly due to the nature of the export commodities. A large part of export basket of the sample countries still consists of primary and agricultural commodities, which are relatively price inelastic. Diversification of exports into relatively more manufactured goods is recommended for improving the competitiveness of exports.

Third, our results show that the short run income elasticity estimates are slightly higher than their respective long run income elasticity counterparts. This is counterintuitive because economic agents are more flexible to the changes in income in the long run than in the short run. Further research is necessary to explain this. Nevertheless, implementing export quality assurance schemes and export promotion fares etc. would assist these countries to attract consistent response for their major exported products.

Finally, we have found mixed results regarding the trade liberalisation impacts on export sector performance in the selected countries. Trade liberalisation produces positive impacts only in the cases of Bangladesh, India and Nepal. We attribute these unconvincing results to the smaller sample size, existing trade barriers, and internal conflicts.

ACKNOWLEDGEMENT

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