PROTECTION, GROWTH AND COMPETITIVENESS : A STUDY OF THE INDIAN CAPITAL GOODS INDUSTRY

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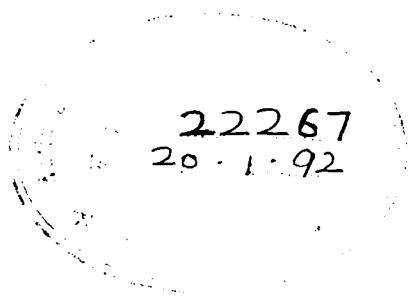

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Abstract

The new trade theory due to Helpman, Krugman and others, taken together with earlier literature on learning effects, factor intensity reversals, etc., imply that general results about the effects of protection could be misleading. Under conditions of increasing returns, or market imperfections, protection could well serve as a strategic export promoting device. The costs and benefits of protection, therefore, need to be evaluated from a dynamic comparative advantage perspective for individual cases: specific products in specific countries. Taking the case of capital goods, which lay at the core of the Nehru-Mahalanobis strategy of State dominated industrialisation under protection in India, this paper first measures the dynamic benefits of protection, in the form of extra growth on account of import substitution. It then goes on to demonstrate that, despite the higher scales of production achieved on account of extra growth over many years, the capital goods industry has failed to become internationally competitive. In the process, the paper also argues that conventional efficiency measures like the domestic resource cost are inappropriate for analysing competitiveness. An alternative measure is then used, which decomposes domestic - international price differences into that component attributable to the inefficiency of capital goods firms themselves and that which is attributable to distortions elsewhere in the system.

PROTECTION, GROWTH AND COMPETITIVENESS : A STUDY OF THE INDIAN CAPITAL GOODS INDUSTRY*

1. Introduction

The Nehru-Mahalanobis strategy of State dominated industrialisation within high protective barriers, which India has implemented for over forty years, has come under increasing criticism in recent years. One view is that the strategy was simply a mistake. That it has blocked rapid, efficient, industrialisation, thereby leaving India behind in the race to achieve higher standards of living in the developing countries. An alternative view recognises the achievements of this strategy, especially compared to conditions prevailing during the colonial period, but maintains that the strategy has outlived its usefulness and should now be replaced by a more market oriented, open economy approach for the next phase of development.

The rationale for much of the ongoing policy reform in India is provided by these views. Their analytical under pinning is provided by traditional trade theory which demonstrated that

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under certain conditions 'free trade' is the best policy for all countries. Indeed, this has been perhaps the single most influential and enduring theorem of economics since the time of Ricardo. Recently a significant literature has emerged which even attempts to measure the costs of protection (Corden, 1985). Second Best variants of this theory recognised a positive role for protective tariffs, etc., as devices necessary to support second best results when the best outcomes were pre-empted by domestic distortions. Though learning effects and increasing return were recognised as a possible justification for protecting infant industries, as advocated originally by Fredrich List, they remained outside the corpus of formal theory.

However, the new trade theory developed during the past decade (Helpman and Krugman, 1985 and Krugman, 1988), which bases itself on increasing returns instead of inter-country differences and comparative advantage, offers a much more powerful explanation of the actually observed pattern of trade as compared to traditional trade theory. It also suggests that temporarily protected domestic markets may actually serve as export promotion devices. Under conditions of increasing returns, which typically characterise manufacturing industry, protection may enable an industry to exploit increasing returns and become internationally competitive. Arrow (1962) type learning effects might also reinforce scale economies, thereby enhancing the competitiveness of a strategically selected industry over time.

Capital goods formed the core of the Nehru-Mahalanobis strategy (Chakravarty, 1987). Hence, the litmus test of the strategy lies in establishing whether or not this process of protection leading to larger scales of production, increasing returns and, finally, international competitiveness has operated

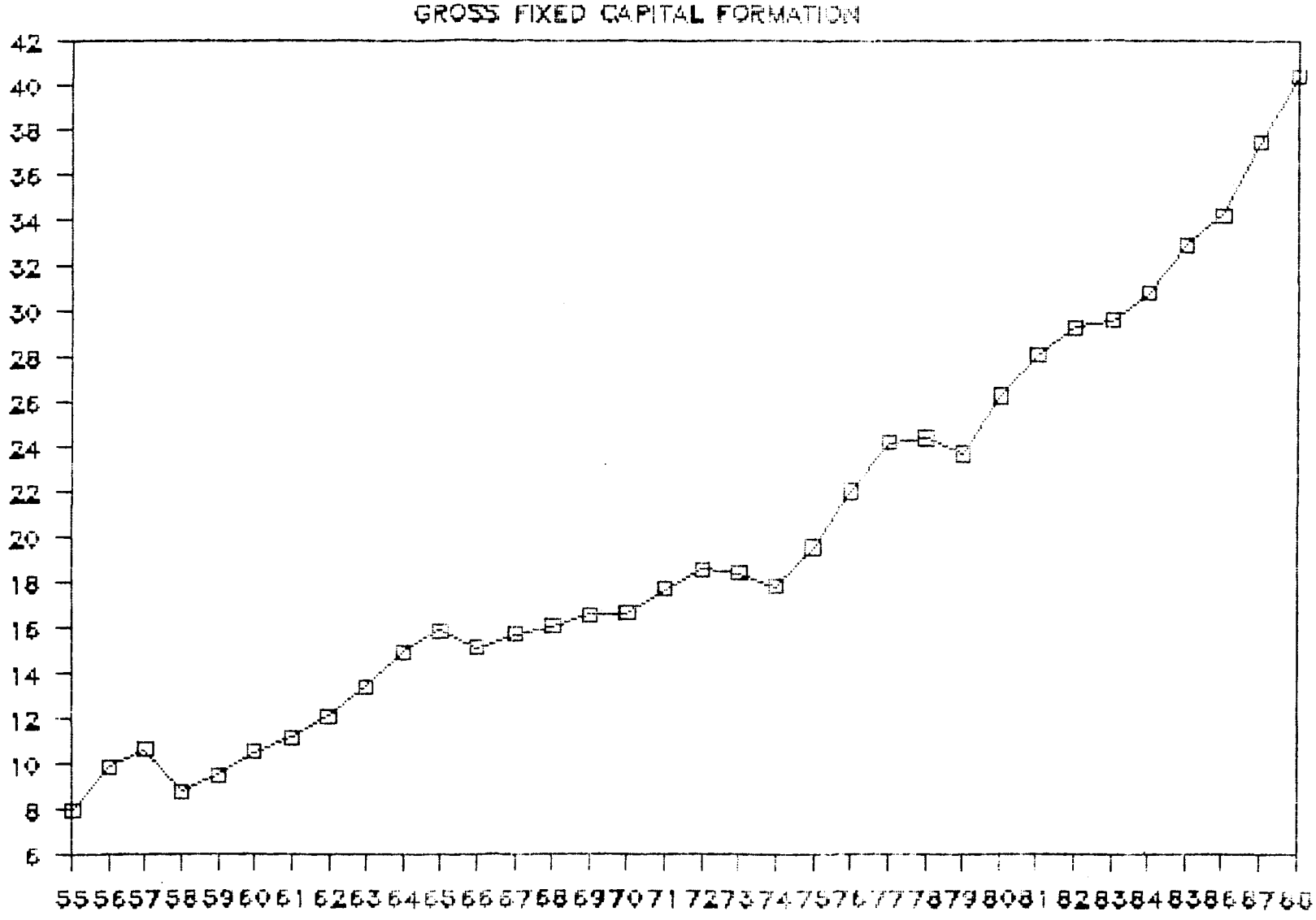
in the case of the capital goods industry, where India is supposed to have dynamic comparative advantage (Bardhan, 1991). The question is addressed in two parts in this paper. In Part 2 of the paper an attempt is made to estimate to what extent protection enabled the domestic capital goods industry to attain a larger scale of production, i.e., the extra growth attributable to import substitution. In part three the competitiveness of Indian capital goods industries is analysed with the help of an alternative measures, after it is demonstrated that conventional measures such as the domestic resource cost or effective rate of protection are inappropriate for this purpose in the presence of distortions elsewhere in the system.

2. Investment, Import Substitution and Growth in Capital Goods Production

In this section we analyse the growth performance of the capital goods industry in India and calculate how much extra growth, if any, is attributable to import substitution in a protected trade regime.

Figure 1 plots the increase in total absorption of new capital goods in the economy, as measured by Gross Fixed Capital Formation (GFCF). It shows distinct discontinuities or kinks between sub-periods in the rate of growth. Conventionally, in such cases, sub-period growth rates would be estimated by fitting separate exponential curves by OLS techniques to each sub-period or by fitting a single curve with intercept and slope dummies for each sub-period, which is much the same thing. However, the problem with this method is that it can lead to strange results, e.g., all sub-period growth rates simultaneously exceeding or

FIG 1



Y axis: Gross Fixed Capital Formation in rupees thousand crores at 1980-81 prices.

X axis: t = 1955-56,....., 1988-89.

falling short of the growth rate for the period as a whole (Boyce, 1986 and Goldar and Seth, 1989). If there is a large positive deviation from trend growth immediately prior to the kink and a large negative deviation immediately after then the growth rate in both periods are upward biased. In the reverse situation they would be downward biased. These anomalies can be considerably reduced by introducing certain linear restrictions (Poirier, 1976). In log-linear models the introduction of such restrictions yields a kinked exponential function which can be estimated with standard OLS packages. This is the method followed in the present paper.

Briefly the logic of this method is as follows. Consider a simple case when a time series Y_t for the period $t = 1, 2, \ldots\ldots, n$ is broken at k. Discontinuous growth rates for the two sub-periods can be obtained by estimating two separate equations or, equivalently, by fitting the single equation

$$\ln Y_t = a_1 D_1 + a_2 D_2 + b_1 D_1 t + b_2 D_2 t + U_t \qquad (1)$$

where D_i $(i = 1, 2)$ is a dummy variable taking the value 1 in the i^{th} sub-period and o otherwise.

Discontinuity can be avoided by using a linear restriction such that the two lines intersect at the break point k;

$$a_1 + b_1 k = a_2 + b_2 k \qquad (2)$$

It should be noted that $a_1 D_1 + a_1 D_2 = a_1$. Now substituting for a_2, we derive the restricted form,

$$\ln Y_t = a_1 + b_1 (D_1 t + D_2 k) + b_2 (D_2 t - D_2 k) + U_t \qquad (3)$$

The OLS estimates of b_1 and b_2 from (3) give the exponential growth rates for the two sub-periods. There is a kink between the two trend lines whenever b_1 and b_2 are significantly different.

The restricted equation of the two-kink model can be derived similarly, yielding the expression

$$\ln Y_t = a_1+b_1 (D_1t+D_2k_1+D_3k_1)+b_2 (D_2t-D_2k_1-D_3k_1+D_3k_2) + b_3 (D_3t -D_3k_2) + U_t \quad (4)$$

The scatter of gross fixed capital formation in Figure 1 clearly indicate two kinks in the years 1965-66 and 1974-75, demarcating the three sub-periods 1955-56 to 1965-66, 1965-66 to 1974-75 and 1974-75 to 1988-89. For reasons which will be obvious, these sub-periods are described as the Mahalanobis period, Stagnation period and Recovery period.

Growth rates of Gross Capital Formation (GFC), Gross Fixed Capital Formation (GFCF), change in stocks, etc., for these three periods, estimated by fitting a kinked exponential growth curve, are presented in Table 1. It will be seen from the table that the growth rate of gross capital formation declined only mildly from 5.5 per cent in the first period to 4 per cent in the Stagnation period, later recovering to about 4.9 per cent. However, what matters for the size of the capital goods market is the growth rate of Gross Fixed Capital Formation. This declined very sharply from almost 6 per cent in the Mahalanobis period to less than 3 per cent in the next period, later rising to a little over 5 per cent in the Recovery period.

TABLE 1

Panel A: Kinked Exponential Growth Rates (1980-81 Prices)

	GCF	GFCF	GFCF (PUB)	GFCF (PVT.)	CST
1955-56 to 1965-66	5.5	5.9	7.1	4.9	2.1
1965-66 to 1974-75	4.0	2.8	1.3	4.0	12.0
1974-75 to 1988-89	4.9	5.1	7.9	3.5	3.9

Panel B: Composition of Capital Formation (Percentage Shares)

	GFCF/GCF	CST/GCF	GFCF (PUB)/ GFCF	GFCF (PVT.)/ GFCF
1955-56	90.5	9.5	41.5	58.5
1965-66	93.3	6.7	49.5	50.5
1974-75	77.4	22.6	38.8	61.2
1988-89	85.8	14.2	47.5	52.5

Source: National Accounts Statistics, various issues.

Notes: GCF: Gross Capital Formation.
GFCF: Gross Fixed Capital Formation.
GFCF (PUB): Gross Fixed Capital Formation in the Public Sector.
GFCF (PVT.): Gross Fixed Capital Formation in the Private Sector.
CST: Change in Stock.

The difference between growth rate changes of the GFC and GFCF series is accounted for by a very sharp increase in the rate of growth of inventory accumulation, which accelerated from just over 2 per cent in the Mahalanobis period to as much as 12 per cent in the Stagnation period, later settling back to under 4 per cent. With this massive build up of inventories, the share of stock changes in total capital formation, which was less than 7 per cent at the beginning of the Stagnation period, 1965-66, had risen to over 22 per cent by the end of that period.

Within fixed capital formation, it was public investment which experienced a major shock, its growth rate falling from over 7 per cent in the Mahalanobis period to a little over 1 per cent in the Stagnation period. However public investment completely recovered and returned to the original 7.1 per cent growth path in the Recovery phase. The growth rate of private investment, on the other hand, declined more gently but monotonically from 4.9 per cent in the Mahalanobis period to 4 per cent in the Stagnation period to 3.5 per cent in the Recovery period.

The growth of fixed capital formation analysed above is a measure of the growth in total absorption of capital goods or the demand for capital goods[1]. We now turn to domestic supply or the

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1. The level of aggregate fixed capital formation increases total demand for capital goods. Total demand and changes in the degree of import substitution are the two major non-price variables which effect the level of demand for domestically supplied capital goods. Whereas changes in relative prices would cause a movement along the demand curve, changes in non-price factors would cause the curve itself to shift. Barring the case of large variations in the relative price of capital goods, changes in the level of demand for domestically supplied capital goods over time would be dominated by such shifts of the demand curve as a consequence of changes in these non-price variables.

growth in domestic production of capital goods. Data on output for the capital goods sector is not available for the period prior to 1960-61, leaving out the classic Mahalanobis period. However, the Net Value Added (NVA) time series is available for the entire period upto 1984-85 in National Accounts Statistics. The plot of the NVA series in Figure 2 shows that there are three distinct growth phases from the beginning of the Second Five Year Plan separated by kinks in the years 1964-65 and again 1975-76. Accordingly, growth rates have been calculated for these three sub-periods which correspond to the Mahalanobis Period, Stagnation Period and Recovery Period identified earlier[2].

The estimates of sub-period growth of net value added for different groups of capital goods are presented in Table 2. In the case of non-electrical machinery during sub-period 1955-56 to 1964-65, which we have called the classic Mahalanobis period, growth was a phenomenal 22.5 per cent and this collapsed to less than 5 per cent in the period 1964-65 to 1975-76 which we describe as the period of Stagnation. Subsequently, during 1975-76 to 1984-85 which we call the period of Recovery, the growth rate increased to 5.8 per cent. However this is not significantly different from the growth of value added in non-electrical machinery during the Stagnation period.

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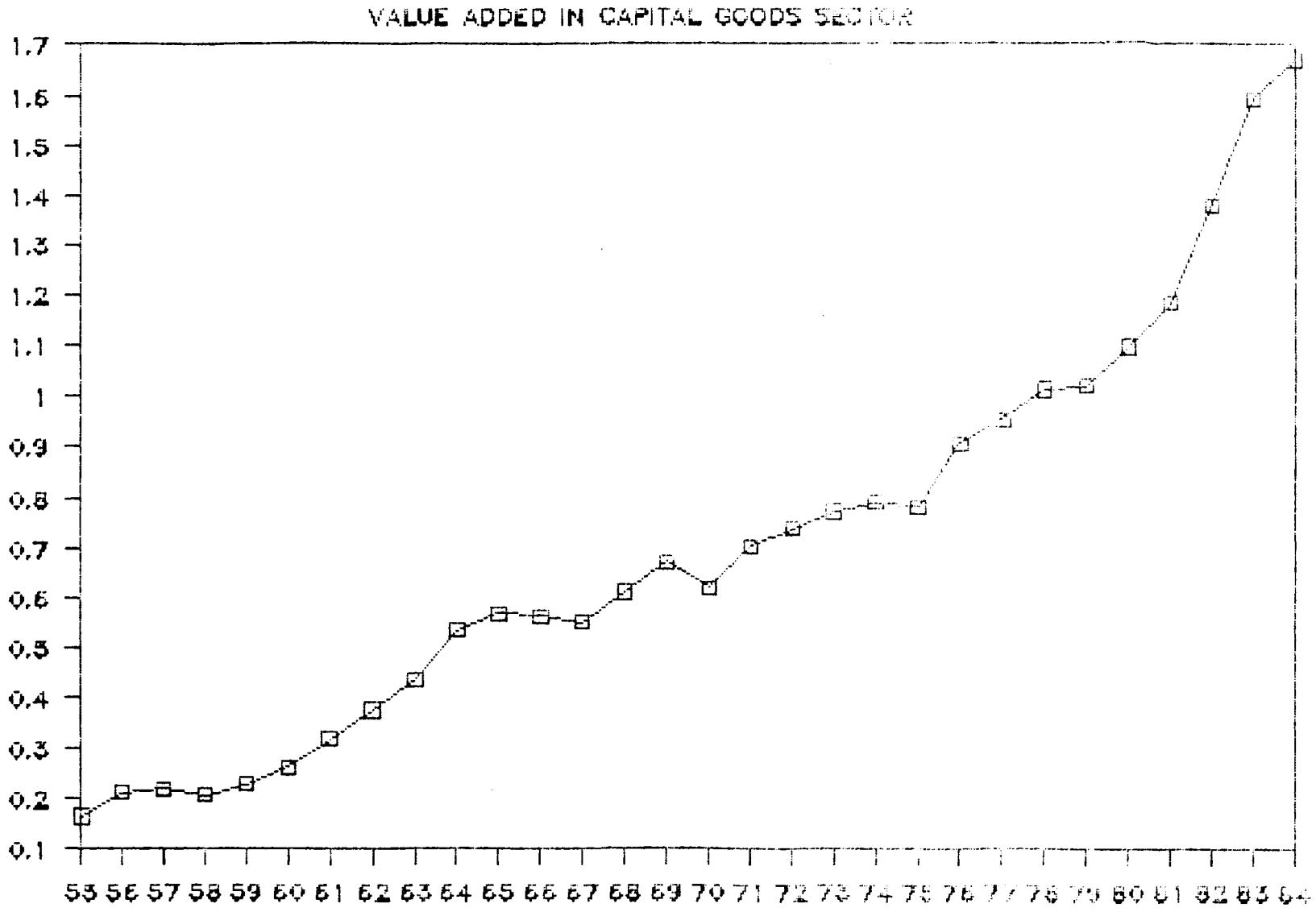
2. Analysis of the NVA series for capital goods in the registered sector has not been extended beyond 1984-85 since NVA estimates for different components of capital goods are not available after 1984-85. However, it has been checked that the growth rate does not change significantly in the case of all capital goods taken together if the series is estimated even upto 1988-89.

FIG 2



Y axis: Net Value Added in capital goods sector in rupees thousand crores at 1970-71 prices.

X axis: t = 1955-56,....., 1984-85.

In the case of electrical machinery, again, an output growth rate of over 16 per cent in the Mahalanobis period fell to about 9 per cent in the Stagnation period and fell still further to about 7.8 per cent in the last period. This is in sharp contrast to the pattern observed in transport equipment where the growth rate fell from about 7.5 per cent in the Mahalanobis period to less than 1 per cent in the Stagnation period and then sharply recovered to over 8 per cent in the last phase.

TABLE 2

Kinked Exponential Growth of Real Net Value Added in Capital Goods Sector (Registered)

(1970-71 Prices)

Industry Group	1955-56 to 1964-65	1964-65 to 1975-76	1975-76 to 1984-85
Non-electrical machinery	22.5 (=, >, >)	4.7 (<, =, =)	5.8 (<, =, =)
Electrical machinery	16.1 (=, >, >)	9.3 (<, =, >)	7.8 (<, <, =)
Transport equipment	7.5 (=, >, =)	.8* (<, =, <)	8.3 (=, >, =)
All capital goods	12.7 (=, >, >)	4.5 (<, =, <)	7.4 (<, >, =)

Notes: 1 Symbols in parentheses indicate whether the growth rate is significantly greater than, less than or equal to the growth rate of periods 1955-56 to 1964-65, 1964-65 to 1975-76 and 1975-76 to 1984-85 respectively.

2. Significance tests are carried out at the 5 per cent level.

* Growth rate is not significantly different from zero.

The large weight of transport equipment is reflected in the growth phases of all capital goods taken together which mimics that of transport equipment, i.e., a sharp decline from 12.7 per cent in the Mahalanobis period to only 4.5 per cent in the Stagnation period and then a recovery to about 7.4 per cent in Recovery period. The case of electrical machinery where growth continued declining during the Recovery period appears to be an exception.

However, the comparison of phases based on the net value added data needs some qualification in the light of comparisons of the Stagnation and Recovery period based on some alternative sets of data. The data presented in Table 2 refers to capital goods production in the registered sector only. However, for the period after 1970-71 we also have data on net value added in capital goods production in the unregistered sector. Estimates of the growth of NVA for different categories of capital goods in the combined data set are presented in Table 3.

These show that during the Recovery period 1975-76 to 1984-85 growth in the electrical machinery sector, at over 8 per cent, was higher than the 6 per cent recorded in the previous period, whereas growth in non-electrical machinery, at 5.6 per cent, during the Recovery period was lower than the 7 per cent growth recorded in the earlier period. However, in a statistical sense, growth rates in the Recovery period are not significantly different from the growth rates of the previous period in either case. By contrast the transport equipment sector does show a sharp recovery, the growth rate rising from less than zero during the earlier period to over 8 per cent during the Recovery period.

Again, the dominant size of this sub-sector is reflected in the all capital goods growth pattern where growth is seen to have accelerated significantly in the Recovery period.

TABLE 3

Kinked Exponential Growth of Real Net Value Added in Capital Goods Sector (Registered Plus Unregistered)

(1970-71 Prices)

Industry Group	1970-71 to 1975-76	1975-76 to 1984-85
Non-electrical machinery	7.0 (=, =)	5.6 (=, =)
Electrical machinery	6.0 (=, =)	8.1 (=, =)
Transport equipment	-0.7* (=, <)	8.1 (>, =)
All capital goods	4.0 (=, <)	7.3 (>, =)

Notes: Symbols in parentheses indicate whether the growth rate is significantly greater than, less than or equal to the growth rate of periods 1970-71 to 1975-76 and 1975-76 to 1984-85 respectively.

* Growth rate is not significantly different from zero.

Growth comparisons covering the Mahalanobis period (1955-56 to 1964-65) can only be undertaken on the basis of the NVA series since capital goods output (registered sector) data is available only after 1960-61. However, the output series can be used to compare the Stagnation period (1964-65 to 1975-76) with the Recovery period for which the disaggregated time series is now available upto 1988-89. From the output series comparison in Table 4 we find that in the case of non-electrical machinery, growth during the Stagnation period was actually significantly higher than growth during the Recovery period which is now divided into two sub-phases 1975-76 to 1983-84 and 1983-84 to 1988-89. In

TABLE 4

Kinked Exponential Growth of Real Output in Capital Goods Sector (Registered)

(1970-71 Prices)

Industry Group	1964-65 to 1975-76	1975-76 to 1983-84	1983-84 to 1988-89
Non-electrical machinery	8.1 (=, >, =)	6.9 (<, =, =)	7.6 (=, =, =)
Electrical machinery	10.8 (=, >, <)	8.3 (<, =, <)	13.6 (>, >, =)
Transport equipment	2.9 (=, <, <)	7.3 (>, =, =)	9.2 (>, =, =)
All capital goods	6.9 (=, =, <)	7.5 (=, =, <)	10.5 (>, >, =)

Note: Symbols in parentheses indicate whether the growth rate is significantly greater than, less than or equal to the growth rate of periods 1964-65 to 1975-76, 1975-76 to 1983-84 and 1983-84 to 1987-88 respectively.

the case of Electrical Machinery, again, growth in the first sub-phase of the Recovery period was lower at 8.3 per cent compared to 10.8 per cent during the Stagnation period. However, in the second sub-phase, 1983-84 to 1988-89, the growth rate sharply accelerated to over 13.5 per cent.

Finally, in the case of transport equipment, growth during the first sub-phase of the Recovery period at 7.3 per cent was already significantly higher than the 2.8 per cent recorded during the Stagnation period. It accelerated still further to 9.2 per cent in the second sub-phase of Recovery. The aggregate picture of output growth for all capital goods taken together shows that growth in the first sub-phase of Recovery was higher but not significantly different from that of the Stagnation period. It is only after 1983-84 that a statistically significant recovery is observed, with growth accelerating to 10.5 per cent as compared to 6.9 per cent in the Stagnation period and 7.5 per cent during the sub-phase 1975-76 to 1983-84.

Putting together the analysis of growth rates in different phases for different groups of capital goods according to the three time series NVA (registered), NVA (registered and unregistered) and gross output, the picture which emerges is the following. The growth of all categories of capital goods in the classic Mahalanobis period (1955-56 to 1964-65) were distinctly higher than in any period thereafter. It was followed by a very sharp deceleration of growth in the period of Stagnation, the growth of NVA in some items like transport equipment declining to zero.

The picture of subsequent recovery is more ambiguous. In the case of non-electrical machinery NVA, both registered and total, no recovery is evident at all in the period right up to 1984-85. For the non-electrical machinery output series growth in the entire period after 1975-76 upto 1988-89 was actually significantly lower than that recorded in the Stagnation period of 1964-65 to 1975-76, i.e., the Stagnation period continued up to 1988-89, the last year for which data is now available. In the case of electrical machinery NVA, again, no recovery is observable. Instead, in the registered sector the NVA growth in the Recovery period (1974-75 to 1984-85) was significantly lower than in the Stagnation period. However, the output series (Table 4) does show a sharp recovery after 1983-84. We would conjecture that this divergence is largely explained by the dramatic increase in production of electronic goods, especially consumer electronics and computers included in this category, for which there is relatively little value addition.

Finally, in the case of transport equipment the recovery after 1975-76 is quite clear in the case of both NVA (total) as well as NVA (registered sector). The output series shows even further acceleration in the period after 1983-84. As mentioned above, the large weight of this category dominates the picture for capital goods taken as a whole, which shows the significant acceleration of NVA growth, both total and registered, for the period 1975-76 to 1984-85. Hence, the designation of this period as the period of Recovery. However, significant recovery of growth of all capital goods in the output series only shows up after 1983-84. In other words, the recovery of capital goods production that has occurred since the mid-seventies is largely

concentrated in the transport equipment sector. It is not evident at all in non-electric machinery and not evident in the two value added series (registered and total) for electric machinery either.

Thus, the overall growth periodisation of capital goods production appears to have closely followed that of fixed capital formation analysed earlier. However, while in the Recovery period the growth rate of fixed capital formation had fully recovered to that of the Mahalanobis period[3], the recovery of capital goods production was partial as pointed out above. Moreover, it is not evident at all in terms of the value added series if transport equipment is excluded. This continuing 'stagnation' of non-transport capital goods, even though fixed capital formation had fully recovered, is explained by the exhaustion of import substitution possibilities or the elimination of the extra growth of domestic production attributable to protection.

The changing share of imports in net domestic availability of different capital goods, i.e., domestic production plus imports less exports, is presented in Table 5. This series is not available prior to 1960-61. However, it is evident that for each category of capital goods the import share was distinctly declining upto the early seventies and stabilised thereafter. For non-electrical machinery the share stabilised at around one quarter of availability. In electrical machinery the share settled at around one-tenth. In transport equipment it had declined to about 8 per cent by the early seventies.

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3. The Recovery period growth rate of 5.1 per cent is not significantly different from the Mahalanobis period growth rate of 5.9 per cent.

TABLE 5

Capital Goods: Domestic Production, Exports and Imports

(Rupees Crore, Current Prices)

	Year	Domestic Production	Export	Import	Net Availability (Column 2 + (Column 4 - Column 3)	Import Share (Column 4 as Percentage of Column 5)
	(1)	(2)	(3)	(4)	(5)	(6)
1. Machinery, machine tools and parts except electrical machinery	1960-61 to 1962-63	158	3	230	385	59.8
	1965-66 to 1967-68	407	6	359	760	47.3
	1970-71 to 1972-73	816	28	276	1064	25.9
	1975-76 to 1977-78	1982	122	659	2519	26.2
	1985-86 to 1987-88	8589	421	2793	10961	25.5
2. Electrical machinery, apparatus and appliances	1960-61 to 1962-63	136	1	63	197	31.8
	1965-66 to 1967-68	367	5	93	456	20.4
	1970-71 to 1972-73	794	20	103	877	11.7
	1975-76 to 1977-78	1910	78	188	2019	9.3
	1985-86 to 1987-88	9439	214	1039	10264	10.1
3. Transport equipment and parts	1960-61 to 1962-63	347	2	70	415	16.8
	1965-66 to 1967-68	634	5	71	700	10.2
	1970-71 to 1972-73	989	35	87	1041	8.4
	1975-76 to 1977-78	1625	99	184	1710	10.8
	1985-86 to 1987-88	8745	216	711	9240	7.7
4. Total	1960-61 to 1962-63	641	6	363	997	36.4
	1965-66 to 1967-68	1408	16	524	1916	27.3
	1970-71 to 1972-73	2383	82	466	2767	16.8
	1975-76 to 1977-78	5517	300	1031	6248	16.5
	1985-86 to 1987-88	26773	851	4543	30465	14.9

Source: Chandok (1990), Vol. I; National Accounts Statistics (various issues) and Report on Currency and Finance, Reserve Bank of India (various issues).

Note: The figures in columns (2) to (6) are averages for the sub-periods.

Thus during the Mahalanobis period, when domestic capital goods production recorded the highest rates of growth, it was driven by both a high rate of growth of fixed investment and by import substitution. In the Stagnation period there was a sharp decline in the growth of fixed capital formation, especially in the public sector, leading to a distinct fall in the growth of domestic capital goods production. But the fall was partly cushioned by continuing import substitution.

In the final Recovery phase even though the rate of growth of fixed capital formation had fully recovered, the reinforcing effect of import substitution had been exhausted. Consequently, the recovery of growth in domestic capital goods production has remained partial. In this sense we may say that the extra growth recorded on account of import substitution in the Mahalanobis period, as compared to the Recovery period, is a measure of the benefit of protection[4]. This works out to 17 per cent, 8.3 per cent and 5.3 per cent respectively for non-electrical machinery, electrical machinery and all capital goods respectively.

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4. Formally, where K, I and d represent respectively domestic capital goods production, the domestic absorption of capital goods and the share of domestic production in absorption, or the degree of import substitution, we have

$$K = d.I \qquad (5)$$

which yields the growth identity

$$g_K = g_d + g_I \qquad (6)$$

where g_i represents the rate of change of i = k, d, I. Indexing the Mahalanobis period, Stagnation period and Recovery period by the time superscript t = 1, 2, 3, and defining $g^{13}_i = g^1_i - g^3_i$ we have

$$g^{13}_k = g^{13}_d + g^{13}_I \qquad (7)$$

Assuming $g^3_d = o = g^{13}_I$ as a stylised fact we have

$$g^{13}_k = g^1_d \qquad (8)$$

Similarly, continuing import substitution during the Stagnation period helped to maintain the growth of capital goods at a level higher than what it would have been in the absence of further import substitution. This too must be counted as the benefit of protection in that period.

Price Competitiveness of Indian Capital Goods

The previous section focused on the benefits of protection in a dynamic perspective as reflected in the extra growth of capital goods production attributable to import substitution. The policy of protection could be regarded as successful in establishing a competitive capital goods industry in India if the years of extra growth attributable to import substitution had yielded economies of scale, learning effects, etc., which made Indian capital goods price competitive with comparable products from the rest of the world.

Here, a distinction must be made between price competitiveness and factor cost inefficiency. Conventional measures of the latter, such as the domestic resource cost or effective rate of protection, usually employed in protection literature are inappropriate as indicators of price competitiveness. This is easily established by the following examples: Take a case where there is no difference between the value added per unit of output at home (V_d) and abroad (V_f) but input costs per unit at home (C_d) exceed input costs abroad (C_f) because of trade restrictions, market distortions or simply the presence of non-tradeable inputs, e.g., power. The domestic resource cost of the product (V_d/V_f) is equal to one, or the effective rate of protection ($V_d/V_f - 1$) is zero, indicating that the domestic product is internationally competitive. However, the

unit price of the domestic product ($C_d + V_d$) will exceed the border price or c.i.f. price ($C_f + V_f$) implying that the domestic product is actually not price competitive.

Conversely take a case where $V_d > V_f$ but $C_d < C_f$ and $(V_d - V_f) < (C_f - C_d)$. Here, the domestic resource cost is greater than 1, or the effective rate of protection greater than Ø, suggesting that the domestic product is not internationally competitive. In fact, in this case the price of the domestic product ($V_d + C_d$) is less than the border price ($V_f + C_f$).

These examples clearly establish that measures designed to study the allocative inefficiency of the system are inappropriate indicators of competitiveness of particular products. They could give misleading signals in the presence of distortions elsewhere in the system. At the same time, when a product is found to be uncompetitive in prices, it is necessary for policy purposes to disentangle the different elements contributing to the domestic - international price difference and establish how much of the price difference is attributable to inefficiency within the industry and how much is attributable to exogenous factors beyond the control of the industry.

In the present exercise differences between the domestic and international price of capital goods, maintained through tariffs, have been decomposed into their different elements as follows. Where P is the difference between domestic and international price, R is the difference between domestic and international cost of intermediate inputs, T is the total domestic tax on inputs plus final output and C is the difference between domestic and international conversion cost, we have

$$P = R + T + C \qquad (9)$$

normalising with respect to the international price p we have

$$P/p = R/p + T/p + C/p \qquad (10)$$

where P/p is the nominal rate of protection and the terms on the r.h.s. constitute its different components. Alternatively, normalising with respect to P we have

$$1 = R/P + T/P + C/P \qquad (11)$$

which gives the shares of different components in the total difference between domestic and international prices.

Notice that the first two terms on the r.h.s. of identities (9), (10) and (11) constitute what may be called the 'exogenous' cost differences which arise on account of factors beyond the control of the capital goods industry or firms. The third term, which reflects differences between domestic and international conversion cost, is the cost difference genuinely attributable to inefficiency of the industry itself, arising from internal factors such as higher factor cost per unit output (low factor productivity). Conceptually, this roughly corresponds to conventional inefficiency measures like the domestic resource cost[5].

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5. We say 'roughly corresponds' because the actual measures would be quite different. Among other things, all calculation in the present exercise are at observed prices whereas it is argued that domestic resource costs ought to be calculated at shadow prices. The shadow prices calculations, in turn, are quite sensitive to the assumptions of the analytical framework. Recall in this context the differences between the Little-Mirrlees approach and that of the UNIDO manual in the evaluation of projects [Little, I.M.D. and Mirrlees, J.A. (1977) and UNIDO (1972)].

In this exercise the decomposition framework spelt out above has been applied to a set of eighteen different items selected from five categories of capital goods, i.e., machine tools, electrical machinery, mining machinery, fertilizer machinery and miscellaneous machinery, to compute the exogenous and internal components of the gap between domestic and international prices. Since the eighteen items are not necessarily a representative sample, the estimates presented here should only be interpreted as illustrative rather than comprehensive estimates for the entire capital goods industry.

The relative contribution of exogenous factors such as raw material cost differences or domestic taxation to the difference between domestic and border prices have been shown in Table 6[6]. These range from about half (47.1 per cent) of total price difference in the case of machine tools to almost the entire difference (98.1 per cent) in the case of electrical machinery.

Furthermore, while differences in raw materials are sometimes quite important, e.g., in electrical machinery they account for about one third of the total price difference, it is really domestic duties, especially those on intermediate inputs, which account for the major part of domestic - international price differentials.

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6. These correspond to the first two terms on the r.h.s. of equation 11.

TABLE 6

Cost Differences Faced by Domestic Capital Goods Due to Higher Raw Material Costs and Taxation of Inputs and Outputs

(Per cent)

Capital Goods	Number of items in the group	Group Averages				
		Difference in raw material cost (r/p)	Tax attracted by		Total tax (ta/p) (column 2 + col. 3)	difference due to exogenous cost (col. 1 + col. 4)
			Inputs	Value added		
	(0)	(1)	(2)	(3)	(4)	(5)
I. Machine tools	5	13.0	20.4	13.7	34.1	47.1
II. Electrical machinery	4	33.4	49.5	15.2	64.7	98.1
III. Mining machinery	5	17.4	34.5	3.5	37.9	55.3
IV. Fertilizer machinery	2	23.3	47.2	8.9	56.1	79.4
V. Miscellaneous items	2	7.9	26.9	21.3	48.1	56.0
All Items	18	28.6	45.4	11.9	57.3	85.9

Notes: 1. Figures in each row indicate the percentage share with respect to difference between domestic selling price and c.i.f. price of the specific item.

2. The domestic price of raw materials and components in column (1) do not include duties.

3. If an outlier item is excluded from machine tools the contribution of exogenous cost difference rises to 67.7 per cent and the average for all items then rises to 86.1 per cent.

The relative contribution of conversion cost differences, which constitute the true measure of internal inefficiency of the capital goods firms, are presented in Table 7. In the case of machine tools internal inefficiency accounts for over half the

TABLE 7

Share of Conversion Cost in Selling Price Difference of the Selected Capital Goods

(Per cent)

	Capital Goods	Number of items	Share of conversion cost difference
I.	Machine tools	5	53.Ø
II.	Electrical machinery	4	1.9
III.	Mining machinery	5	44.7
IV.	Fertilizer machinery	2	2Ø.6
V.	Miscellaneous items	2	44.Ø
	All Items	18	14.1

Notes: 1. Figures give the percentage share of conversion cost difference in the total difference between domestic selling price and c.i.f. prices.

2. In the case of machine tools if an outlier item is excluded the share of conversion cost difference declines to 32.3 per cent, the average for all items declining to 13.9 per cent.

domestic - international price spread (53 per cent)[7]. In the case of mining machinery and miscellaneous items the internal inefficiency component works out to around 45 per cent, a little over 20 per cent for fertilizer machinery and less than 2 per cent for electrical machinery.

An alternative decomposition in terms of equation 10, presented in Table 8, shows what rate of nominal protection is required to neutralise exogenous factors like differences in intermediate input costs or domestic taxes and to what extent it actually protects the inefficiency of capital goods producers.

It is evident from this table that the bulk of nominal protection is required to neutralise external sources of cost inefficiency. However, the internal inefficiency of capital goods producers is by no means insignificant, except in the case of electrical machinery. For the others the inefficiency of capital goods firms accounts for nominal protection ranging from 25 per cent to over 40 per cent of border prices[8]. It is also evident that the extent of nominal protection, or the ranking of products in terms of nominal protection, bears no relationship to the actual degree of inefficiency of firms.

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7. If one outlier item is excluded the internal inefficiency contribution drops to around 32 per cent.

8. Since, this element is exclusive of protection required to offset differences in input costs or taxes on inputs and outputs, including countervailing duties, this is the true measure of 'producer protection' extended purely to offset the conversion inefficiency of capital goods manufacturers.

TABLE 8

Nominal Rate of Protection for the Selected Capital Goods

(Per cent)

Capital Goods	Number of items	Nominal protection required in each group to neutralise				
		Differences in raw material and component cost	Taxes	Total exogenous cost (col. 1 + col. 2)	Differences in conversion cost	Total nominal protection (col. 3 + col. 4)
	(0)	(1)	(2)	(3)	(4)	(5)
I. Machine tools	5	19.5	51.0	70.6	79.5	150.1
II. Electrical machinery	4	19.4	37.6	57.0	1.1	58.1
III. Mining machinery	5	16.0	35.0	53.0	41.2	92.2
IV. Fertiliser machinery	2	35.9	86.3	122.2	31.7	153.8
V. Miscellaneous items	2	4.4	26.6	31.0	24.3	55.3
All Items	18	19.4	38.9	58.3	9.6	67.9

Notes: 1. The nominal rates of protection given in the table are based on selling prices quoted by the units for these items.

2. In the case of machine tools if an outlier item is excluded the nominal protection rate declines to 111.2 per cent and conversion cost protection to 36 per cent. The corresponding averages for all items change to 67.7 per cent and 9.4 per cent respectively. The extent of neutralising protection rises to 75.2 per cent for machine tools (52.9 per cent for taxes) but there is no significant change in the average neutralising protection for all items.

The case of electrical machinery is interesting. While the firms producing these items are efficient, as indicated by our measure of internal inefficiency, our measure of exogenous inefficiency also indicates that a nominal protection rate of almost 60 per cent is still required to offset the external sources of inefficiency.

Concluding Remarks

The new theory of international trade suggests that increasing returns and market imperfections are powerful sources of gain from international trade. They also offer a more compelling explanation of the observed patterns of international trade as compared to the traditional comparative advantage theory. However, increasing returns and market imperfections, taken along with learning effects already highlighted in the earlier literature, imply that conventional theorems about the welfare costs of protection, based on simple parables of perfect markets, constant returns, no factor intensity reversals, etc. may be misleading or, at best, inadequate. Under more complex conditions, protection may in fact serve as a strategic export promoting device. Therefore, the benefits and costs of protection need to be separately worked out for individual cases from a perspective of dynamic comparative advantage.

In this paper, we have examined whether protection performed this strategic role of establishing international competitiveness for the Indian capital goods industry which lay at the core of the Nehru-Mahalanobis industrialisation strategy. It turns out that there were indeed very distinct gains from protection to the capital goods industry, particularly electrical

and non-electrical machinery, by way of extra growth from the mid-fifties to early seventies, leading to much higher scales of output than would have been achieved in the absence of protection.

However, despite these gains, the Indian capital goods industry has failed to become price competitive internationally. The major component of domestic - international price differences is attributable to exogenous factors such as higher input prices or taxes. Nevertheless, conversion cost differences are still significant, implying relative inefficiency of the manufacturers themselves, in the case of most capital goods other than electrical machinery. This conclusion is consistent with other studies which suggest that factor productivity in the capital goods industry is actually declining over time (Ahluwalia, 1985). Evidently, the scale economies and learning effects, if any, have been too weak to establish international competitiveness in this industry. In the case of electrical machinery, though the manufacturers may be conversion cost efficient, the product is not competitive because of exogenous cost disadvantages, which must still be neutralised by significant nominal protection of the home market.

Finally, it will be obvious that price is only one instrument of competition. Increasingly, this is being displaced by control of the market channels (Frankena, 1973), lines of credit and product or process technologies as the leading instruments of competition in the international capital goods market. Firms which cannot compete in these terms cannot survive even in the home market, let alone switching from a regime of import substitution to export promotion (Paauw and Fei, 1977). Without such a switch, it is unlikely that capital goods will ever recover the high rates of growth recorded in the Mahalanobis period.

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