

# RIS DISCUSSION PAPERS

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A Simultaneous Error-Correction Approach**

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RIS-DP # 37/2002



**Research and Information System  
for the Non-Aligned and  
Other Developing Countries**

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**RESEARCH AND INFORMATION SYSTEM FOR THE  
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**The Determinants of India's Exports**  
***A Simultaneous Error-Correction Approach***

Saikat Sinha Roy\*\*

*Abstract:* This paper attempts an analysis of changing India's export behaviour during 1960/61 to 1999/2000. Broadly, there are two sharply divided views on the India's export behaviour. While the predominant view stresses the importance of supply and policy related constraints, other studies find the significance of world demand in the determination of exports. Most econometric studies find relative price factor, real effective exchange rate in particular, to be significant. The emergence of various export sectors over the period of time does not lend support to the observation that only relative prices play an important role, but highlights the importance of various demand and supply factors at the sectoral level. Individual demand and supply factors can be found to be important for specific short periods, but their confluence very likely determine a long run behaviour. The demand-supply model of export determination, which is based on Goldstein and Khan (1978), is estimated using error-correction method. The study establishes the importance of demand factors such as world demand and real effective exchange rates in the determination of India's exports as against the relatively weak relevance of supply side determinants. The findings are a definite improvement over the existing studies on India's exports.

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## **The Determinants of India's Exports**

### *A Simultaneous Error-Correction Approach*

#### **1. Introduction**

This paper attempts an analysis of changing behaviour of India's exports during 1960/61 to 1999/2000: whether it is demand or supply factors that determine the observed pattern of export growth. India's exports witnessed a change in the growth path since the mid-eighties. Such a changing export growth path, being coincidental with India's trade liberalisation efforts<sup>1</sup>, is often attributed to price responsiveness of exports, improvements in incentive structure towards trade or plausibly due to increasing capability to export with industrialisation and changes in development strategy<sup>2</sup>. In explaining export growth, on the other hand, demand factors are no less important in explaining export behaviour. However, the issue is more important than empirical estimation of determinants of exports. Rather, it is theoretically rooted as most industrialising economies are able to liberalise their respective trade regimes, expand and diversify their exports almost at the same time without facing deteriorating terms of trade or subject to fallacy of composition. The paper, thus, investigates the role of relative prices in determining trade flows. In addition, the role of other demand and supply factors would be taken into account while an econometric model in a demand-supply framework is estimated.

Sharply divided views predominate the literature explaining India's export behaviour: first, it is with respect to price responsiveness of exports and second, the relative importance of demand or supply factors in determining behaviour of exports. While price responsiveness of exports lends support to "small" country assumption prevalent in theoretical trade models, effectiveness of demand or supply factors tends to prove that it is not only relative price that determine industrialising country exports<sup>3</sup>. Though some studies, as those by Bhagwati and Srinivasan (1975), Wadhwa (1988) and Srinivasan (1998), provide evidence on India's exports being price responsive. Most recent

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<sup>1</sup> Trade liberalisation in India, though often identified with structural adjustment programme, was in place since the mid-1980s. The structural adjustment programme only carried the trade reforms process forward. In that sense, the agenda of trade reforms was sequential.

<sup>2</sup> See Sinha Roy (2001 b) for a brief review of this set of studies.

<sup>3</sup> In this context, it would be interesting to highlight the debate on industrialising country exports between Athukorala and Riedel on one hand and Muscatelli and associates on the other.

econometric studies, as those by Virmani (1991), Joshi and Little (1994) and Krishnamurthy and Pandit (1995), also point to significant price responsiveness of exports. Lucas (1988), however, finds varying price responsiveness across commodities and thus, questions the validity of small country assumption across export categories. The relative price responsiveness of exports, as discussed in the literature, depends on the development strategy followed: while import substitution leads to biases against exports as a result of distortions in relative prices, liberalisation - through competition and access to cheaper inputs - aim at “right” relative prices for exports. However, Nayyar (1988), Ghosh (1990), Sarkar (1994), and Sinha Roy (2001b) argue that Indian exports are not necessarily price responsive as turning points in India’s export performance were not often led by the movements in exchange rate. Further, the emergence of various export sectors over time does not lend support to the observation that only relative prices play an important role, but highlights the importance of various demand and supply factors determining export performance.

Apart from price responsiveness, the predominant view also stresses the importance of supply and other policy related constraints. For instance, Panchamukhi (1978) shows that domestic policies have significant effect on trade behaviour of developing countries. The studies by Bhagwati and Srinivasan (1975) and Wolf (1978) highlight that an inward looking policy, with capacity constraints, lack of competition, and high domestic demand, do not signal enough incentives to export. Even export promotion policies are found to be insufficient for the purpose<sup>4</sup>. In contrast, other studies find the significance of world demand in the determination of exports. Nayyar (1976, 1988), for instance, argue that it is incorrect to suggest that the policy regime is the mainstay in explaining overall export performance, rather external constraints provide an upper limit to growth of exports from India. Sinha Roy (2001b, 2002) provides evidence on the primacy of world demand in determining India’s exports growth pattern. Thus, the debate on whether India’s exports are demand constrained or supply determined is far from being conclusive.

The scheme of the paper is as follows. The following section provides a brief overview of India’s export performance and the importance of various demand and supply factors explaining the growth process. Section 3 outlines the simultaneous equation model, the methodology and the data

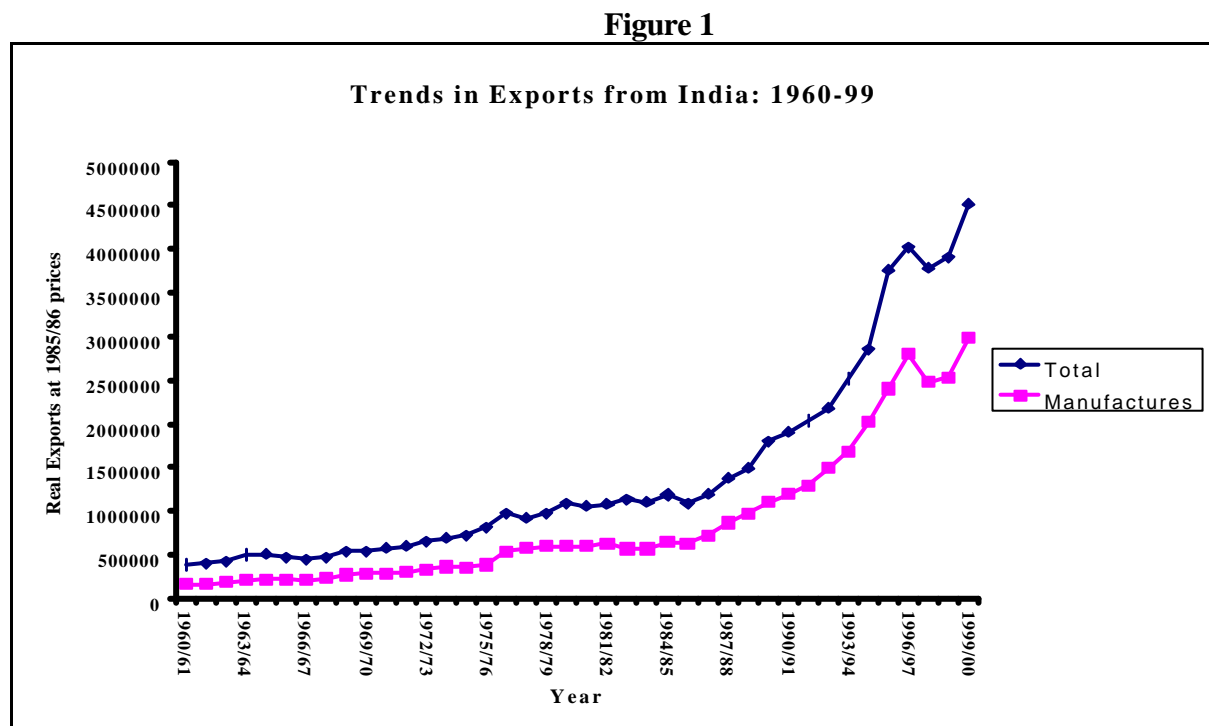
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<sup>4</sup> Pradhan (1991) showed that various fiscal incentives for exports during the years prior to 1991 not only proved to be insufficient, but also were directed to exports sectors in which India did not have comparative advantage.

used in the paper. The fourth section provides the estimates of the econometric model and provides an interpretation of the results. The paper concludes with a summary and implications of findings.

## 2. The Behaviour of India's Exports: Some Salient Features

Even though an increasing trend is observed over the period 1960/61 to 1999/2000 (see Figure 1), real aggregate exports<sup>5</sup> grew at lower rates till the mid-eighties from when they are on a high growth path. India's manufactured exports also followed a similar trend path. However, exports are found to have lowered during the couple of years ending with 1997-98. The trend behaviour of aggregate exports, as well as manufactured exports, thus have distinct discontinuities during the forty-year period, 1960/61 to 1999/2000. For analytical purposes, the time path of exports can be divided into three distinct phases: 1960-72, 1973-84 and 1985-1999<sup>6</sup>.



Source: Based on GoI, DGCI&S database.

<sup>5</sup> Value of merchandise exports is deflated by unit value index of exports to arrive at constant price estimates. Volume index of exports could have been used instead.

<sup>6</sup> Even if exports have lowered towards the end of the third period, it is needless to periodise the couple of years with low growth separately as the phase is a short one.

The growth path, being demarcated into three distinct phases, comprised of initial phases of low to moderate export growth till the mid-eighties and a phase of high growth thereafter. The period-wise growth rates<sup>7</sup> point to such evidence. Table 1 shows that aggregate exports at constant prices, during 1960/61 to 1972/73, grew at a low of 4.71 per cent. Though some years during the mid-seventies logged high growth of exports<sup>8</sup>, the period average rate at 5.29 per cent during 1973-85 was only marginally higher than in the earlier phase and, thus, can also be ascribed as one of low growth. In sharp contrast, during 1985/86 to 1999/2000, aggregate exports registered significantly higher annual average growth of 9.73 per cent with a number of years during the phase witnessing unprecedented high growth. Certainly, such high average growth supported a significant break in trend of real exports in 1985. The time path of manufactured exports witnessed changes almost similar to that of aggregate exports with manufactured exports growing at the average rate of around 6 per cent during the first two phases (refer Table 1). The trends in manufactured export growth show a turnaround of above 11 per cent during 1985-99, as a result of which manufactures account for above 70 per cent of total exports during the phase. However, the average rates of growth of aggregate and manufactured exports were observed to be higher during 1985-95 than for the entire phase, 1985-99. As export growth lowered for a couple of years after 1995/96 and, in fact, declined in 1997/98, so high export growth during trade liberalisation could not be sustained<sup>9</sup>.

It is also evident from Table 1 that periods with higher growth rates are more stable. The phase after the mid-eighties, apart from witnessing high growth, was one of low instability with much lower coefficient of variation in annual rates of growth than that observed in the earlier phases. However, the pattern of variations differs for aggregate and manufactured exports. Nonetheless, the observed turnaround in export growth is necessarily in a period when the development strategy pursued in India

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<sup>7</sup> The period-wise growth rates are based on average annual percentage change, which have inherent advantages over the trend rates arrived at from a semi-log fit. However, the rates do not vary much over these different measures.

<sup>8</sup> Nayyar (1988) finds that export growth during the period 1970/71 to 1984/85 can be divided into two phases: pre- and post-1977/78. The study finds that during the later half the annual average growth rate was half of the unprecedented high rate of growth witnessed during the first sub-period. Such low growth during the post-1977/78 period has, perhaps, led to the lowering of low average rates of export growth during 1973-84.

<sup>9</sup> Sinha Roy (2001b) analyses unsustained pattern of post-reforms export growth in India.

also has undergone a change with a shift in the incentive structure towards exporting. Such a changing trajectory of exports from India would seem particularly meaningful if observed against the performance of select industrialising countries, which have emerged as successful exporters during the period.

**Table 1:** Period-wise Growth Rates<sup>@</sup> of Exports: Aggregate and Manufactures (in per cent)

Product Groups	1960-72	1973-84	1985-95	1985-99
Aggregate Exports	4.71 (1.49)	5.29 (1.38)	11.44 (0.88)	9.73 (1.02)
Manufactured Exports	6.05 (0.96)	6.19 (1.95)	12.91 (1.00)	11.33 (0.79)
Share of Manufactures in Aggregate Exports (average)	48.07	54.41	70.54	71.96

Note: (<sup>@</sup>)The growth rates for each phase are average annual percentage change.

Figures in the parentheses indicate instability in growth measured in terms of coefficient of variation.

Source: Calculated from Government of India, Monthly Statistics of Foreign Trade in India, Vol. 1, March issues, various years.

A comparison of export growth rates between India and such countries as China, Hong Kong, Singapore, South Korea, Indonesia, Malaysia, Thailand, Argentina Brazil and Mexico is interesting as most of these economies have undergone regime transformation towards trade liberalisation sometime during 1980's or even earlier. Table 2 brings out that exports from all these countries, with the exception of Brazil, grew at high rates in the post-1985 period irrespective of their performance in the earlier phases. India's high rates of export growth rate during the liberalisation phase are, thus, no exception<sup>10</sup>. Such simultaneous expansion of exports across developing countries during liberalisation points to the fact that growth of exports was not subject to fallacy of composition<sup>11</sup>.

<sup>10</sup> Duttagupta and Spilimbergo (2000) show that exports from East and Southeast Asian countries declined since 1997. This finding, further, demonstrates the trends in India's exports are no different from that in other Asian developing countries.

<sup>11</sup> Martin (1993) finds evidence that in a global setting with general equilibrium interactions and two-way trade, there are possibilities of simultaneous high growth in exports across industrialising countries resulting from investment and technological advances.



**Table 2:** Average Annual Growth of Merchandise Exports across Industrialising Economies, 1960-99  
(in per cent)

Countries	1960-72	1973-84	1985-99
India	4.22	5.73	10.65
China	6.22	6.61	15.07
Hong Kong	15.19	8.41	13.31
Singapore	7.44	10.46	12.57
South Korea	35.37	18.80	13.16
Indonesia	-0.44	5.20	9.11
Malaysia	7.27	7.29	13.45
Thailand	9.14	9.17	13.43
Argentina	3.42	2.42	7.42
Brazil	8.01	10.13	3.31
Mexico	4.25	13.73	12.86

Note: For China, Hong Kong, Singapore and South Korea, growth rates are calculated from 1963 onwards, for Argentina and Mexico from 1961 onwards.

Source: Calculated from World Bank, CD-ROM on World Tables and World Development Indicators, various years and IMF, International Financial Statistics, various years.

The long run export performance can be related to various demand and supply factors. Arize (1990) shows that in some Asian developing countries demand and supply factors are equally important in determining their export growth pattern. It is evident from empirical results that while relative price or export price plays an important role in determining the world demand for exports from all these different countries, the impact of world income is significant for only some of them. On the supply side, the estimated supply price elasticity is found to be significant in most of these countries. In addition, the capacity variable is found to have significant effect on exports from across countries. The results arrived at in Arize (1990) might be at variance with results obtained from other studies on industrialising economy exports. Muscatelli et al. (1992), for instance, find high income elasticity of demand for NIE exports, but low price elasticity of demand result in demand being constrained in export markets.

In India's context, like in any other industrialising country, the development strategy, the industrial and trade policy regime in particular, is one of the most important factors determining exports. With protection during import substitution, as is often stressed in the literature<sup>12</sup>, the exchange rate is

<sup>12</sup> See Bhagwati and Srinivasan (1975), for instance.

overvalued and results in anti-export bias. The changes in policies relating to the external sector in India have moved in two directions: the reforms relating to tradeables since the mid-eighties and exchange rate reforms from an earlier period onwards, which aimed at reducing price and cost distortions in the economy. The attempts to liberalise external trade are meant to create export opportunities by allowing competition at the margin apart from making products more price-competitive by providing access to cheap inputs at near-world prices.

**Table 3: Growth and Instability of Different Demand and Supply Factors affecting India's Exports**  
(growth rates in per cent)

Period	Total World Demand	REER	Relative Prices (UVI/WPI)	GDP	
				Total	Manufacturing
<b>Growth</b>					
1960/61-1972/73	9.36	-2.02	-0.97	3.18	4.70
1973/74-1984/85	4.73	-3.01	1.01	4.34	6.63
1985/86-1999/00	6.66	-3.15	1.36	6.33	7.23
<b>Instability</b>					
1960/61-1972/73	0.42	2.73	8.34	1.09	0.85
1973/74-1984/85	1.77	1.82	6.15	0.91	0.80
1985/86-1999/00	0.40	2.39	4.98	0.47	0.61

Note: Growth rates are annual average growth rates. Instability is measured in terms of coefficient of variation.

Source: Author's calculation based on different sources.

The major thrust of exchange rate reforms in India has been towards a depreciating currency for promotion of exports. To that end, the rupee, a managed float by 1985, was devalued in 1991. The depreciation of the currency was carried forward with current account convertibility in 1993-94. The Reserve Bank of India has often intervened in the foreign exchange market to maintain a depreciating rupee. The average rates of real rupee depreciation, as is evident from Table 3, increased over the phases, though the devaluation of the currency in 1966 and 1991 did not lead to sustained and large real rupee depreciation in the following years.<sup>13</sup> The high instability in REER depreciation is indeed indicative of years of real currency appreciation in some post-reforms years, for instance in 1997. It is found that

the existence of overvalued but depreciating exchange rate till the early eighties did not promote export growth. From the eighties onwards, high export growth is in place when real exchange rate has depreciated at a faster pace neutralising the effects of currency overvaluation. In addition, exports-to-domestic prices grew at a higher average rate since the mid-eighties after growing low or even declining earlier in the period. Thus, export growth has responded to movements in relative prices, whether on the demand or the supply side.

Development strategy, by itself, enables an economy towards building capabilities to export. The import-substituting phase of industrialisation in India, with production of manufactures primarily for the home market, resulted in the high growth of non-traditional manufactures as capital goods till the mid-sixties (Ahluwalia, 1985). With removal of capacity constraints on industrial production in the early eighties, manufacturing production diversified to chemicals and allied products in 1980's (Kelkar and Kumar, 1990) and more than half of manufacturing growth during 1990s is accounted for by consumer goods (Chaudhuri, 2002). The above pattern of widening industrial base, even though often not in accordance to the economy's comparative advantage<sup>14</sup>, is indeed indicative of enhanced capabilities to export.

In India, capability to export is often measured in terms of GDP, investment or installed capacities in manufacturing. Measured in terms of GDP, growth provided an expanding base for exports from India. GDP growth, despite fluctuations, has been significant over different phases between 1960 and 1999. Likewise manufacturing value-added grew, though average growth is lower during 1980's and 1990's than it was till the mid-sixties<sup>15</sup>. The widening base of manufactures in India also improved the capability to export proportionately more of manufactures during the period (see Table 1). With changes in policy, not only growing manufacturing production is expected to provide an expanding base

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<sup>13</sup> Sinha Roy (2002 b) highlights this point.

<sup>14</sup> See Panchamukhi (1978) for an analysis of the 1960s, while World Bank (1990) for analysis of the 1980s. Further, Kelkar and Kumar (1990) show that, during 1980s, India's manufacturing sector diversified towards production of more chemicals and allied products, which is not necessarily in tune with India's comparative advantage. Further, manufacturing growth during 1990's, was not necessarily in labour-intensive manufactures as is often expected during reforms {Nagaraj (1997): 2875}.

<sup>15</sup> Manufacturing growth in India, however, followed a growth path different from that as periodised in Table 3.

for exports, an efficient manufacturing production is expected to result in higher export growth<sup>16</sup>. Even though the trends in improvements in capability to export are found to be independent of the industrial and trade policy regimes, capability is an important factor explaining long-run export growth.

In addition to movements in relative prices and improvements in capability to export, trends in world demand tend to explain export growth in a significant way. At the outset it needs to be mentioned that there are relatively new destinations of India's exports at different time points during 1960-99 in addition to the permanent ones. The developed country destinations are the permanent source of demand for India's exports. The emerging destinations, which changed from the Middle-east countries during the seventies to include East and Southeast Asia after the mid-eighties, gave rise to additional demand for exports during the period. Total world demand, as is evident from Table 3, grew at high rates till the early seventies, followed by a phase of much lower growth thereafter. This is despite the emergence of new destinations of exports during the period. Since mid-eighties, there is a revival in total demand for India's exports arising due to a revival of demand from permanent destinations together with additional demand from emerging markets. The lowering of world demand after the mid-nineties is synchronous with declining rates of export growth then.

There are other supply side factors determining export growth as well, especially non-price factors as technology and quality, marketing, infrastructure, and access to export credit. When any of these factors are inadequate, they operate as constraints limiting supplies for exports. Even transaction costs due to procedural delays and sector specific supply constraints are as important to export growth as any other factors. Many of these constraints are overlooked while initiating changes in development strategy pursued, and thus, they operate as effective constraints on exports even if policy regime undergoes a change.

Overall, after a long period of low and relatively unstable growth, India's exports, aggregate and manufactures, entered a high and more stable growth phase from the mid-eighties onwards. Such unsurpassed rates of export growth after the mid-eighties, however, could not be sustained. Nonetheless, a changing growth path, especially that of manufactured exports, assumed importance in the context of trade liberalisation in India. Most demand and supply variables are found to have a

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<sup>16</sup> However, industrial structure in India did not witness any significant changes. Further, Das (2001) shows that manufacturing productivity growth did not improve even during liberalisation of 1990's or improvements in efficiency is, at best, restricted to a few sectors.

changing growth path during the period. The shift in development strategy from around the mid-eighties has attempted at “right” relative prices. Even world demand grew at a high rate from around that time. From a synthesis of the above sets of evidence it emerges that growth of exports from India is related to supply capability, be it during import substitution or trade liberalisation. Another competing view is also evident: in contrast to development strategy, it is essentially the changes in world demand that determined export growth over the long run. It is also to be observed whether relative prices, on the demand and the supply sides, have an impact on export performance.

### **3. Model Specification, The Econometric Method and The Data**

A viable explanation of the behaviour of exports has to grapple with issues relating to model specification and the method of econometric estimation. Panchamukhi (1997) has provided an extensive survey of the variety of models used for estimation purposes in the Indian case. The econometric studies on India’s exports, the exceptions being Virmani (1991), Joshi and Little (1994) and Krishnamurty and Pandit (1995), estimate either the demand or the supply side after assuming away the other. In most instances, either demand function is only estimated by assuming infinite elasticity of supply of exports or supply side estimates become redundant due to inappropriate choice of factors. The single equation estimates are not only based on stringent assumptions, but they are subject to simultaneity bias. Above all, such partial explanations to export performance either in terms of demand or supply factors are found to hold good only for specific short periods.

Apart from eliminating any bias arising from the two-way relationship between export quantities and export prices<sup>17</sup>, an integrated demand and supply approach can only explain the long-run behaviour of exports. Further, robust estimates of the effect of various factors can be obtained only if demand and supply functions are carefully specified with appropriate variables. Often reduced form equation, which includes relative price as well as other demand and supply factors, is estimated in the Indian case<sup>18</sup>. However, such an approach is inappropriate to arrive at specific demand and supply side conclusions as their individual effects cannot be separated out, though the effect of relative price can be correct.

The model to be estimated, which is based on Goldstein and Khan (1978), is as follows:-

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<sup>17</sup> See Goldstein and Khan (1978) and Funke and Holly (1992).

<sup>18</sup> Srinivasan (1998) uses such an ‘eclectic’ approach to analyse the determinants of India’s exports. Sinha Roy (2002 a) also adopts the same specification.

**Export Demand:**  $X_t^d = \alpha_0 + \alpha_1 \text{REER}_t + \alpha_2 W_t + u_t \dots\dots (1)$

**Export Supply:**  $X_t^s = \beta_0 + \beta_1 \text{RP}_t + \beta_2 Y_t + v_t \dots\dots (2)$

where  $\text{REER} = P^x / eP^w$  and  $\text{RP} = P^x / P^d$ ,  $X$ - real merchandise exports,  $P^x$  – price of exports,  $eP^w$  – exchange rate multiplied by world prices,  $W$  – Total World Demand,  $Y$  – Gross Domestic Product and all variables are in logarithm.

The above specification is different from that in Goldstein and Khan (1978) in the sense that the scalar variables in the above system of equations are different. Further, specification, based on a two-goods – two-country framework, is different from that in a multicountry framework<sup>19</sup>. Supply-side specifications across studies differ from that specified here. For instance, Riedel (1988) and Muscatelli et al. (1992) have used either unit cost or wages in manufacturing along with prices of raw material inputs instead of domestic prices. With regards to the supply-side scale variable, Goldstein and Khan (1978) used an index of domestic productive capacity. Some studies like Joshi and Little (1994), on the other hand, use time trend to capture capacity growth and improvements in productivity. In addition, Joshi and Little (1994) specifies excess domestic demand as a supply side factor measured in terms of excess of monetary growth over the growth rate of real GDP. Further, while Virmani (1991) has used domestic expenditure or income and some measure of capacity utilisation, Krishnamurthy and Pandit (1995) have used a concept of overall demand measured in terms of output of a particular sector relative to total real GDP<sup>20</sup>. The model specified in Equations (1) and (2) uses real GDP as a measure of supply capability instead. The demand specification differs in the choice of the scale variable: instead of real income of the world economy, aggregate imports of major trading partners are used as a measure of world demand.

The Equations (1) and (2) are rewritten as:

$$X_t^d = \alpha_0 + \alpha_1 (P_t^x / e.P_t^w) + \alpha_2 W_t + u_t \dots\dots\dots (3)$$

$$X_t^s = \beta_0 + \beta_1 (P_t^x / P_t^d) + \beta_2 Y_t + v_t \dots\dots\dots (4)$$

or,  $X_t^d = a_0 + a_1 P_t^x + a_2 e.P_t^w + a_3 W_t + u_t \dots\dots\dots (5)$

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<sup>19</sup> Virmani (1991) incorporates a multicountry framework in the demand specification.

<sup>20</sup> In the estimation for aggregate merchandise exports, Krishnamurthy and Pandit (1995), however, do not use a supply side scale variable representing either capacity or overall demand.

$$X_t^s = b_0 + b_1 P_t^x + b_2 P_t^d + b_3 Y_t + v_t \quad \text{----- (6)}$$

with  $a_1 < 0; a_2, a_3 > 0; b_1, b_3 > 0; b_2 < 0$

In equilibrium,  $X_t^d = X_t^s = X$  (say) ----- (7)

The above system of equations, as specified in Equations (5), (6) and (7), can be referred to as an equilibrium model with instantaneous adjustment of export prices and quantities and accordingly, no lags are specified in the system of equations. The simplest way to arrive at estimates of simultaneous equation system is by using two-stage least squares (2SLS) method, a single equation technique, if the system of equations is found identified. The 2SLS method is found to be valid even if the variables of the system are non-stationary and cointegrated<sup>21</sup>. The usual method adopted in estimation is in terms of normalising export demand by quantity as the dependent variable and export supply as the price equation<sup>22</sup>. After normalising equations (5) and (6), the system is usually estimated by using a single-equation method such as OLS or 2SLS.

A dynamic specification of the model presumes that excess demand and supply potentially affect the evolution of both export quantities and prices in the short run. The dynamic generalised error-correction model (ECM) of the system incorporates the errors of the demand-supply equations estimated by the modified OLS method of Philips and Hansen (1990)<sup>23</sup>. The ECM of the system of equations is estimated using a systems method, as is done in Muscatelli et al. (1992). This is different from the partial adjustment model adopted in Goldstein and Khan (1978), Riedel (1988) or Arize (1990).

By applying Philips and Hansen (1992) method, the error correction terms are constructed for

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<sup>21</sup> Johnston and Dinardo (1997) view that even if the variables in an equation system are non-stationary and cointegrated, a structural model building exercise has to only take into account issues of identification and simultaneity bias.

<sup>22</sup> Virmani (1991) and Krishnamurty and Pandit (1995), like that in Goldstein and Khan (1978), adopt this method. However, it is different from that adopted by Joshi and Little (1994) – who chose export quantity as the dependent variable independent of the equation being estimated. The estimates of price and income elasticity, as Muscatelli et al. (1992) observe, vary with the type of normalisation.

<sup>23</sup> Muscatelli et al. (1992) find that the use of OLS method in estimating long-run simultaneous models suffers from the dual deficiencies of small sample bias and endogeneity of regressors. Muscatelli et al. (1992) justifies the use of Phillips and Hansen (1990) modified OLS estimator, which corrects for both serial correlation and endogeneity. Muscatelli and Hurn (1992), in their survey article, show that Johansen method can be used instead to find out the number of cointegrating vectors to be followed by Engle-Granger OLS procedure to the behavioural equations.

the demand and the supply sides respectively<sup>24</sup>. The errors are as follows:

$$e_t^d = X - a_0 - a_1 P_t^x - a_2 e.P_t^w - a_3 W_t \text{ ----- (8)}$$

$$e_t^s = X - b_0 - b_1 P_t^x - b_2 P_t^d - b_3 Y_t \text{ ----- (9)}$$

The system of equations estimated by a systems method, say Full Information Maximum Likelihood (FIML) Method, uses the errors,  $e_t^d$  and  $e_t^s$ , for the demand and the supply sides respectively to arrive at the dynamic ECM estimates. Following Muscatelli et al. (1992), the generalised error-correction equation is specified as:

$$\Delta Z_t = \gamma_0 + \sum \gamma_{1i} \Delta Z_{t-i} + \sum \gamma_{2i} \Delta V_{t-i} + U_{t-1} + \mu_t \text{ ..... (10),}$$

$$\text{where } Z_t = (X_t, P_t^x), V_t = (e.P_t^w, W_t, P_t^d, Y_t) \text{ and } U_{t-1} = (e_{t-1}^d, e_{t-1}^s).$$

In the above equation (10), equation  $\Delta X_t$  is seen as a demand relationship and the equation  $\Delta P_t^x$  is the supply relationship and these demand and supply equations are arrived at by imposing zero restrictions on the exogenous supply-side variables in the demand equation and on the exogenous demand-side variables in the supply equation.

The data on different variables used in this paper have been drawn from different sources. Among these variables, while the data on aggregate exports (X) and production (Y) are used at constant prices, the data on real effective exchange rate (REER), relative prices (RP) and world demand (W) are estimated, which needs elaboration. The data on the different variables are detailed as follows.

**X:** The data on India's merchandise exports are collected from the Monthly Statistics of Foreign Trade of India published by the Directorate General of Commercial Intelligence and Statistics (DGCI&S), Calcutta. For constant price estimates, the value of manufactured exports is deflated by unit value index (UVI) of total exports. The DGCI&S quantity index data also provides an estimate of the volume of trade. As value of exports at constant prices and the export volume index have similar trends (Sinha Roy, 2001 a), the latter data could have been used instead.

**Y:** The data on gross domestic product (GDP) are taken from the Government of India, National Accounts Statistics (NAS), various years. Either constant price estimates of GDP are available based on implicit deflators or such figures are arrived at by deflating the current price figure by wholesale price index (WPI) for the economy.

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<sup>24</sup> The estimation of error terms by Philips and Hansen (1992) method is done using MICROFIT



**REER or RP:** Real exchange rate (REER) is generally defined in terms of  $P^x$  and  $P^w$  – the price indices of domestic economy and the trading partner economy respectively - and “e” is the exchange rate of the domestic economy with respect to the trading partner economies calculated in terms of a numeraire as the SDR. Often WPI, consumer price index (CPI) or implicit GDP deflator is used for the purpose. An alternative way of constructing a proxy for the real exchange rate index is to use the trading partner country's wholesale price index (WPI) and the domestic country's consumer price index (CPI), where WPI is treated as a proxy for prices of tradeables and the latter as price of non-tradeables. However, for the purpose here, unit value of exports is used relative to the WPI or import unit values of trading partner countries. In this exercise, bilateral real exchange rate is calculated with respect to the most prominent eleven trading partners of India. The multilateral or the real effective exchange rate of the rupee is the weighted average of the bilateral rates, the weights being the 1985 share of India's exports for these eleven trading partner countries. While the above weighting diagram has often been the practice in the literature, there are instances of using contemporaneous weights<sup>25</sup>. RP is the ratio of “ $P^x$ ” to “ $P^d$ ”, where  $P^d$  is the domestic price proxied by WPI of India.

**W:** World Demand is represented by a sum total of imports of different countries would necessarily mean aggregate world demand<sup>26</sup>. As realized demand for India's exports are essentially lower than the potential, the aggregation of imports across countries necessitates adjustment. Thus, “W” is calculated as a weighted sum of imports of individual destination country, the weights being the destination's share in India's total exports in 1985. The data on total imports of different destination countries are obtained from the IMF database.

#### **4. The Estimates and Interpretations: *Understanding Growth of Exports***

The use of a dynamic error correction specification is justified in this case as all the variables used in the estimation are integrated of order 1,  $I(1)$ <sup>27</sup>. In this exercise, the long-run estimates provide

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Ver. 4.

<sup>25</sup> The real exchange rate series as generated by the RBI and Pradhan use the share of exports for a particular base year as weights, Trivedi (1996) uses contemporaneous weights for the purpose.

<sup>26</sup> Muscatelli et al. (1995) use imports of export destination countries as a scale variable as against the practice of using world income, as in Goldstein and Khan (1978).

<sup>27</sup> See Sinha Roy (2002 a, b).

errors used in the error correction estimation. This would rather help to understand the short run dynamics and identify the different causal factors leading to the long run performance. The ECM estimates, as given in Table 4, show that both the equations have an error correction representation with the lagged error terms, “ $e^d_{t-1}$ ” and “ $e^s_{t-1}$ ”, being significant. The demand side error has larger significance than the supply side error in correcting for the long run equilibrium path of India’s export growth. It is found that changes in all demand side factors significantly explain the short-run dynamics of the export growth process. Further, the significance of the relative price factor, real effective exchange rate in particular, in the short run dynamics of export performance is noteworthy. However, on the supply side, only the price factor is found to be significant, with the coefficient of  $\Delta X$  being significant at only 10 per cent. The insignificance of supply-side scalar factor, GDP, implies that supply capabilities do not provide an explanation to the dynamics of long run export growth. This shows the relative predominance of the demand side over the supply side in explaining India’s long run export performance. These results on India exports are at variance from that of a typical industrialization country, as shown in Muscatelli et. al. (1992).

Understanding India's export performance in terms of relative price and various non-price factors leads to important dimensions that are of crucial policy relevance. The economy underwent changes in policy towards the external sector from the mid-eighties onwards. Prior to this, policy changes were brought about with respect to the domestic economy. All these changes were meant to bringing in competition in the economy, reducing biases against exports and bring about improvements in competitiveness leading to higher export growth. Though relative prices, both on the demand and the supply sides, improved and export growth was higher during liberalisation, the above analysis would point to the fact that it would be too naïve to attribute such increases to liberalisation per se. What changes in development strategy by way of liberalisation has done at best is to release the constraints operating on the external sector performance.

Overvalued exchange rate and relative prices on the supply side have impacted significantly to the dynamics of long run export growth. The significant effect of domestic prices on India’s exports is not to deny the benefits derived from a growing relative price on the supply side during the post-1985 period. Such growing relative prices would have provided better incentives to domestic producers to export over the domestic market and in a way neutralised the disincentives to export in a non-perfect

domestic market for manufactures with high unit costs. During pre-1985 period, overvalued exchange rate, as is expected, had a bearing on export performance despite depreciation in the real currency through the period. Even if the real rupee depreciated at a higher rate after the mid-eighties, such depreciation alone is not found to be beneficial to export growth. The significance of price factors on the demand side would show that exports are not constrained due to low price responsiveness. On the other hand, depreciating rupee along with growth in world demand provides an answer to the importance of demand side in explaining export growth.

**Table 4:** Determinants of India's Manufactured Exports: FIML Estimates

Demand Side		Supply Side	
Dependant Variable: $\Delta X$		Dependant Variable: $\Delta P^x$	
Variable	Coefficient	Variable	Coefficient
$DP^x$	-0.737 (-3.718)*	$DX$	0.466 (1.828)***
$DeP^w$	0.643 (4.434)*	$DP^d$	0.889 (3.165)*
$DW$	0.692 (5.225)*	$DY$	-0.529 (-1.577)
$DX(-1)$	0.188 (1.751)***	$DP^x(-1)$	0.029 (0.135)
$Dum\ 85$	0.043 (2.228)**	$Dum85$	0.030 (0.868)
$e^d_{t-1}$	-0.726 (-6.075)*	$e^s_{t-1}$	-0.630 (-2.732)**

Note: Period of Analysis: 1960-1997. The system of equations is over-identified.

(\*) denotes significance at 1%, (\*\*) denotes significance at 5%, (\*\*\*) denotes significance at 10%.

Variable Description: X-real merchandise exports,  $P^x$  – price of exports,  $P^d$  – domestic prices,  $eP^w$  – exchange rate multiplied by world prices, W (Total)-Total World Demand, Y – GDP,  $\Delta$  - first difference and, (-1) one-year lag of the variable.

Source: Author's Estimation based on Equation 10.

Table 4 would show that the impact world demand variable is significant at 1 per cent level. The overriding importance of world demand in determining India's exports is worth an interpretation. Till the early seventies, to be specific 1972-73, world demand grew, but such growth was only from the

traditional destinations. But world demand for India's exports not only came from traditional destinations after 1973, but emerging destinations played an increasing role. Such a pattern has proved to be more beneficial after the mid-eighties. But there are certain nuances in the pattern of growth of world demand. The importance of market access as a determinant of exports is noteworthy. Even after liberalisation of world trade consequent upon various rounds of multilateral trade negotiations, market access problems for exports from such developing countries as India continue to persist<sup>28</sup>. Elsewhere (Sinha Roy, 2002 b) it is argued that the market access problems necessarily lead to mismatch between structures of India's exports and world demand<sup>29</sup>. An effective limit on world demand is being set by the asymmetry in structures of world demand and India's exports. In addition, the spread of non-tariff barriers to trade, and especially MFA, has restricted exports of merchandise from India. These are mostly textiles and clothing, footwear and leather manufactures, iron and steel, etc.. This, in a way, allowed the asymmetries in trade structures to persist and provide a critical limit for world demand to grow.<sup>30</sup> It is the growth of effective world demand that is of relevance to the growth of exports from India over the long run.

This finding brings back to the initial question of the effectiveness of changes in development strategy in bringing about higher export growth. The changes in policies could neither bring about a change in the manufacturing production structure that had evolved over a long period of import substitution in accordance to India's comparative advantage, nor did it lead the export structure to change in compliance with the pattern of world demand. The policy regime has addressed this problem by aiming at changes in relative prices. On the whole, the change in development strategy, by relaxing the constraints operating on exports, has improved overall export performance. Even if relative prices play a role in determining India's export growth path, it is only a necessary condition guaranteeing export growth. The scope of relative price on the demand side, real effective exchange rate, in

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<sup>28</sup> Despite substantial liberalisation of trade in the Uruguay Round of multilateral negotiations, market access problems of developing country exports continue to exist necessarily in terms of tariff peaks, other non-tariff barriers and tariff escalation (UNCTAD, 2000). Mehta and Mohanty (1999) have shown the extent of tariff and non-tariff barriers hindering market access to Indian exports in the post-Uruguay Round scenario.

<sup>29</sup> For an elaboration on the pattern of world trade, see Mayer et al. (2002).

<sup>30</sup> Nayyar (1988) have also argued that various barriers to trade have put an upper limit to growth of exports from India.

promoting exports remains limited to situations when REER is depreciating along with growth in demand. The importance of world demand, thus, cannot be denied as a sufficiency condition for sustaining export growth. While growth in world demand gives an expanding market to India's exports, constraints remain in accessing this expanding market.

On the whole, India's export performance is explained by such factors as world demand, real effective exchange rate and relative prices on the supply side. The effectiveness of demand side factors, both scalar and relative prices, have played a more effective role in explaining the variations in India's long run export growth. The result of predominance of demand side factors over different supply side determinants is definitely an improvement over existing interpretations of India's export growth. However, the short run variations of these explanatory variables do not fully explain yearly changes in manufactured exports. If other supply factors are quantified on a time series basis and used in the econometric exercise, capability to export might have been significant and better supply side estimates would have been in place. Various other supply side factors such as investment or productivity growth, sunk cost, availability of transactional infrastructure and procedural bottlenecks<sup>31</sup>, if taken into account, could have provided a better explanation of short-run variations in export performance. Nonetheless, the results are robust.

## **5. Summary and Implications**

India's export growth witnessed a long run stagnancy till the mid-eighties, from when there is a turnaround. With changing growth performance over the period, the Asian developing countries emerged as important destinations of India's exports. Even if the commodity composition of Indian exports changed over the years, with an increase in the share of manufactured exports, few commodities with advantage only predominate the export basket (see Sinha Roy, 2001 b; 2002 b). No single factor can explain such a changing pattern of export growth, but a number of demand- and supply-side factors provide an explanation to such a long run phenomenon. The most striking result that this exercise provides is the predominance of demand side factors, price and non-price, in determining export growth in India till the late 1990's. This result stresses the importance to be given to demand-side factors rather than relying entirely on supply side improvements in providing a viable strategy towards export growth.

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<sup>31</sup> See Marjit (1998) for evidence on procedural bottlenecks faced by Indian exporters.

Further, it is the question of relative importance of price measures or non-price factors in export promotion. Effectiveness of Real effective exchange rate along with world demand explain the predominance of demand side in understanding long run behaviour of merchandise exports, But the effects of relative prices are not as significant as that of world demand in determining export performance, real effective exchange rate, unless being depreciated continuously, is often found to short term effect on exports. Even if world demand grew and led to the growth in India's exports, the perpetuating market access restrictions creates an asymmetry between India's export structure and the pattern of world demand and thus, set an upper limit on the realisation of potential world demand. Thus, for sustained export growth, price competitiveness has to be guaranteed in addition to diversifying the export basket towards more value-added and high technology products. Greater market access for India's exports have to negotiated at the multilateral level. Such persisting market access problem has to be tackled by developing countries adopting a two pronged strategy. Apart from negotiating for a greater market access at the multilateral level, developing countries, and especially India, have to stress on diversifying the export basket towards more value-added and high technology products.

The relatively less importance of supply side and insignificance of GDP as a supply-side determinant of export growth leaves enough room for higher value-added growth providing a better explanation of long run export performance. In addition, if supply factors other than capability and relative prices are considered while estimating the system of equations, a better account of export performance could have been provided. Higher value-added growth would entail technology upgradation of exports. Along with improvements in efficiency, the performance of exports can also be improved by removing structural impediments in terms of provision of better infrastructure, simplification of trade procedures and focussing on various transactional factors as marketing associated with the sale of manufactures. Such developments on the supply side would necessarily reduce delivery time for exports, improve efficiency in transaction and result in larger volumes of exports.

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