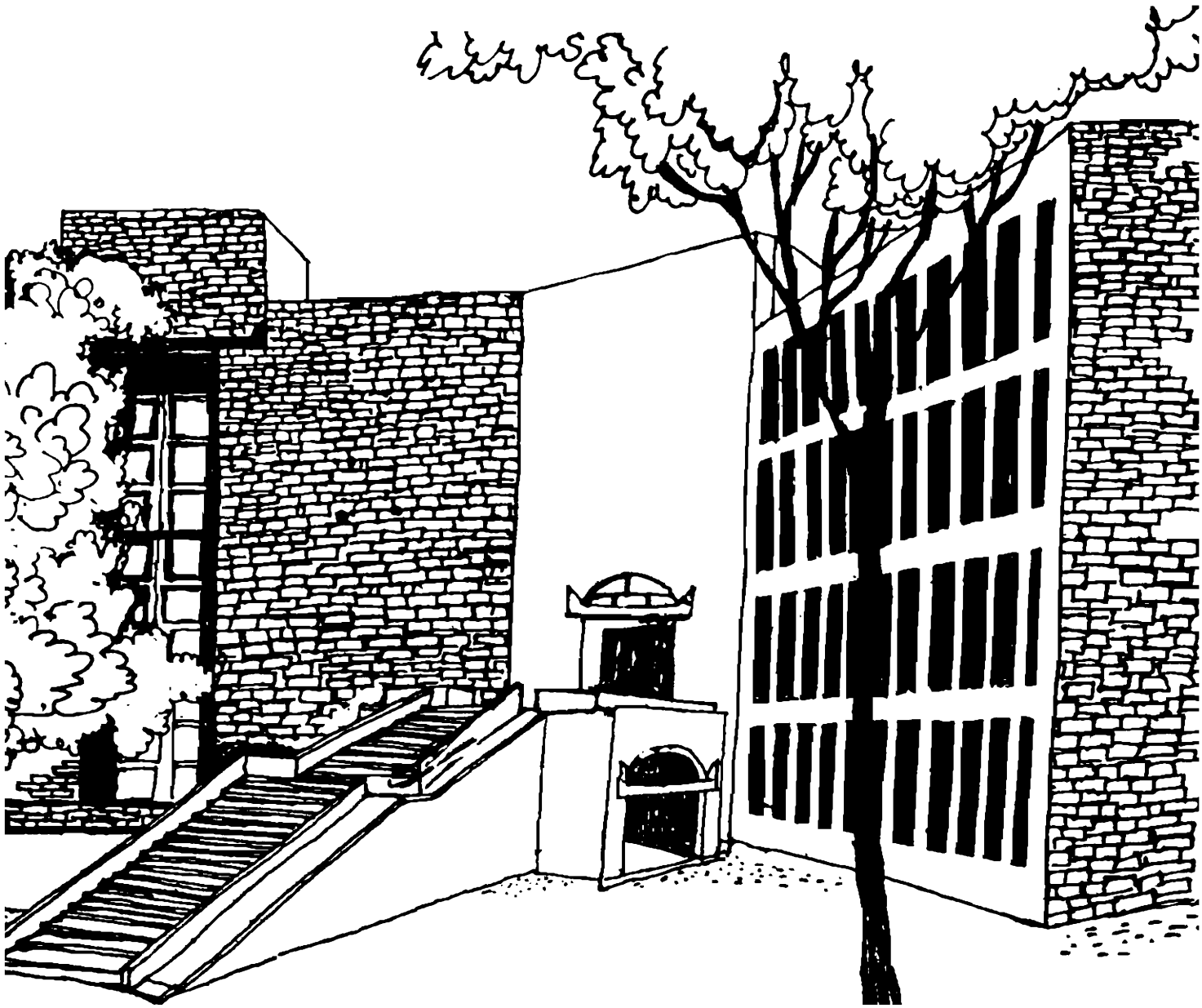
विद्याविनियोगाद्विकास:

IIM AHMEDABAD

Working Paper



INDIA'S EXPORTS OF CAPITAL GOODS
AN EVALUATION

By

Dillip Rath

&

Amarendra Sahoo

W P No. 861
April 1990

The main objective of the working paper series of the IIMA is to help faculty members to test out their research findings at the pre-publication stage.

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380 056
INDIA

INDIA'S EXPORTS OF CAPITAL GOODS

AN EVALUATION*

by

Dillip Rath

Indian Institute of Management
Ahmedabad-380 056

and

Amarendra Sahoo

The Policy Group
W-17, Greater Kailash-I
New Delhi-110 048

February, 1990

ABSTRACT

This paper evaluates the recent performance of India's capital goods exports and finds that it is not so impressive in comparative terms. It also analyses the determinants of exports using econometric techniques and develops an equilibrium model of simultaneous equations. Exports demand is found to be inelastic, but supply is elastic with respect to prices. The findings suggest that to increase volume of exports along with appropriate value realisation, a judicious mix of policies, e.g., devaluation and exports subsidies, should be pursued. The econometric model is also used to evaluate whether the recent government policies have made any impact. The findings are in the affirmative.

---

* We would like to thank Surjit Bhalla for extensive discussions.
Correspondence may be addressed to the first author.

1. Introduction

Capital goods form the third most important category in India's total exports, accounting for nearly 10 percent of the latter and next only to textiles and gems and jewellery. (By capital goods, we mean product code 7 of the SITC classification.) They also belong to the high growth category of exports, registering a growth of nearly 50 percent in 1988-89, on top of an impressive 48 percent growth in the previous year (Table 1). In the context of the adverse balance of payments situation faced by India, the recent performance of capital goods exports has been hailed as being 'very impressive'. Again, since it comes close on the heels of two export-import policy announcements of 1985-88 and 1988-91 by the Government of India, it is attributed at least partly to the success of these policies. The Economic Survey (1988-89), for example, states, "The surge in these exports in 1987-88 could be partly due to the depressed domestic market conditions in a drought year and partly because of the numerous initiatives taken by the Government of India."

In this paper, we examine the following questions: (i) Is the recent performance really good according to some criteria? (ii) What are the determinants of India's capital goods exports? Alongside these two questions, we also attempt an evaluation of the recent policy announcements by the Government of India.

We take up the first question in the next section. In section 3, we analyse the determinants of capital goods exports with the help of an econometric model and in section 4, use the

same model for evaluation of policies. We conclude in section 5 with a few brief remarks. Data definitions and sources are given in the Appendix.

2. India's Performance in Capital Goods Exports

The recent performance appears impressive on two counts. First, as can be seen from Table 1, the value of exports (hereafter, by exports we will be refering to exports of capital goods) has gone up from a paltry 1 million dollars in 1961-62 to 10 million dollars in 1970-71 and 160 million dollars in 1988-89, a more than hundredfold increase in less than three decades. Secondly, Table 2 and Figure 1 reveal that India's exports to Asian and African developing countries have gone down from 85 percent in 1970-71 to less than 50 percent in 1985-86. Instead, exports to the developed countries of North America and Western Europe and the Eastern Bloc are on the rise. One would have expected India to export primary or labour intensive goods to these countries. It appears as though Indian capital goods are becoming competitive by international standards.

In comparative terms, however, the impressiveness is more apparent than real. Table 1 reveals that India's share in world exports has remained virtually stagnant since 1970. This fact imputes a passive character to Indian exports: As world exports grew, Indian exports got "pulled up", with no credit for government policies. We will come back to this point latter.

The picture is again not very encouraging even when we look at India's performance in various markets vis-a-vis its competitors. While India's exports to the developed countries is going up, exports of other developing countries to these markets is going up faster. In the developing markets, India's exports are going down, but the rate of this decline is much more than that of the exports of other developing countries. As a result, India's share in the total develping countries' exports has gone down in many important markets (Table 2.1). In other words, India has fared badly vis-a-vis its competitors.

The picture becomes clearer when we look at some representative markets in Tables 2.2 through 2.5. In West Germany, India has maintained its share, but Brazil, China, Hongkong and South Korea have improved their shares significantly. In the US market, India has only marginally improved, whereas Brazil and South Korea have made substantial inroads. In UK, it has lost out to Japan, South Korea, Hongkong and Brazil. It has not improved in the Italian market either.

It is however an interesting fact that India is exporting to the developed markets. It could be due to improved competitiveness of Indian manufactures [see for example, Gangopadhyay and Goswami (1986, pp 59-63)]. But that in itself is unlikely to be a complete explanation. So what else could be the reasons?

First, because of increasing labour costs, the multinationals are shifting operations to cheaper pastures of developing countries. As a result, a gap develops between demand and domestic production in the developed countries, their imports

demand goes up and hence exports from developing countries including India increases. As the multinationals start exporting, exports of countries that host them (e.g., South Korea, Hongkong, Brazil) pick up and India loses its competitive edge.

Secondly, in these days of changing technologies, the developed countries might be phasing out production of certain capital goods that would not be needed in near future any longer. In the interim period, therefore, exports of such goods from developing countries would go up. It needs to be examined in detail whether Indian exports to developed countries fall in such category[1]. If they do, the recent spurt in exports would be shortlived.

India's exports to the planned economies have gone up from 8.6 percent in 1971 to 36 percent in 1985, nearly three-quarters of which is accounted for by USSR alone. This has been achieved more through goodwill and bilateral trade arrangements than the competitive nature of India's products. But that might also explain, to some extent, the low value realisation of India's exports.

It is clear from Figure 2 that most of the increases in Indian exports has come through quantity rather than price increases. In other words, value realisation per unit quantity of exports has remained stagnant, although the world unit value index has been rising at a faster rate. At the same time, it is seen from Figure 3 that the price indices of India's imports have gone up much faster than the quantum indices. India seems to be on the wrong side of the bargain!

Another way of judging India's exports performance is to ask: Have we done better than what we could have done? In other words, has there been a structural break of sorts in recent years, initiated by government policies? This can be answered by using an ex-ante model of exports of capital goods and then predicting the out-of-sample recent values. If predicted values are lower than observed figures, the performance is commendable.

This question is analysed in section 4, using the model developed in the next section.

3. A Model of India's Exports of Capital Goods

Determinants of Indian capital goods exports have been studied in Bhagwati-Srinivasan (1975), Goldar (1989), Harinarayan (1983), Lucas (1986), Moran (1988), Pandit (1986), Riedel et al (1984), Wadhwa and Sharma (1975) and Kumar (1989). While most of these studies use the small country assumption and hence concentrate on the demand side alone, some of them look at the supply side determinants also. The typical demand side explanatory variables are India's export price (represented by unit value index) corrected for exchange rate relative to the world/competitor price (represented by world unit value index or, not infrequently, the US domestic producer price of capital goods) and a scale variable, usually the world exports of capital goods. The typical supply side explanatory variables are relative profitability (represented by Indian export price relative to domestic wholesale price) and a proxy for capacity utilisation and/or domestic demand pressure (represented respectively by the

trend line of domestic production and actual to trend output ratio).

For our purpose, we will develop a model of exports where demand and supply are simultaneously estimated, using an equilibrium approach, described in Goldstein and Khan (1978). We will first estimate demand and supply equations individually and after pointing out the advantages and disadvantages of single equations, we will proceed to estimate the simultaneous model. Before concluding this section, we will also check whether a disequilibrium approach would serve better than the equilibrium approach.

Demand for Exports

We specify the typical demand equation for capital goods exports as follows:

$$\log QX = a - b \log PXD + c \log PXW + d \log QXW \qquad (1)$$

where QX = quantum index of exports (obtained by dividing value of exports by unit value index and then indexing it with some base = 100), PXD = unit value index of exports of India in dollar terms, PXW = unit value index of world exports in dollar terms and QXW = quantum index of world exports. Ideally, we should impose homogeneity restriction on prices (i.e., b=c). But since available price indices are far from ideal conceptually, often it

is found that better results are obtained without the homogeneity constraint on b and c. Therefore, we do not always impose this restriction.

Recent research shows that coefficients obtained from regressions of level variables may yield unreliable coefficients [Stock and Watson (1988)]. One suggested way of avoiding this problem is to use first difference of the variables. Accordingly, we also estimate the price and income elasticities (b,c, and d) using first difference of logs as follows:

$$DQX = a' - b\ DPXD + c\ DPXW + d\ DQXW \qquad (1')$$

where DQX = log QX - log QX(-1); DPXD = log PXD - log PXD(-1); DPXW = log PXW - log PXW(-1) and DQXW = log QXW - log QXW(-1). The constant a' is expected to be zero.

Using ordinary least squares (OLS), we obtained the following estimates of equation (1') for two time periods, 1971-87 and 1971-84.

(1.1) DQX = -8.85 - 1.61 DPXD + 2.34 DPXW + 1.29 DQXW
(-1.91) (-7.69) (5.57) (2.40)
$\bar{R}^2$ = 0.84 D.W. = 2.12 SMPL = 71-87

(1.2) DQX = -7.89 - 1.64 DPXD + 2.44 DPXW + 1.11 DQXW
(-1.46) (-6.32) (3.67) (1.52)
$\bar{R}^2$ = 0.86 D.W. = 2.23 SMPL = 71-84

Figures in parentheses indicate t-values. SMPL stands for the sample period.

These equations are evidently quite good. The elasticities are statistically significant and have the right sign. The

constant terms are not significantly different from 0, as expected. The most notable feature about the above equations are that the price elasticity of demand for capital goods exports is close to (-) 1.6 and this estimate is robust as is evident from the fact that it remains stable for both sample periods 1971-87 and 1971-84[2]. Contrary to elasticity-pessimism, this result underscores a more important role for prices.

The elasticity of demand for capital goods exports with respect to world exports is found to be close to 1. This indicates that even in the absence of a conscious price policy, Indian exports will get pulled up any way as world exports increase.

Although these equations are quite good, they explain only the demand side and hence cannot explain the determinants of exports completely. For example, for answering questions like what role relative profitability plays in the determination of exports, we will have to estimate supply functions. We do that below.

Supply of Exports

We specify the following supply equation:

$$\log QX = e + f \log PX + g \log PH + h \log QHAT \qquad (2)$$

where PX is India's unit value of exports in rupee terms, PH, domestic wholesale price index and QHAT is a measure of domestic capacity represented by the trend value of domestic production,

QH, obtained by regressing log QH on time. Again, we do not always impose the homogeneity condition on prices (i.e., f=-g). We expect f and h to be positive and g to be negative.

We also tried a proxy for domestic demand pressure as an independent variable in some supply equations. This proxy was the ratio of actual production to the trend level of production of capital goods, represented as QHATR (= QH/QHAT). The elasticity of supply with respect to this variable was expected to have negative sign.

The OLS estimates of the supply equations using log-level and first difference of log of the variables respectively were obtained as follows:

(2.1) log QX = -10.83 - 0.82 log PX - 2.02 log PH
(-2.22) (-1.21) (-1.92)

+ 7.12 log QHAT - 1.07 log QHATR
(5.53) (-1.26)

R^{-2} = 0.93 D.W. = 0.47 SMPL = 61-87

(2.2) DQX = 22.98 - 1.17 DPX + 0.66 DPH - 1.12 DQHAT
(2.55) (-4.15) (1.00) (-2.40)

R^{-2} = 0.43 D.W. = 1.18 SMPL = 61-87

In these equations, DPH = log PH - log PH(-1) and DQHAT = log QHAT - log QHAT(-1).

These equations are clearly not meaningful on economic as well as econometric grounds. Most coefficients do not have the right sign. In some cases t-values are low. These equations also suffer from autocorrelation problems.

The results reported here are the best we could obtain after

trying various combinations of explanatory variables as well as sample periods. Contrary to our expectations, however, the price elasticity with respect to foreign price (i.e., the unit value index of exports) was found to be negative in all equations. This suggested that better results could possibly be obtained if the bias arising from the two-way relationship between export quantities and export prices could be eliminated and supply aspect could be isolated from demand forces. We therefore went for simultaneous estimation of demand and supply equations, following Goldstein and Khan (1978).

An Equilibrium Model of Exports Determination

In this model, we assume that export quantities and prices get determined simultaneously when demand equals supply. In other words, we assume that there are no adjustment lags in the system and equilibrium values get determined instantaneously. (Since we have used annual data, this model assumes that all adjustments take place within a year.)

We use the same demand equation as given above in equation (1), but the supply equation (2) is estimated in a modified form as follows:

$$\log PX = -e/f + (1/f)\ \log QX + (-g/f)\ \log PH + (-h/f)\ \log QHAT \qquad (3)$$

We expect that $(1/f) > 0$, $(-g/f) > 0$ and $(-h/f) < 0$.

Thus, our equilibrium model consists of equations (1) and (3). The structural coefficients were estimated simultaneously using three stage least squares estimator. (This technique is asymptotically full information maximum likelihood, FIML. See Goldstein and Khan (1978, p 278) for its advantages and disadvantages.) The following results were obtained[3].

(3.1) $\log QX = \underset{(109.3)}{4.35} - \underset{(-3.5)}{0.64} \log (PXD/PHU) + \underset{(17.27)}{1.68} \log QXW1$

$R^{-2} = 0.98$ SMPL = 63-87

(3.2) $\log (PX/PH) = 3.90 + \underset{(5.23)}{0.19} \log QX - \underset{(-4.68)}{1.00} \log QHAT - \underset{(-2.77)}{0.31} DUM74$

$R^{-2} = 0.78$ SMPL = 63-87

PHU indicates the domestic price index of capital goods of the United States, used here as a proxy for world prices[4]. (This is because unit value index of world exports of capital goods was not available for the period before 1970.) QXW1 is quantum index of world exports obtained by using PHU as the deflator. DUM74 indicates a dummy for the oil shock of 1973-74.

Notice that homogeneity has been imposed on the price coefficients in these equations. Preliminary results obtained otherwise (i.e., without using homogeneity condition) were not satisfactory, unlike in the case of individual demand equations. This could be because the systems estimation technique employed here is highly sensitive to changes in specification and constraints on coefficients and also to changes in data.

The coefficients have the right signs and they appear to be

significant (although in case of FIML, t-values are only rough indicators of significance). Thus, equations (3.1) and (3.2) constitute our preferred model. The implications are interesting:

i) The price elasticity of demand for exports is (-) 0.64 which is significantly less than (-) 1.6, the elasticity implied by the individual demand equations (1.1) and (1.2) above. This appears to lend support to the view of elasticity-pessimism that India cannot increase its capital goods exports by reducing its prices by, for example, a devaluation of rupees. This view also finds some support from the fact that the elasticity of exports demand with respect to world exports in equation (3.1) is significantly greater than 1 (= 1.68). Because, this implies that demand for India's exports responds more to world exports than to world prices, and thus, cannot be actively promoted by price policies alone.

ii) The implications of the supply equation (3.2) are however quite different from above. It is found that the price elasticity of supply of exports is significantly greater than 1; indeed it is as high as 5.3 (= 1/0.19). This implies that relative profitability has a very important role to play in determining the volume of exports and therefore, a policy of devaluation and/or exports subsidy will tend to increase India's capital goods exports.

iii) A devaluation of the rupee will shift the demand curve to the right, but since it is inelastic, the demand curve will shift by a small extent. If supply curve was flat (i.e., infinitely elastic), exports would have increased by the extent

of shift in the demand curve. But since the supply curve here is positively sloped, the increase in exports will be smaller than the initial shift in demand due to devaluation. Also at the new equilibrium, price would be higher than the initial level. Thus, only a part of the benefits of devaluation will accrue to the suppliers of exports, the rest will accrue to the buyers of Indian exports.

An increase in exports subsidy, on the other hand, will shift the supply curve to the right. Since the supply curve is elastic, the increase in exports subsidy will lead to a more than proportionate shift in the supply curve. At the new equilibrium, therefore, volume of exports will be more while the price will be lower than the initial levels. In this case, since the demand curve is inelastic, a large part of the benefit of exports subsidy will be passed on to the buyers.

Devaluation of rupee simultaneously with an increase in exports subsidy, on the other hand, will shift both the demand and the supply curves to the right. The volume of exports will therefore increase, but the price will not rise as much as the case of devaluation alone, or fall as much as the case of exports subsidy increase alone - it will lie somewhere in between. This is what seems to have happened in the case of Indian capital goods exports: Since both policies (of devaluation and exports subsidies) have been followed, there has been increase in the volume of exports but price of exports has remained more or less stable [5].

iv) The elasticity of supply of exports with respect to

domestic production capacity is also over 5 (=1/0.19). This implies that a one percent increase in capacity would lead to more than five percent increase in exports.

The coefficients of equations (3.1) and (3.2) should, however, be used with caution, because, as mentioned before, they are derived using level variables and may not be reliable. Also, there is a presumption in this model that all adjustments take place within one year, which may not be quite correct. If responses are lagged, a disequilibrium approach that explicitly recognises the dynamic adjustment processes might yield better results.

A Disequilibrium Approach

Depending on whether the exporting country is a large or a small open economy, the dynamic adjustment processes will be different. Exporters in a large open economy are price setters rather than price takers, whereas in a small open economy (small in terms of exports share, in this context) they are price takers rather than setters (Browne, 1982). Accordingly, we tried two dynamic adjustment processes. In both adjustment processes, the basic demand and supply equations are given by (1) and (2) above.

The first adjustment process (used also in Goldstein and Khan (1978)) is based on a large economy assumption. Here, export quantities are assumed to adjust to the difference between the desired demand in current period and the actual flow in the previous period, while the price of exports is assumed to adjust

to conditions of excess supply, i.e.,

$$\log QX - \log QX(-1) = m\,(\log QXd - \log QX(-1)), \quad m > 0 \qquad (4)$$

$$\log PX - \log PX(-1) = n\,(\log QX - \log QXs), \quad n > 0 \qquad (5)$$

In these equations, QX = actual flow of export quantities, QXd and QXs stand for demand for and supply of exports given by equations (1) and (2) respectively, and m and n are the coefficients of adjustment, assumed positive.

Substituting (1) in (4) and (2) in (5) and assuming homogeneity in prices for both demand and supply of exports, we obtain the following equations:

$$\log QX = c0 + c1 \log (PXD/PXW) + c2 \log QXW + c3 \log QX(-1) \qquad (6)$$

$$\log PX = c4 + c5 \log QX + c6 \log PH + c7 \log QHAT + c8 \log PX(-1) \qquad (7)$$

where $c0 = ma$, $c1 = -mb < 0$, $c2 = md > 0$, $c3 = 1-m > 0$,
$c4 = -ne/(1+nf)$, $c5 = n/(1+nf) > 0$, $c6 = nf/(1+nf) > 0$,
$c7 = -nh/(1+nf) < 0$ and $c8 = 1/(1+nf) > 0$.

The second adjustment process is based on the small economy assumption. Here exporters are price takers so that price is determined by conditions of excess demand, while exports quantities adjust to the difference between desired supply in current period and the actual flow in the previous period. Thus,

$$\log PX - \log PX(-1) = m'(\log QXd - \log QX), \quad m' > 0 \qquad (4')$$

$$\log QX - \log QX(-1) = n'(\log QXs - \log QX(-1)), \quad n' > 0 \qquad (5')$$

Again, substituting (1) and (2) in (4′) and (5′) respectively, we obtain,

$$\log PX = k0 + k1 \log QX + k2 \log(PXW*XR) + k3 \log QXW + k4 \log PX(-1) \quad (6')$$

$$\log QX = k5 + k6 \log (PX/PH) + k7 \log QHAT + k8 \log QX(-1) \quad (7')$$

where $k0 = ma/(1+m'b)$, $k1 = -m'/(1+m'b) < 0$, $k2 = m'b/(1+m'b) > 0$, $k3 = m'd/(1+m'b) > 0$, $k4 = 1/(1+m'b) > 0$, $k5 = n'e$, $k6 = n'f > 0$, $k7 = n'h > 0$, $k8 = 1-n' > 0$.

XR stands for the exchange rate (rupees/dollar).

The results corresponding to (6) and (7) are presented below as (6.1) and (7.1), and those corresponding to (6′) and (7′) are presented as (6.1′) and (7.1′). Each pair of these equations was estimated using three stage least squares estimator. Note that the supply equation has been augmented by the additional term, QHATR, a proxy for demand pressure.

(6.1) $\log QX = \underset{(3.21)}{1.20} - \underset{(-3.56)}{0.46} \log (PX/(XR*PHU)) + \underset{(3.83)}{0.66} \log QXW1$

$$+ \underset{(6.05)}{0.54} \log QX(-1) + \underset{(3.3)}{0.42} DUM74$$

$R^{-2} = 0.99$ SMPL = 63-87

(7.1) $\log PX = \underset{(2.69)}{4.4} + \underset{(2.49)}{0.17} \log QX - \underset{(-1.53)}{0.89} \log QHAT + \underset{(2.07)}{0.53} \log PH$

$$- \underset{(-1.19)}{0.30} \log QHATR + \underset{(3.74)}{0.57} \log PX(-1) - \underset{(-2.89)}{0.33} DUM$$

$R^{-2} = 0.93$ SMPL = 63-87

(6.1') log PX - log XR = 3.93 - 0.75 log QX + 0.63 log PHU
(3.45) (-4.46) (2.19)

+ 1.41 log QXW1 - 0.18 LPX(-1)
(3.89) (-0.59)

R^{-2} = 0.90 SMPL = 63-87

(7.1') log QX = 1.28 - 0.98 log (PX/PH) - 0.09 log QHAT
(0.44) (-1.98) (-0.2)

- 0.03 log QHATR + 0.88 log QX(-1)
(-0.06) (7.96)

R^{-2} = 0.98 SMPL = 63-87

It is seen that neither pair of equations is meaningful, although the first pair seems to be preferable to the second pair. The equilibrium model, presented as (3.1) and (3.2) above is clearly preferable to these two disequilibrium models. Note that we have used annual data for all estimations. A year is perhaps sufficiently long to accommodate the adjustment process, and probably that is why the equilibrium model does better than the disequilibrium models. The latter might yield better results when quarterly data are used.

4. An Evaluation of Recent Policies

As mentioned earlier, one way of evaluating Government of India's recent export policies is to compare the actual exports to those predicted by an ex-ante model. If these policies had any significant impact on exports, the predictions from the ex-ante models would differ from actual volume of exports. Depending on whether predicted values are lower or higher than actual values,

it can be judged whether the new policies improved or impaired the growth of exports.

Since the new export-import policies were announced by the Indian government in 1985 (and again in 1988), the ex-ante model to be used for evaluating these policies should cover a period before 1985. The equations of our preferred model above cannot be used since they cover the period upto 1987. For the purpose of this section, therefore, we use a variant of our preferred model estimated for the period 1963-84. The relevant equations are:

$$\log QX = \underset{(100.66)}{4.38} - \underset{(-3.61)}{0.91} \log (PXD/PHU) + \underset{(15.21)}{1.62} \log QXW1 \quad (3.1')$$

$$\bar{R}^2 = 0.98 \qquad SMPL = 63\text{-}84$$

$$\log (PX/PH) = \underset{(3.21)}{2.54} + \underset{(1.66)}{0.10} \log QX - \underset{(-2.84)}{0.63} \log QHAT - \underset{(-2.91)}{0.29} DUM74 \quad (3.2')$$

$$\bar{R}^2 = 0.88 \qquad SMPL = 63\text{-}84$$

In Figure 4, we have plotted the actual value and the predicted value of exports (= predicted quantum X predicted price of exports) obtained using these two equations. It is seen that the magnitudes are fairly close till 1980. There seems to be a jump in 1981, but annual growth rates (predicted and actual) are close till 1985. But in the subsequent two years, the actual growth rates seem to be significantly higher than the predicted ones, as can be seen from the steepness of the curves. In other words, there seems to be a marked improvement in exports after 1985.

We repeated this exercise using the individual demand equation (1.2) which also terminates in the year 1984. The actual and the predicted volumes (in terms of first difference of logs) are plotted in Figure 5. The fit is good since it captures almost all the turning points within the sample period. Even in the two periods after 1984, the predicted volume is close to the actual. That would imply that the policies announced in 1985 did not have any impact till 1986 and hence exports followed the prevalent trend. This is to be expected. In 1987, however, the actual volume is a good deal higher than the predicted volume.

Both the exercises show an improvement in the exports of Indian capital goods after 1985. Two noticeable events took place during 1985-87. One was the announcement of the export-import policy 1985-1988, which is likely to have affected exports directly. The other event was the drought of 1987-88, which, due to depressed domestic demand, might have improved the relative profitability of exports vis-a-vis domestic market. (Note that a drought year would not affect the capacity variable, QHAT, since the latter is obtained from a semilog trend. The effect of drought would be more on the demand side.) Our exercises here seem to support the views expressed in the Economic Survey, 1988-89 (quoted earlier in section 1) that both these events helped the exports of capital goods.

5. Conclusion

The following interesting conclusions emerge from the above discussion:

i) Compared to past performances, exports of capital goods by India have been impressive in recent years. But India has not done as well as some of its cometitors such as Brazil, South Korea and Hongkong.

ii) An interesting fact is that India has been exporting capital goods to the developed countries. However, if the demand for such exports is transitory in nature for some reason (e.g., if the developed countries are phasing out production of conventional machines etc., going in for more sophisticated tools), the recent spurt may not last for long.

iii) The demand for capital goods exports is inelastic, but supply of exports is elastic with respect to prices. This lends support to the view of elasticity pessimists as far as demand is concerned, but contradicts the view that domestic profitability is so high compared to exports that export supply is inelastic to export prices. Under such circumstances, to increase volume of exports along with suitable value realisation, a judicious mix of policies that shift the demand curve (e.g., devaluation) and those that move the supply curve (e.g., exports subsidies) should be adopted.

iv) Aided by depressed domestic demand conditions due to the

drought of 1987-88, the export-import policy announcements of recent years appear to have stimulated exports.

Before we conclude, however, two major weaknesses of this study must be mentioned. First, the robustness of the results particularly in case of the equilibrium model has to be properly checked, because coefficients obtained by using level variables may be unreliable. Secondly, some important variables such as exports subsidies are missing from our models, although data on exports subsidies are not only difficult to obtain, but also are extremely unreliable owing to the complexities and non-quantifiability of the policy regime. Again, two years may not be enough for realising the full impact of a policy package. To that extent, our analyses and conclusions, particularly regarding evaluation of government policies, should be viewed with care.

Also, a major improvement in the analyses can be achieved by greater disaggregation of sectors, although price data at a more disaggregated level are difficult to obtain.

APPENDIX

Data Definition and Sources

All data are annual. Data relating to India are generally for the fiscal year (April-March), whereas those relating to the world are generally for the calendar year (January-December).

QX = VX/PX, indexed with base 1970-71 = 100. VX is value of capital goods exports in rupees and PX, unit value of exports of

capital goods with base 1970-71 = 100. Both are obtained from the Report on Currency and Finance (RCF) published by the Reserve Bank of India. VX is available for 1960-88 whereas PX for 1960-85. We have updated PX for 1985-86 and 1986-87 by using a semi-log trend.

XR is the exchange rate (rupees per dollar) obtained from International Financial Statistics (IFS) published by the International Monetary Fund.

PXW is unit value index of exports of capital goods of the world with base 1970 = 100, obtained for the period 1970-1987 from the Monthly Bulletin of Trade Statistics.

QXW = VXW/PXW, indexed with base 1970 = 100. VXW is value of world exports of capital goods, available for the period 1963-1987, from the Year Book of International Trade Statistics. Since PXW is not available for prior to 1970, the producer price index of capital goods of the United States (PHU) is used as a proxy.

QXW1 = VXW/PHU, indexed with base 1970=100. PHU is available for 1960-87 from the Bureau of Labor Statistics, USA.

PH is the wholesale price index of capital goods of India, obtained from RCF for 1960-88.

QHAT is the trend value of QH, obtained by regressing log QH against time. QH = VH/PH, indexed with base 1970-71=100. VH is the value of domestic production of capital goods of India, obtained from National Account Statistics.

FOOTNOTES

[1] There is some evidence in favour of this view. For example, a report by Malcolm Subhan in the Economic Times dated November 5, 1989 p 8 states, "It is evident that Economic Community machine tool manufacturers are giving up the production of certain lines, including conventional machines and low-cost machine tool accessories and parts". See also Wadhwa and Sharma (1975).

[2] The robustness of this result is again borne out by estimating the demand equation using the homogeneity restriction, b = c. The following result is obtained:

$$DQX = \underset{(-1.21)}{-5.43} - \underset{(-7.90)}{1.70}\ DPR + \underset{(2.54)}{1.44}\ DQXW$$

$R^2 = 0.82$ D.W. = 1.59 SMPL = 71-87

Here, DPR stands for the first difference of log of India's price relative to world price, or, DPR = log(PXD/PXW) - log(PXD(-1)/PXW(-1)) The price elasticity is again close to (-) 1.6.

[3] Coefficients would have been more reliable if first difference of log of variables rather than log of level variables were used. The first difference estimations however did not yield meaningful estimates, so we report log-level estimates only.

[4] The US prices have been used as proxy for world prices in many studies earlier. See for example, Moran (1988), Bhalla (1989) and Ram and Rath (1989).

[5] This argument is not particular to the present case alone, it would generally hold so long as demand curve is downward sloping and supply curve is upward sloping.

REFERENCES

Bhagwati, Jagdish and T.N. Srinivasan. 1975, Foreign Trade Regimes and Economic Development: India, National Bureau of Economic Research.

Bhalla, Surjit S., 1989, Notes on Indian Trade Policy, The Policy Group, New Delhi.

Browne, Francis X., 1982, Modelling Export Prices and Quantities in A Small Open Economy, the Review of Economics and Statistics, pp 346-347.

Gangopadhyay, Subhashis, and Omkar Goswami, 1986, Capital Goods Under Project Imports: A Study of the Indian Fertiliser and Power Industries, The Policy Group, New Delhi.

Government of India, Economic Survey. Various Issues.

Goldar, Biswanath, 1989, Determinants of India's Export Performance in Engineering Products:1960-79, The Developing Economics, XXVII-I,March.

Goldstein, Morris and Mohsin S. Khan, 1978, The Supply and Demand for Exports: A Simultaneous Approach. the Review of Economics and Statistics. May, pp 275-286.

Harinarayan, D., 1983, India's Engineering Goods Exports, Bombay: Himalaya Publishing House.

Kumar, Anjali, 1989, India's Manufactured Exports 1957-1980: Studies in the Export of Non-Traditional Industries, Delhi: Oxford University Press.

Lucas, Robert E.B., 1986, Demand for India's Manufactured Exports. Journal of Development Economics, Vol 29(1), pp 63-76.

Moran, Christian, 1988, A Structural Model for Developing Countries' Manufactured Exports, the World Bank Economic Reiew Vol 2, No 3, pp 321-340.

Pandit, V.N., 1986, Price Adjustments and India's Trade Performance: A Macroeconomic Analysis, Delhi School of Economics

Ram, Kewal and Dillip Rath, 1989, Towards A New Specification of A Trade Model, presented at the UN-ESCAP and RIS Regional Seminar on Interlinked Country Model System, Feb 27-March 1, New Delhi.

Riedel, James, Chris Hall and Roger Grawe, 1984, Determinants of Indian Export Performance in the 1970s, Welt. Archiv, Vol 120, No 1.

Stock, J.H. and M.W. Watson, 1988, Variable Trends in Economic Time Series, Journal of Economic Perspectives, Summer.

Wadhwa, C. D. and O.P. Sharma, 1975, Growth Concentration and Diversification of India's Exports of Engineering Goods: 1956-71, Economic and Political Weekly, April 5.

Table 1

India'Exports of Capital Goods

	Value of Exports in in Billion Dollars	Quantum Index of Capital Goods	Percentage share in world exports	Annual growth rate (percentage)	
				Value of exports	Quantum of exports
1961-62	0.01	7.73	---	-19.97	-16.80
1962-63	0.01	10.19	---	10.52	31.68
1963-64	0.02	10.40	0.05	23.76	2.15
1964-65	0.02	13.97	0.05	16.02	34.26
1965-66	0.03	18.92	0.06	34.54	42.55
1966-67	0.02	25.39	0.04	-12.02	27.43
1967-68	0.03	31.28	0.05	24.13	23.27
1968-69	0.05	53.92	0.08	85.03	72.36
1969-70	0.07	78.92	0.10	42.50	46.36
1970-71	0.10	100.00	0.11	36.02	26.71
1971-72	0.10	90.79	0.10	-0.18	-9.21
1972-73	0.11	95.76	0.09	11.87	5.49
1973-74	0.15	115.23	0.09	33.54	20.31
1974-75	0.27	235.05	0.13	79.56	103.99
1975-76	0.30	195.22	0.12	10.23	-16.94
1976-77	0.33	224.31	0.12	11.85	14.90
1977-78	0.39	237.05	0.12	16.25	5.68
1978-79	0.49	291.89	0.13	23.14	23.10
1979-80	0.56	281.97	0.13	14.55	-3.37
1980-81	0.67	377.34	0.13	19.90	33.82
1981-82	0.69	374.41	0.13	3.86	-0.78
1982-83	0.61	320.29	0.12	-12.11	-14.45
1983-84	0.52	273.06	0.10	-13.77	-14.74
1984-85	0.56	334.88	0.10	6.39	22.64
1985-86	0.57	385.23	0.10	3.05	15.04
1986-87	0.77	530.56	0.11	34.42	37.73
1987-88	1.10	784.09	0.13	42.86	47.76
1988-89	1.60	---	---	44.95	---

Note: The years indicate Fiscal Years i.e., April-March .

Table 2

Destination of India's Export of Capital Goods
(Percent of Total)

	North America	US	Europe	EEC	Centrally Planned Economy	USSR	Asia Developing	Africa
1970	1.40	1.40	NA	7.70	NA	NA	NA	NA
1971	0.80	0.70	17.89	6.25	68.61	2.89	43.52	32.30
1972	1.61	1.35	15.85	4.27	10.50	4.85	49.60	25.45
1973	1.79	1.59	18.04	8.57	10.72	4.51	52.94	16.99
1974	1.91	1.63	14.62	10.43	7.11	4.85	53.08	16.20
1975	1.20	0.99	13.02	7.29	7.99	6.15	56.04	19.67
1976	1.95	1.56	12.22	8.95	10.07	8.04	52.18	23.05
1977	2.66	2.31	12.50	8.63	8.58	6.64	51.76	23.46
1979	4.46	3.89	11.07	8.55	7.08	4.83	46.82	26.74
1980	4.34	3.91	8.25	6.38	12.47	7.87	46.3e	27.04
1983	2.30	2.30	NA	14.80	NA	NA	NA	NA
1984	4.39	4.12	9.32	6.82	29.71	26.02	34.38	21.9.
1985	5.79	5.54	10.52	7.53	36.90	31.04	29.95	17.0e

Source: 'Commodity Trade Statistics' and 'Year Book of International Trade Statistics'.

Table 2.1

Percentage Share of Inida's Exoprts in the Total Developing Market,s Exoprts to Major Regions

	US	EEC	JAPAN	Devloping countries
1970	0.26	4.87	0.35	12.77
1975	0.18	2.50	0.58	6.97
1976	0.17	2.46	0.28	5.46
1977	0.25	2.10	0.17	5.15
1979	0.30	1.36	0.05	4.06
1980	0.32	1.01	0.06	3.63
1983	0.08	1.45	---	0.57
1984	0.11	0.59	0.04	2.08
1985	0.15	0.59	0.12	1.65

Source: "Commodity Trade Statistics" and "Year Book of International Trade Statistics".

Table 2-2

India and its Competitors in West German Market
(Exports of Capital Goods)
Per centage Share

	India	Japan	Argentina	Brazil	China	Hongkong	Korea(Rep.)
1966	0.02	2.08	0.04	0.06	0.01	0.04	0.03
1967	0.02	1.83	0.05	0.12	0.02	0.09	0.03
1968	0.03	2.17	0.01	0.10	0.05	0.15	0.01
1969	0.04	2.55	0.01	0.10	0.04	0.16	0.01
1970	0.06	2.95	0.02	0.16	0.09	0.15	0.01
1971	0.07	3.58	0.03	0.11	0.11	0.17	0.01
1972	0.04	4.33	0.02	0.10	0.00	0.25	0.05
1973	0.06	5.43	0.04	0.08	0.00	0.36	0.07
1974	0.10	4.95	0.02	0.20	0.00	0.42	0.18
1975	0.09	5.21	0.02	0.35	0.00	0.63	0.17
1976	0.08	6.34	0.01	0.33	0.00	0.70	0.26
1977	0.08	7.00	0.01	0.37	0.00	0.64	0.22
1978	0.08	7.27	0.01	0.42	0.00	0.49	0.32
1979	0.06	7.13	0.01	0.38	0.00	0.57	0.34
1980	0.05	10.19	0.00	0.30	0.01	0.56	0.36
1981	0.04	11.89	0.04	0.28	0.01	0.53	0.33
1982	0.04	11.05	0.05	0.33	0.02	0.64	0.29
1983	0.03	12.19	0.03	0.19	0.07	0.61	0.32
1984	0.04	13.96	0.03	0.23	0.11	0.74	0.37
1985	0.04	14.41	0.02	0.34	0.07	0.69	0.52

Source: 'International Year Book' and 'Commodity Trade Statistics'.

Table 2-3

India and Competitors in US Market
(Exports of Capital Goods)
Per centage Share

	India	Japan	Argentina	Brazil	China	Hongkong	Korea (Rep.)
1966	0.01	17.02	0.03	0.02	0.28	1.46	0.04
1967	0.01	15.13	0.08	0.02	0.48	1.32	0.06
1968	0.01	15.31	0.06	0.02	0.76	1.26	0.14
1969	0.01	17.77	0.06	0.05	1.02	1.51	0.27
1970	0.01	20.08	0.07	0.06	1.27	1.49	0.27
1971	0.00	23.17	0.05	0.08	1.46	1.25	0.31
1972	0.01	25.10	0.03	0.14	0.00	1.41	0.45
1973	0.01	22.59	0.05	0.34	0.00	1.51	0.82
1974	0.01	24.47	0.04	0.61	0.00	1.63	1.15
1975	0.02	23.10	0.05	0.49	0.00	1.32	0.94
1976	0.02	28.27	0.04	0.51	0.00	1.50	1.25
1977	0.03	29.32	0.05	0.73	0.00	1.58	1.43
1978	0.03	32.52	0.04	0.80	0.00	1.31	1.55
1979	0.05	31.40	0.05	0.81	0.00	1.38	1.64
1980	0.12	34.86	0.08	0.67	0.01	1.67	1.39
1981	0.05	37.34	0.05	0.75	0.06	1.81	1.50
1982	0.06	35.90	0.12	0.77	0.07	1.78	1.71
1983	0.05	35.70	0.03	0.85	0.05	2.24	2.44
1984	0.06	36.25	0.02	0.91	0.06	2.18	2.31
1985	0.04	38.67	0.02	0.95	0.07	1.57	2.08

Source: 'International Year Book' and 'Commodity Trade Statistics'

Table 2-4

India and Competitors in UK Market
(Exports of Capital Goods)
Per centage Share

	India	Japan	Argentina	Brazil	China	Hongkong	Korea(Rep.)
1966	0.26	1.84	0.02	0.10	----	0.60	0.00
1967	0.25	1.17	0.05	0.02	----	0.10	----
1968	0.04	2.11	0.02	0.04	0.01	0.47	----
1969	0.16	1.68	0.04	0.07	0.03	0.44	0.01
1970	0.16	2.49	0.11	0.05	0.06	0.51	0.01
1971	0.13	3.83	0.06	0.08	0.12	0.61	0.01
1972	0.11	6.83	0.05	0.16	0.01	0.69	0.02
1973	0.12	7.62	0.03	0.19	0.02	0.72	0.05
1974	0.11	7.59	0.03	0.14	0.03	0.63	0.08
1975	0.16	7.65	0.09	0.16	0.04	0.42	0.08
1976	0.11	7.48	0.07	0.20	0.14	0.48	0.15
1977	0.10	8.24	0.09	0.22	0.05	0.47	0.15
1978	0.08	7.83	0.08	0.33	0.05	0.53	0.14
1979	0.09	7.50	0.06	0.20	0.05	0.61	0.19
1980	0.10	8.68	0.06	0.10	0.02	0.75	0.22
1981	0.13	11.76	0.08	0.15	0.03	1.05	0.22
1982	0.37	11.70	0.02	0.13	0.03	0.78	0.29
1983	0.12	12.36	0.00	0.19	0.02	0.81	0.88
1984	0.33	11.59	----	0.21	0.03	1.30	0.49
1985	0.11	11.32	0.00	----	0.03	0.89	0.62

Source : 'International Year Book' and 'Commodity Trade Statistics'.

Table 2-5

India and its Competitors in Italy Market
(Exports of Capital Goods)
Per centage Share

	India	Japan	Argentina	Brazil	China	Hongkong	Korea(Rep.)
1966	0.01	0.51	0.01	0.01	0.01	0.12	
1967	0.01	0.49	0.03	0.06	0.01	0.06	
1968	0.01	0.63	0.02	0.01	0.02	0.08	0.00
1969		0.84	0.01	0.00	0.04	0.10	0.00
1970	0.02	1.01	0.02	0.01	0.04	0.13	0.00
1971	0.01	1.09	0.01	0.05	0.07	0.11	0.01
1972	0.01	1.62	0.03	0.04	0.01	0.09	0.10
1973	0.01	2.42	0.02	0.03	0.01	0.18	0.05
1974	0.03	2.19	0.02	0.03	0.01	0.19	0.06
1975	0.03	2.34	0.02	0.05	0.01	0.17	0.07
1976	0.12	3.50	0.02	0.06	0.01	0.30	0.15
1977	0.21	2.94	0.02	0.36	0.01	0.36	0.22
1978	0.23	2.24	0.35	0.56	0.01	0.26	0.19
1979	0.10	2.17	0.13	0.66	0.01	0.33	0.27
1980	0.03	3.17	0.13	0.82	0.02	0.35	0.26
1981	0.02	3.89	0.19	1.46	0.02	0.36	0.28
1982	0.02	3.55	0.13	2.32	0.03	0.04	0.31
1983	0.01	4.26	0.17	1.99	0.04	0.32	0.24
1984	0.02	5.08	0.16	1.48	0.01	0.40	0.29
1985	0.01	1.85	0.03	0.66	0.01	0.14	0.12

Source: 'Inernational Year Book' and 'Commodity Trade Statistics'

Figure 1 : Direction of India's Capital Goods Exports

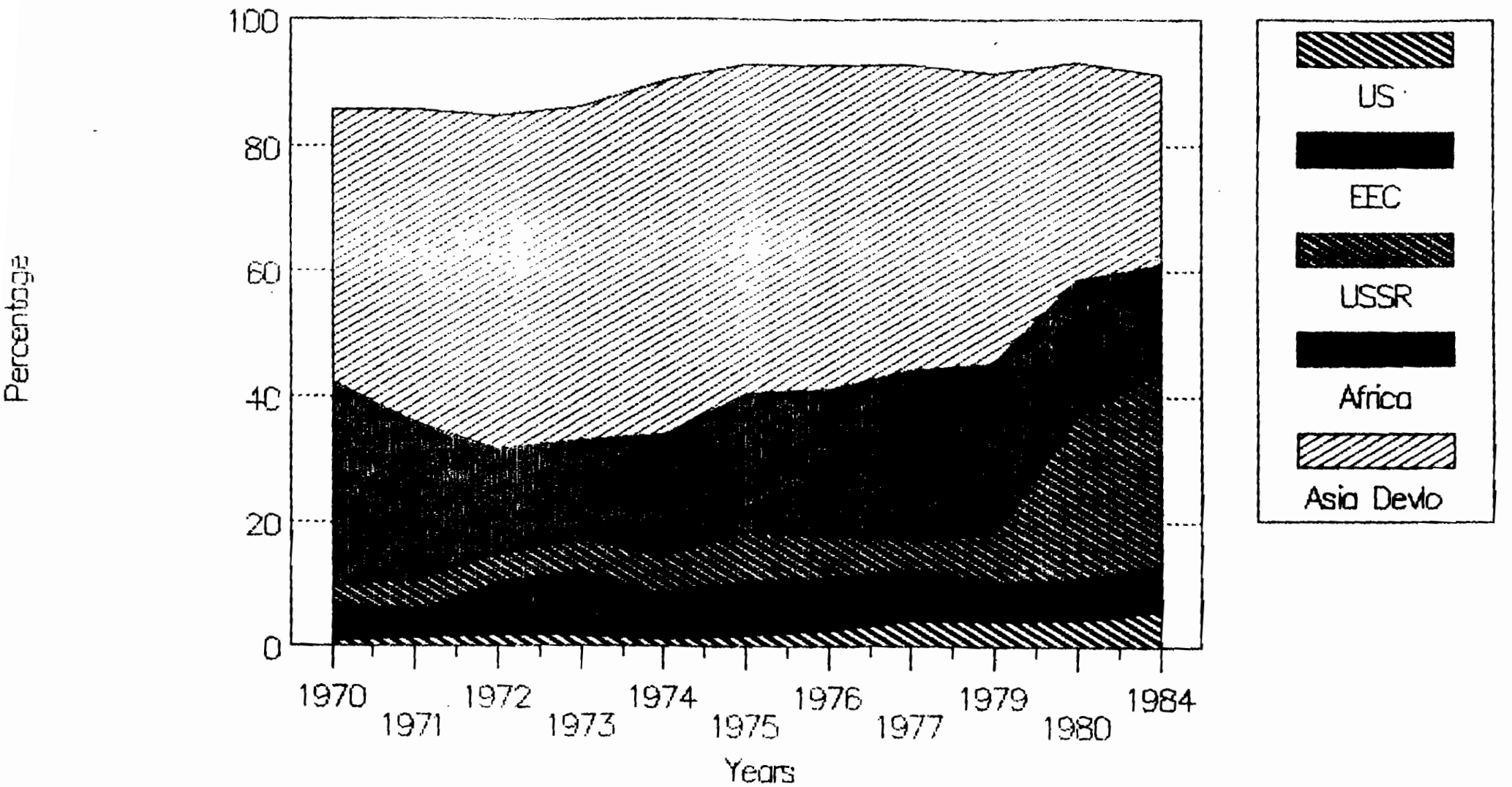


Figure 2: Movement of Indian price (PXD), world price (PXW) and India's volume of capital goods exports(QX)

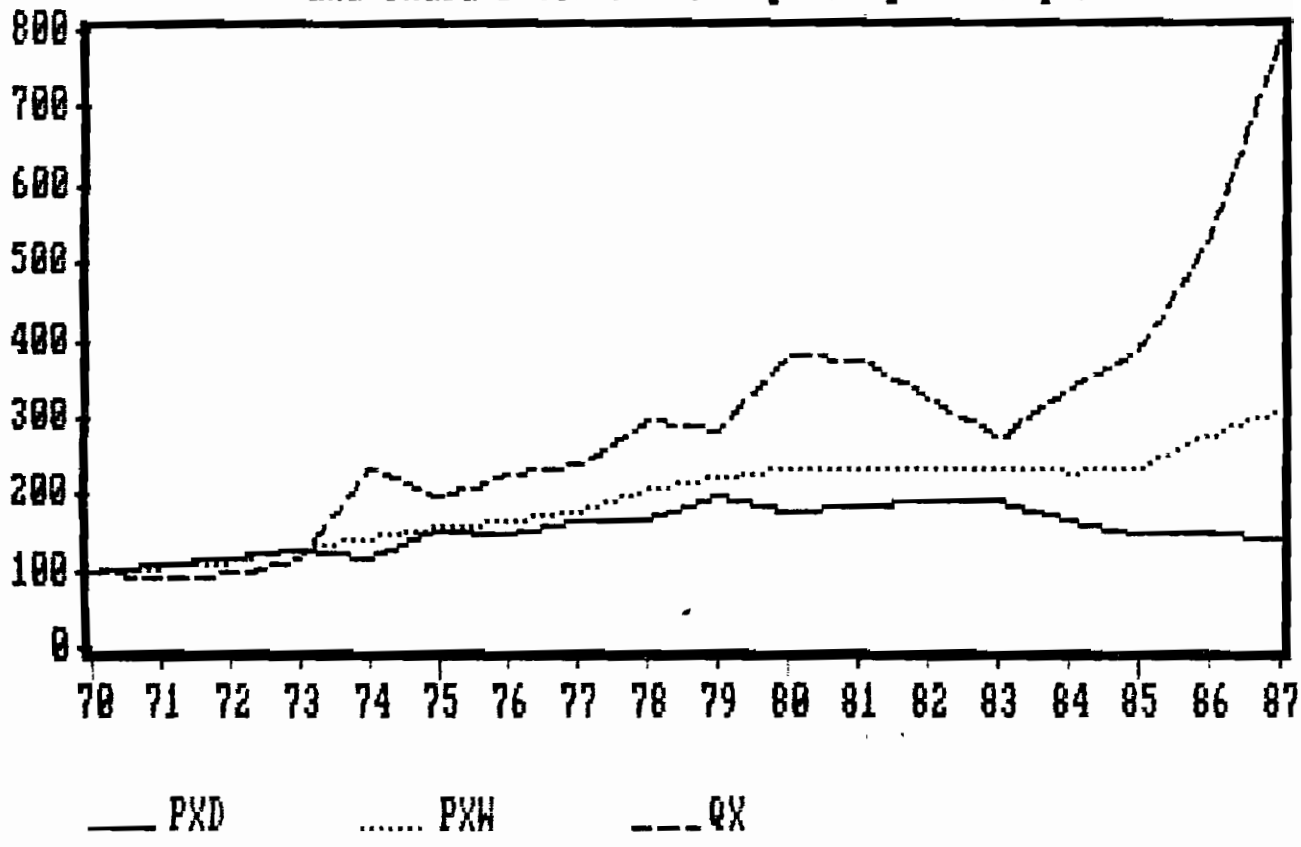


Figure 3: Movement of price (PM) and volume (QM) of India's capital goods imports

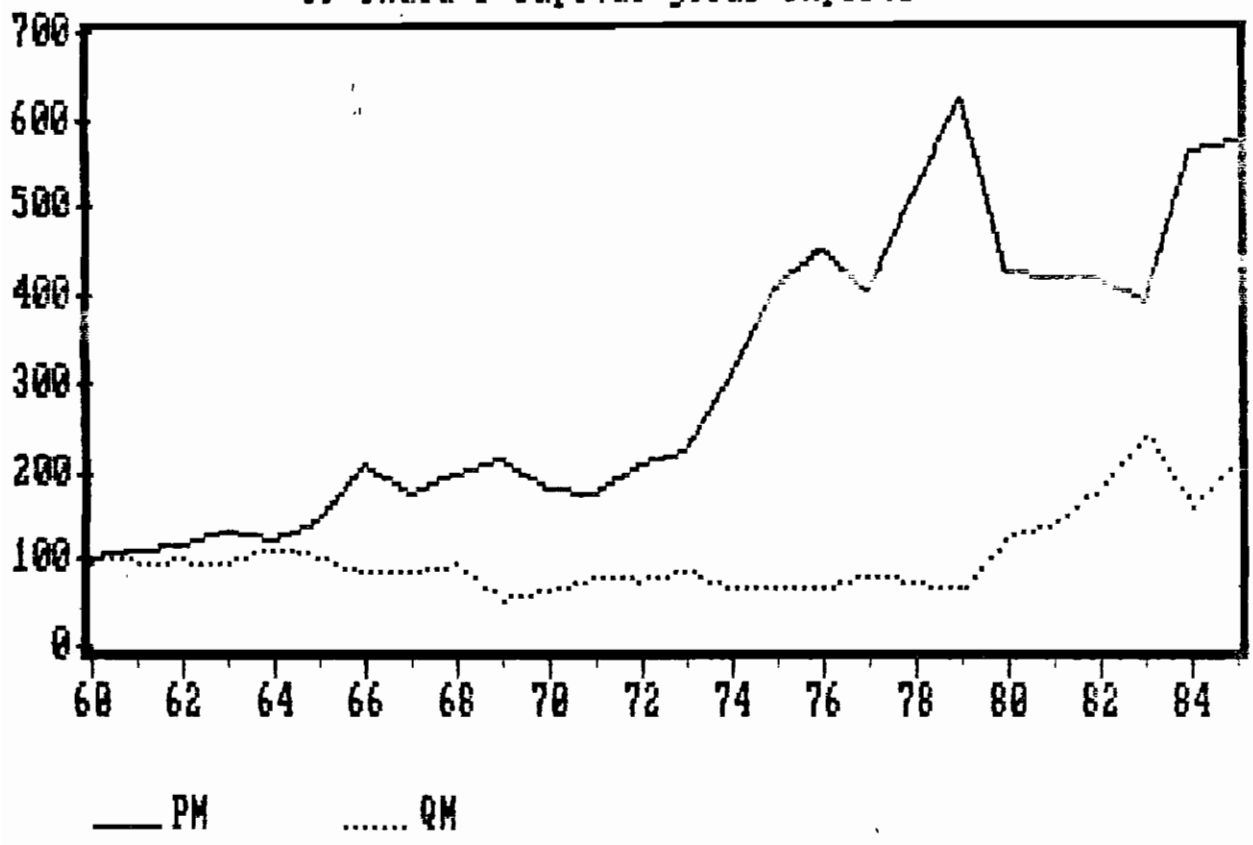


Figure 4: Actual and predicted value of capital goods exports in crores of rupees

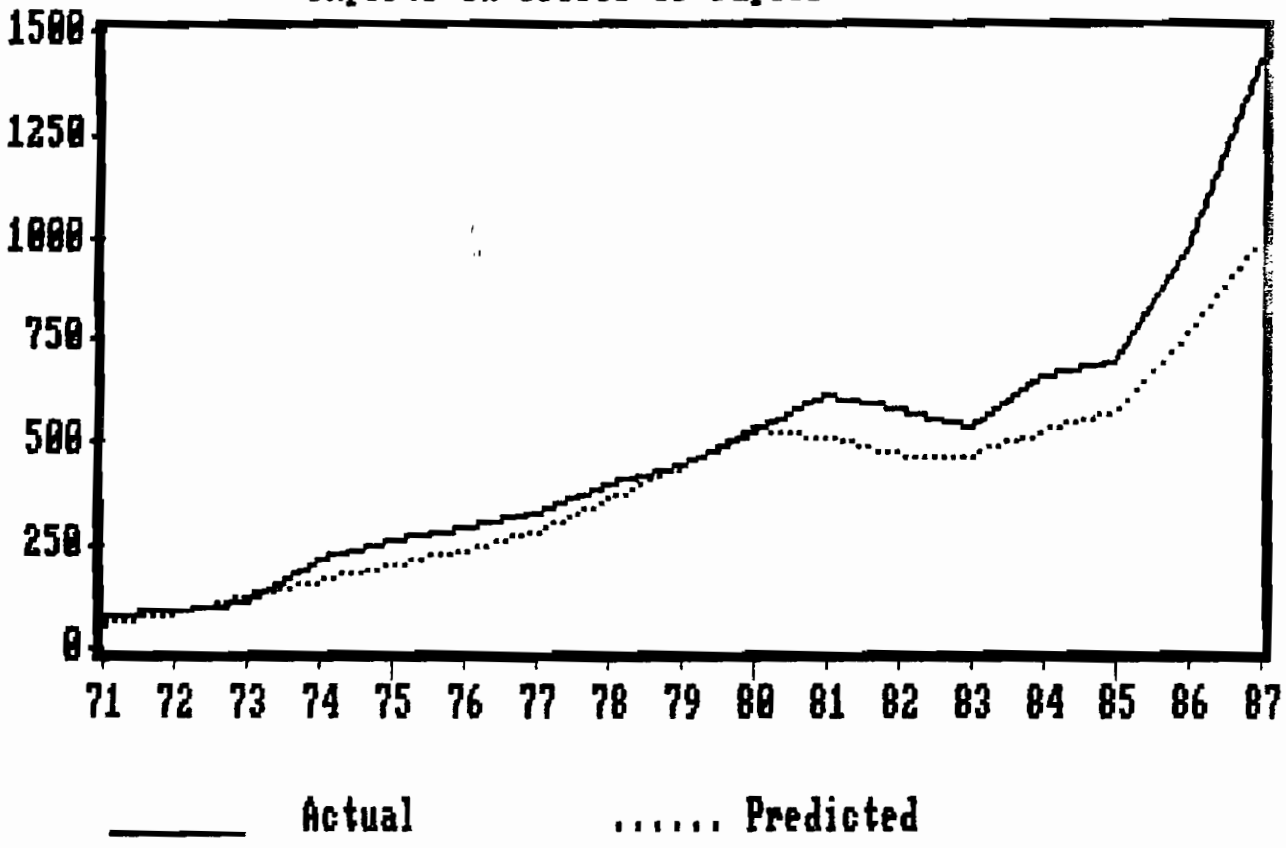


Figure 5: Actual and predicted volume of capital goods exports (in first difference of logs)