

In 1976, the DCI went through a long process of reorganisation and there are indications that stricter criteria of analysis which include some concern at least with the market for the products of the projects, have been introduced (see also Section 3). However, its power and capacity of coordination remain limited.

It is important that the lack of comprehensive policy for the industry is not due to an ignorance of its main traits in Brazil.^{1/} Following the ECLA studies in the early 'sixties on machine tools and heavy engineering equipment (ECLA, 1962; 1963), especially since the late 'sixties, the technical staff of the Planning Ministry produced several documents (e.g. MPCC, 1968; IPEA, 1974) and commissioned others (e.g. TECNOMITAL, 1971), which analyse the main problems of the capital goods industry in Brazil and suggests forms of State intervention to correct such problems, inclusive or strengthening the technical capacity of the industry in Brazil.

Although sometimes such suggestions have been incorporated into official Plans (e.g. MPCC, 1968) very few of them have been implemented.^{2/}

In fact, although hypothetically representing the policy of the whole Government, such prescriptions, originated from the Planning Ministry, had not a real binding power over the policies of the other Ministries and related institutions (e.g. the DDI, which is attached to the Ministry of Industry and Trade), which retained considerable autonomy of operation, sometimes with conflicting orientations, even after the process of

^{1/} At the product level, however, the difficulties of planning are considerable. Leff (1968), when discussing the GRIMAPE experience registers the complaint of Government officers about the difficulty of planning for a sector where products are very heterogeneous, requiring a vast mass of information.

^{2/} It is a sobering experience for those who believe in the power of technical reports to compare the ECLA (1962) and IPEA (1974) reports on the machine tool industry in Brazil and note the similarity of their suggestions. The comparison is also indicative of how little was done, especially as regards the technological problems of the industry in the course of a decade.

centralisation of control established by the Federal Government from the late 'sixties onwards.

Indeed, an important characteristic of the Brazilian State is the significant differences which exist between its institutions as regards important questions of strategy, such as the degree of control of strategic industries (such as the capital goods industry) by foreign enterprises. Although such differences are rarely publicly expressed, they play an important role in the shaping of the policies of the institutions.

More recently, especially since 1974, because of the increasing problems of the Brazilian balance of payments and because of the share of capital goods in the imports of the country (see Section 3), the capital goods industry has received a higher specific priority and attempts have been made to establish a greater degree of coherence between the policy instruments which affect it. The strategy adopted is mainly one of import substitution, through stricter imports controls, greater availability of credit for investment and for sales of the industry, through pressures on the State Enterprises to increase their local purchases of capital goods and through reliance on foreign capital and technology. Distinctly from the first period of import substitution of capital goods, during the second half of the 'fifties, there is now an explicit concern with the development of technology locally, partly as a means to reducing imports. We shall discuss such aspects in more detail in the next Sections, analysing also the contradictions that exist between such policy and the objective of increasing the technological self-reliance of the Brazilian capital goods enterprises.

It is, however, interesting to observe the connection between co-ordination of policies and import-substitution in Brazil. Although in any

circumstances the State deeply influences the industry there, it seems that only when a crisis in the external sector threatens the continuation of the process of capital accumulation does the State use its power over the industry for a coordinated and purposeful policy, albeit for short periods.

We have stressed that a strategy of technological self-reliance by the enterprises requires a long-term horizon. However, the strategy of the State for the capital goods in Brazil probably not only did not fulfill a role of reducing the uncertainty for the entrepreneurs but probably had the opposite effect, stimulating a short-term horizon and inducing scepticism about long-term policies, as those expressed in the Plans.

It is also worth noting that the STI meeting of 1975 between capital goods entrepreneurs and Government officials ^(see Section 5) confirmed our interviews as regards the lack of knowledge of the former about the Government policies, especially with respect to the instruments of support of technological activities.

This suggests not only lack of search of information by the private entrepreneurs (see Chapter IV), but also a poor operation of the channels of communication, which should play a critical role in a system where planning is, by Government definition, "indicative".

V.3: Imports

3.1) Introduction

Imports of capital goods contain, implicitly, the import of design. Such import of embodied technology is an important source of competition to locally developed designs, especially if there are advantages of price, delivery time and quality associated with the imports. Such advantages,

in the Brazilian case, are to a considerable extent due to the Government policies which we shall examine below.

In the last decade, especially since the beginning of the period of great economic growth of 1968/1973, imports played an increased role in the total supply of capital goods in Brazil, as shown in Table V-2. Nevertheless, in spite of the fact that in the period 1965/1974 imports grew at a yearly rate of 28%, the import coefficient is still below that prevailing during the preceding period of economic expansion (1956/1962), as the internal production also expanded considerably (16.4% p.a. in 1965/1974) (see Tables V-2 and V-3).

Such imports also represent an important share of total Brazilian imports, as can be seen in Table V-4, and, since 1974, the Government has given a high priority to their reduction: although the "fundamental ambivalence" of Brazilian policy-makers as regards the value of domestic capital goods production noted by Leff - "on the one hand they wanted to promote domestic equipment production. On the other hand, cheapening the cost of equipment importation had always been a policy instrument for promoting development". (op. cit., p. 140) - is still present nowadays.

In the discussion below we shall concentrate on three policies which have represented, for over two decades, considerable incentives to the imports of capital goods: the exchange rate policy; tariffs and other fiscal instruments, and finally, credit for investment, examining also their recent changes.

Recently, the Brazilian policy-makers have identified as one of the causes for the imports of capital goods a technological gap between local

TABLE V-2: IMPORTED COMPONENT OF TOTAL SUPPLY OF CAPITAL GOODS

<u>Period</u>	<u>Imported Component(%)</u>
1947/49 1950/1955	55 46
1956/1962	31
1963/1967	19
1968/1974	26

SOURCES: 1950/1967:- Erber et al. (1974)
1968/1964:- Castelo Branco (1975)

TABLE V-3: GROWTH RATES OF INTERNAL PRODUCTION AND IMPORTS OF CAPITAL GOODS.

<u>Period</u>	<u>Internal Production</u>	<u>Imports</u>
1965-1967	6.0	38.0
1967-1970	16.1	21.0
1970-1974	22.1	28.4
1965-1974	16.4	27.9

SOURCE: Castelo Branco (1976)

production and imports. Accordingly, they have taken several measures to stimulate both the absorption of foreign technology and the development of local design, which are discussed in Section 6.

This technological gap is roughly shown in Table V-5A by a comparison between the US\$/kg. ratio of Brazilian imports and exports (no data for total Brazilian production is available, except for machine tools). The latter data suggest that the difference between exports and imports overestimates the difference between imports and local production, i.e. exports are less "technology-intensive" than the average of local production. (See Table V-5-B.)

Notwithstanding such technological gap, the studies made by the Fundacao Getulio Vargas and the BNDE seem to confirm the claims of capital goods producers (especially of ABDIB, which also has made its own surveys) that many goods are imported that could be locally produced (Biato, 1975) (see also especially Section 3.3 on the protection of local equivalents).

3.2) Exchange Rates

The manipulation of exchange rates through various mechanisms was the main instrument of control of imports in Brazil in the post-World War period, until 1957.

After a short period (1945/1947) of free imports with an overvalued exchange rate, which resulted in the expenditure of the foreign reserves accumulated during the War, in the following quinquennium (1948/1953), an administrative system of control of imports, via permits to import, was adopted. Such licenses to import were given according to a "priority list", following the "essentiality" of the goods, in which capital goods,

TABLE V-5A: BRAZILIAN IMPORTS (M) AND EXPORTS (X) OF CAPITAL GOODS - US \$/KG - 1971/1974.

Capital Goods	1971			1972			1973			1974			
	M	X	X/M	M	X	X/M	M	X	X/M	M	X	X/M	Average X/M 1971/7
Mechanical M.	3.34	2.06	0.62	3.70	2.19	0.59	4.77	2.48	0.52	4.55	6.69	0.68	0.60
Electrical M.	4.12	3.83	0.93	4.54	3.38	0.74	5.66	3.34	0.59	5.76	7.89	0.73	0.75
Indust. Eq.	1.61	0.56	0.35	1.98	0.57	0.29	1.93	0.75	0.39	1.70	1.72	0.99	0.50

SOURCE: Bieto (1975).

TABLE V-5B: MACHINE TOOLS IMPORTS (M); EXPORTS (X) AND LOCAL PRODUCTION (LP) - US \$/KG - 1969 AND 1973/1974.

Machine Tools	1968		1973/1974 ^{1/}	
	M	X	M	X
M	3.32	5.7		
X	1.61	2.2		
LP	1.86	2.5 - 3.0		

^{1/} Estimates

SOURCE: Bello (1975).

as well as other industrial inputs, received the highest ranking (Bergsman, 1970). Considering that, for the whole period, the exchange rate was kept at a fixed rate of Cr\$ 28.50/US\$ (while internal prices rose at 15% per year) and that tariffs were specific and, therefore, eroded by inflation (they were established in 1937), (Lessa et al., 1964), imports of capital goods were highly stimulated in comparison with local purchases.

In 1953, the system of administrative controls was replaced by a system of multiple exchange rates (Instruction 70 of SUMOC and Law 2145). Imports were classified according to five categories, according to their essentiality and the exchange rate for each category was determined through a complex system of public auctions (see Huddle, 1972_a, 1972_b for details), whereby the most essential goods payed a lower exchange rate. There were also, a free exchange rate for capital transfers, remittances of profits and invisible services, as well as a low, non-auctioned preferential rate ("custo de cambio") for special imports.

A rough idea of the relative prices involved in the above-mentioned scheme is given in Table V-6, which compares the different exchange rates for some years of the period, in nominal and real terms. The preferential rate declines slightly over the period 1953/56 while the exchange rates resulting from the auction system tend to increase, although less in the top priority categories than in the others.

The distribution of commodities among the classes was not changes significantly during the period the auction system was in effect (October 1953 to August 1957) (Bergsman, 1970). Capital goods, when subject to auction, were classified in the three first categories, especially in the top two (Huddle, 1972_a) and, in the period 1954/1957, circa 44% of the exchange auctioned was used to import capital goods under those favoured

Type of Category	Nominal Exchange Rates			Real Exchange Rates			Index		
	1953	1954	1956	1953	1954	1956	1953	1956	1956
"Custo de Cambio"	25.0	30	44	1533.7	1449.3	1522.5	100.0	99.0	
Category I	31.1	42	74	1908.0	2029.0	2560.5	100.0	134.2	
Category II	35.3	45	81	2165.6	2174.0	2802.8	100.0	129.4	
Category III	36.7	58	103	2251.5	2802.0	3564.0	100.0	146.6	
Category IV	44.7	68	116	2742.3	3285.0	4013.8	100.0	198.4	
Category V	55.5	111	222	3405.0	5362.3	7681.7	100.0	225.6	
Free Market	46.3	62.2	73.6	2840.5	3004.8	2546.7	100.0	89.7	

1/
Nominal Exchange Rates corrected by the general prices index (Column 2) of Conjuntura Economica (Basis 1965/1967 = 100).

SOURCES:
1953 - Huddle (1972a)
1954/1956 - Bergsman (1970); except Free Market Rate which comes from Baer (1965).

circumstances (Bergsman, 1970).

However, only part of the imports of capital goods was made under the auctioned exchange rates. Imports made by the Government and State Enterprises as well as imports for projects of "special interest for the development of the country" were paid for at the preferential exchange rate ("cambio de custo"). The same applied to imports backed up by external credits lasting for five years or more.

Although the multiple exchange system was drastically simplified in 1957, when imports were divided in two categories - "general", where the majority of products was placed, including capital goods, and "special", composed of "inessential" goods (mainly consumer goods) - the possibility of importing capital goods at the preferential rate, when the conditions above-mentioned applied, was retained until the beginning of 1961.

Compared to a situation where imports would be made at a free exchange rate, set according to the evolution of internal and external prices, most of the imports of capital goods were subsidised. Gudín (1972), based on the difference between the preferential and the free market exchange rates, estimates that half of the cruzeiro price of the machinery imported by the Brazilian industry in the period 1955/1960 was "paid by the nation" (p. 10).

Facility to import capital goods was not restricted to the local entrepreneurs - quite the contrary. Since 1955 (Instruction 113 of SUMOC) foreign investors were allowed to import machinery and equipment without exchange cover if they "agreed to accept payment not in the form of cash or deferred debit, but by assuming instead a cruzeiro participation in the enterprise by which the equipment was to be used. ... The treatment under Instruction 113 was clearly much more advantageous to foreign investors than the alternative of sending dollars into Brazil at the free market

rate and using the cruzeiros thus obtained to repurchase dollars at a higher price in the auction market" (Gordon and Grommers, 1962, pp. 19/20).

Practically all foreign investment in Brazil in the period 1955/1960 was made under the conditions of the Instruction 113, a total estimated by Gordon and Grommers to be circa half a billion dollars (op. cit.). Bergsman (1970) estimates that "the costs of favoured imports would have been roughly 45% higher in the absence of Instruction 113" (p. 74).

The mechanism of Instruction 113 provided foreign investors with considerable advantages over Brazilian companies which had to resort to the auction system. In some cases, according to the findings of Gordon and Grommers, such advantages led to the establishment of joint ventures between Brazilian and foreign enterprises instead of a licensing relationship.

Also, according to the same authors, the Instruction 113 resulted in the imports of capital goods in a "package form", although part of such equipment could be locally produced, as well as the import of used machinery, although the latter was rather controlled by the Government authorities.

In 1961, Instruction 208 of SUMOC ended the "cambio de custo" system, transferring all imports to the free market. Nevertheless, since then, the exchange rate devaluation has lagged considerably behind the increase in internal prices in Brazil, as shown in Table V-7, so that the real value of the exchange rate, in cruzeiros, is, in 1975, 39% of its value in 1961.

Since 1968, when a crawling-peg policy was introduced (several "mini-devaluations" during the year), the exchange policy aims at devaluations

TABLE V-7: YEARLY CHANGES IN THE EXCHANGE RATE AND IN THE INTERNAL PRICE INDEX - 1961/1975.

Year	Exchange Rate Change <u>1/</u>	Internal Price Change <u>2/</u>	Real Exchange Rate
1961	38.4	47.7	100
1962	49.8	51.3	70
1963	57.9	81.3	61
1964	120.8	91.9	64
1965	33.6	34.5	76
1966	0.3	38.8	65
1967	22.3	24.3	63
1968	18.9	25.5	65
1969	13.7	20.1	64
1970	13.8	19.3	60
1971	13.8	19.5	58
1972	10.7	15.7	55
1973	0	15.5	49
1974	19.7	34.5	42
1975	22.0	29.4	39

NOTES: 1/ Changes as for December each year.

2/ General Price Index - Column 2 of Conjuntura, Economica.

SOURCES: Columns 1 and 2: 1961/1967 - Conjuntura Economica, Vol. 27, No. 12, December 1973.

1968/1975 - Conjuntura Economica, Vol. 30, No. 2, August 1976.

Column 3: Conjuntura Economica, Vol. 30, No. 2, August 1976.

that compensate the difference between the increase in international prices and Brazilian prices. As shown by Conjuntura Economica (December, 1975), taking the US prices as a proxy for international prices, this was by and large achieved in the period 1971/1975.

Although such a policy has been, to some extent, successful in its main objective of controlling inflation in Brazil, and, lately, avoiding the "import of inflation" from abroad, as regards capital goods, the over-valuation of the exchange rate is an important stimulus to their imports¹

Such conclusion is supported by Castelo Branco's analysis of the determinants of imports of capital goods in Brazil in the period 1964/1974 (Castelo Branco, 1976). As regards the exchange rate, Castelo Branco provides an estimate of the implicit rate of exchange for imports of capital goods (ratio of CIF values of imports in dollars and cruzeiros) and he shows that such exchange rate, in real terms, was, in 1974, one-third below that prevailing ten years before (Table V-8). Moreover, he argues that, taking into consideration tariffs, the price of imported goods, and the exchange rate, the latter is the prime determinant of the cost of imports of capital goods.

The over-valuation of the exchange rate, has often led the Government to impose financial surcharges on imports, in the form of deposits equivalent to a fraction (sometimes a multiple) of the value imported. This system was started in 1961, when importers had to deposit the equivalent in cruzeiros of the value of foreign exchange bought for a period of 150 days, receiving in exchange notes of the Bank of Brazil (Baer, 1965) and it lasted until October 1965, with some modifications. It was reinstated in 1975 under more drastic conditions - the deposit (equivalent to the FOB value of the import) is to be held for 360 days, without earning interest nor

TABLE V-8: IMPLICIT EXCHANGE RATE^{1/} FOR IMPORTS OF CAPITAL GOODS -
1964/1974 - IN CR \$ OF 1969. .

<u>Year</u>	<u>Exchange Rate</u>	<u>Index</u>
1964	4006	100
1965	4600	114.8
1966	4150	103.6
1967	3843	95.9
1968	3868	96.6
1969	3978	99.3
1970	3783	94.4
1971	3608	90.1
1972	3481	86.9
1973	2898	72.3
1974	2663	66.5

NOTE: CIF values of imports in dollars divided by their value in cruzeiros. Deflated by General Price Index (Column 2) of Conjuntura Economica.

SOURCE: Castelo Branco (1976).

monetary correction for the inflation in the period (D.L. 1427/75).

Although the interest foregone on such deposits and their loss of value because of inflation imply a de facto devaluation of the exchange rate, this devaluation is selective, especially as regards capital goods, as such products are often exempted from such requirement.

3.3) Tariffs and Other Fiscal Instruments and the Law of Similarity

As mentioned earlier on, prior to 1957 tariffs had little significance as a policy instrument in Brazil. In that year a sweeping reform was introduced (Law 2344); which not only changed the whole basis of the tariff system from specific to ad-valorem, but also led to the creation of the Tariff Policy Council (Conselho de Política Aduaneira - CPA), composed of representatives of the Government and of entrepreneurs' and workers' institutions (but dominated by the former), which had broad powers to change tariff rates and of classification of goods within the structure of tariffs.

In 1967 a considerable liberalisation was introduced in the Brazilian tariff structure, reducing average protection by almost 30% (see Table V-9) but, following an upsurge in imports, they were revised upwards at the end of 1968, although to levels still below the 1957/1967 period (von Doellinger et al., 1974).

Throughout this period, capital goods have received a relatively low degree of protection. This can be seen in Table V-9, where average nominal rates are presented for broad aggregates of products and in Table V-10, where

TABLE V-9: IMPORT TARRIFS, BY GROUPS OF GOODS - NOMINAL TARRIFS - IN PERCENTAGE..

<u>Classes</u>	<u>1964/1966</u>	<u>1967</u>	<u>1973</u>
Non-Durable Consumer Goods	73	54	84
Durable Consumer Goods	80	64	83
Combustible and Lubricants	65	48	25
Intermediary Metallic Goods	47	34	49
Non-Metallic Intermediary Goods	37	27	34
Materials for Construction	62	44	47
Capital Goods for Agriculture	32	25	31
Capital Goods for Industry	49	36	44
Capital Goods for Transport	55	42	47
Total Imports	54	39	49

SOURCE: von Doellinger et al., (1974).

TABLE V-10: NOMINAL (N) AND EFFECTIVE (E) ^{1/} RATES OF TARRIF PROTECTION BY INDUSTRY - IN PERCENTAGE.

<u>Industry</u>	<u>1966</u>		<u>1967</u>		<u>1973</u>	
	<u>N</u>	<u>E</u>	<u>N</u>	<u>E</u>	<u>N</u>	<u>E</u>
Machinery	48	41	34	32	38	32
Electrical Equipment	114	215	57	97	56	61
Transport Equipment	109	151	57	75	43	34
Manufacturing Average	99	181	48	76	57	47

^{1/} Protection on value added.

SOURCE: Tyler (1976).

nominal and effective (protection and value added)^{1/} rates at the industry level are shown.

The above-mentioned Tables show also that there are considerable differences in the degree of protection given to the different types of capital goods. As regards users, capital goods for agriculture received the lowest protection, followed by capital goods for industry and for transport equipment (Table V-9). Such aggregation disguises, however, wide differences at the product level: most machine tools, other industrial equipment, earth-moving equipment and transport equipment (except automotive) were assigned low tariffs. Electrical equipment tended to receive higher protection and motor-vehicle the highest (Bergsman, 1970).

The branches of the capital goods industry which received the highest protection (transport and, especially, electrical equipment) are dominated by foreign subsidiaries. Mechanical machinery, where the Brazilian firms are stronger (see Chapter I) received the lowest protection (see Table V-10).

The level of tariffs shown over-estimates however the degree of protection for capital goods. The exemption from tariff duties has been an incentive consistently given to investment in Brazil. In the period 1957/1967, Bergsman, (1970, p. 34/35) points out that "for capital goods the ratio of tariff collections to value of imports seldom exceeded 10%, even though the average official tariff, weighted by imports, was about 50%". More recently, for the period 1972/1973, Castelo Branco (1976) has shown that

^{1/} The effective rates of protection presented in Table V-10 have to be taken with great caution because of the way in which they were estimated. For details, see Bergsman (1970), especially Appendix 3.

the ratio of tariff collections to the value of imports was 7.90% in the first year and 9.97% in the latter, although the nominal rates were, respectively, 35.72 and 37.38%. Moreover, Castelo Branco shows also that only 20% of the imports of capital goods did not receive any tariff exemption (partial or total), "an evidence of the liberalism with which the tariff instrument has been used" (op. cit., p. 61).

In theory, such exemptions should not be granted to goods for which there is a locally produced equivalent, a provision which, through the Law of Similar, dates, in fact, back to 1911.

From 1957 onwards, if the CPA was satisfied that domestic producers could supply the product in sufficient quantity and quality, it would register the product as "domestic similar". In 1967 "reasonable price" and "time for delivery" were added as elements for the criterion of similarity and the Foreign Trade Department of the Banco do Brasil (CACEX) was given the authority to determine the existence of a local similar, which is then registered at the CPA.

However, the very technical nature of capital goods, the importance of performance and reliability considerations in determining what is a "product" and the specificity of many capital goods to the uses of a specific customer, large number of models, etc. (see Chapter II), makes the task of assessing the existence of a "similar" very difficult. As pointed out by Bergsman: "In cases where goods were not standardised (especially capital goods), the CPA's register tended to omit many goods for which domestic similars had recently come into existence ... [Within capital goods] only the simplest kinds of goods, mostly light electrical equipment, were recognised similars" (Bergsman, 1970, pp. 35 and 133). Although Bergsman, in the quote above, is referring to the period 1957/1967

there is no indication that the situation has changed considerably since then.

Such difficulty is compounded if the purchasers of capital goods or the engineering firms which specify such goods, wish to import as they can characterise the goods in such a way that there is no local similar. My contacts with CACEX and my experience of project appraisal at the BNDE suggest that this happens rather frequently and that it is not only difficult to identify but to counteract as well. Recently, Fung and Cassiolato (1976) have expressed the same opinion.

Moreover, the local producer(s) can voluntarily drop their protection, stating to CACEX that they cannot supply the required equipment in, for instance, the necessary time. It is not unheard of that big purchasers of capital goods, including the State Enterprises, have used their bargaining power vis-a-vis the producers of capital goods to elicit such "voluntary" statements.

In recent years, a pattern that is becoming increasingly common, especially among State Enterprises, is to negotiate collectively with the capital goods producers at CACEX which goods in each project are to be imported and which are to be considered as having a local similar; in fact, three sectors - electric power, steel and metallurgy, oil and petrochemicals - where State Enterprises are dominant, accounted for over 70% of the total value of the contracts (circa US\$ 1.5 billions) signed in the period 1968/1972 (Villares, 1973).

It is important to stress that tariff exemptions (partial or total) are normally granted in conjunction with other incentives to import. In

the period 1957/1961 the latter included the use of preferential exchange rates (see above), the remission of port charges and other additional taxes (equivalent to circa 13% of the CIF value of the import -(Morley, 1972). After the extinction of the "cambio de custo", in 1961, exemptions of tariff duties have been coupled to exemption of the tax on value-added on the enterprise (ICM) and of the sales tax (IPI) (the latter since the end of 1970) (Suzigan et al., 1974).

The bulk of investment made by industry in Brazil benefitted from such incentives (Suzigan et al., 1974), especially in the period 1969/1974, when the institution in charge of the incentives, the CDI, followed a very liberal policy (see Section 3).

As noted by several authors (von Doellinger et al., 1974; Suzigan et al., 1974; Bastos, 1976), fiscal incentives granted by the CDI represented, until 1971, a discrimination against the local producers of capital goods, as the incentives applied only to imports. From 1971 onwards, capital goods purchased locally were also exempt from payment of the IPI if included in projects approved by the CDI. Imports continued to benefit from the exemption of the ICM, which local purchases were still subject to, but only local production benefitted from the allowance of rapid depreciation for fiscal purposes (Suzigan et al., 1974).

In fact, the projects approved by the CDI had, up to the middle of 1975, an import component of capital goods much higher than the average, although this component had declined since 1974 (see Table V-11 and compare with Table V-2). The capital goods enterprises' projects represented a very small proportion of the value of projects approved by the CDI (see Table V-12), probably in part because of the over-capacity accumulated during the 'sixties (see Section 4), but possibly also because of the lack

TABLE V-11: PARTICIPATION OF IMPORTED CAPITAL GOODS IN THE PROJECTS APPROVED BY THE C.D.I. - 1969/1975 - IN PERCENTAGE.

<u>Period</u>	<u>Imported Component</u>
1969/1975 (average)	65.6
1974	55.9
1975 (1 st Semester)	53.8

SOURCE: Biato (1975)

TABLE V-12: PROJECTS APPROVED BY THE CDI - DISTRIBUTION OF VALUE BY INDUSTRIES - IN PERCENTAGE - 1970/1974.

<u>Industries</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
Capital Goods	3.0	3.5	5.4	5.6	7.6
Raw Materials ^{1/}	31.2	37.8	56.4	25.3	41.9
Intermediary Goods ^{2/}	14.4	27.5	11.0	15.0	21.6
Automotive	28.0	8.7	11.5	31.2	10.3
Consumptive Goods	23.4	27.5	15.7	22.9	18.6
Total	100.0	100.0	100.0	100.0	100.0
Value (US \$ 100,000.)	3882747	2677625	10624381	14346697	18721195

NOTES: 1/ Mainly chemical and petrochemical industry and steel.
 2/ Mainly non-metallic products (e.g. cement)

SOURCE: Bestos (1976)

of incentives to invest, caused in part by the policies of the CDI. The increase observed in 1974 is probably a response to the changes in both conditions.

At the end of 1975 the CDI stopped temporarily the granting of incentives to import, at the same time it underwent a reorganisation. Although it has resumed its operations after six months (in May 1976), it is my understanding, based on information from participants in the operation of the Council, that presently a much stricter policy as regards imports of capital goods is being adopted because of the difficulties of the Brazilian balance of payments.

Nevertheless, the policy of granting tariff exemptions (and other fiscal incentives) to imports of capital goods for priority projects seems to have been maintained. As an example, the CPA has recently (in the first semester of 1976) granted an exemption of up to 50% on imports of equipment to be used by enterprises that are providing services to the Government and State Enterprises, especially (but not exclusively) for oil exploration and production and for steel, provided they do not have a local similar (a proviso which can be easily got round as we have seen) (Conjuntura Economica, August, 1976).

3.4) Credit for Purchases in Brazil

The policies above discussed had as one of their main results the lowering of the price of the imported capital goods relatively to the local capital goods. However, credit is often a more important element than price in determining the choice of suppliers of capital goods. This is especially true in the Brazilian case, where enterprises generally

present a low level of self-finance.^{1/}

In Brazil there has been, traditionally, a great reliance on foreign credits to finance purchases of capital goods. According to some estimates, in the period 1955/1963, "71% of all imported equipment purchased by domestic investors" was financed from abroad (Leff, 1968, p. 148). According to the same author, "in heavy engineering products, the incidence of imports with foreign financing was even greater, explaining in part the sector's above-average import coefficient" (*ibidem*). For a more recent period, 1968/1972, imports of capital goods with foreign financing have been around 50% of total capital goods imports (Pereira, 1974). (See Table V-13).

As it is known, when such credits are provided by international institutions, such as the IBRD and the IDB, local producers can compete for the supply and they even normally enjoy a margin of protection of around 15% of the price, but when the credits are provided either by foreign Governments, through agencies like the Eximbank, or by foreign suppliers, the local producers tend to be excluded from the competition.

Although Brazil has been, traditionally, one of the main borrowers from the IBRD and the IDB, their role in financing imports of capital goods has been limited and a much greater share has come from governments' and suppliers' credits, especially the latter.

^{1/} The level of self-finance of Brazilian corporations (sociedades anónimas) was around 50% in the period 1956/1961, according to my estimates, using data from Baer (1965). According to CONCLAP (1973) it was approximately the same in the period 1959/1968. Sugigan *et al.* (1972) estimated that the participation of the resources of the enterprises in industrial projects in the period 1967/1970 was also approximately 50%. As a rough comparison, they point out that in the US, the level of self-finance was 66.8%, in the FRG 62.8% and in the UK 55.4%.

TABLE V-13: FOREIGN FINANCED EQUIPMENT IMPORTS AS A PERCENTAGE OF ALL EQUIPMENT IMPORTS - 1955/1963 AND 1968/1972.

	<u>Year</u>	<u>Perce n age</u>
	1955	38
	1956	62
	1957	89
	1958	97
	1959	89
	1960	71
	1961	70
	1962	69
	1963	59
Average	1955/1963	71
	1968	53
	1969	43
	1970	45
	1971	49
	1972	47
Average	1968/1972	47

SOURCES: 1955/1963:- Leff (1968)

1968/1972:- Pereira (1974)

Taking the two main periods of great industrial expansion (1956/1961 and 1968/1973), when imports of capital goods have tended to increase substantially,^{1/} we see that, in the first period, suppliers' credits were the most important source of financing by far (see Table V-14). Indeed, Donnelly has commented that "the shift from long-term official credits to medium-term suppliers credits as the single most important source of development (i.e. autonomous) financing constitutes the distinguishing feature of Brazil's external capital movements in the second post-war decade" (Donnelly, 1973, p. 418). Although the lack of credits from the IBRD in the period 1960/1961 can be in good measure attributed to the break with the IMF in 1959, following disagreements on stabilisation policies, Table V-14 shows that the IBRD share was quite limited in the preceding years.

In the post-1964 period, when the policies implemented by the Brazilian Government received the approval of the IMF, the IBRD (and the IDB) increased their loans to Brazil, to the point that in 1974 it had become the single greatest borrower from these two institutions (Banco Central, 1974 Report). Nevertheless, taking the 1968/1973 period, we see from Table V-14 that the role of the international organisations (IBRD, IDB and IFC), although considerable at the beginning of the period has steadily declined, while that of suppliers increased.

According to Pereira's analysis, in the period 1966/1971, "around 50% (or US\$2,334 millions) of financed imports in the period were absorbed by institutions directly under control of the economic policy of the Government" (Pereira, 1974, p. 152). Although such institutions were the main beneficiaries of the international organisations' loans, mainly for infrastructure and basic industries (especially steel), they also sub-

^{1/} It has been observed that imports of capital goods have been highly elastic in terms of growth - see Morley (1972) and Erber et al. (1974).

TABLE V-14: FOREIGN SOURCES OF CREDIT - 1957/1961 AND 1969/1973
- IN PERCENTAGE.

<u>Year</u>	<u>International Agencies</u> ^{1/}	<u>Government Agencies</u> ^{2/}	<u>Private</u>
1957	15.6	(3)	84.4
1958	37.4	(3)	62.6
1959	3.7	15.2	81.1
1960	-	14.0	86.0
1961	-	7.8	92.2
1969	39	36	25
1970	34	29	37
1971	27	20	53
1972	30	12	58
1973	24	16	60

NOTES: 1/ IBRD; IBD and IFC

NOTES: 2/ Mainly Eximbank (U.S.); USAID and KfW.

3/ Included in International Agencies

SOURCES: 1957/1961:- Lessa (1964) - my estimates

1969/1973:- Pereira (1974) and Banco Central - Imports.

1973&1974:- My estimates.

substantially used tied-in loans (government and supplier's credits).

In order to understand better this reliance on foreign credits for purchase of capital goods, it is convenient to examine in some detail the availability of investment credits from internal sources of finance in Brazil and the conditions in which such credits were provided; especially because this is a policy area in which considerable changes have been introduced in the recent years with the hope of increasing local purchases of capital goods.

Since its foundation in 1952, the BNDE (National Bank of Economic Development) has been the main source of investment capital for industry. In fact, except for a small participation of loans from the Banco de Brasil, it was, until the middle of the 'sixties, practically the only source available internally for long-term capital (Lessa et al., 1964).

Although in the mid-'sixties a great reform was introduced in the credit system in Brazil (see, for instance, Simonsen, 1972, for details), long-term credit is, up to the present time, provided almost exclusively by official institutions. Table V-15 shows the main sources of investment capital for industry in the period 1966/1972 (that is, prior to the changes recently introduced, discussed below). The main sources were the BNDE, with its subsidiary FINAME (see below) and the Banco de Brasil, producing about 90% of the total. The residual is largely accounted for by the State Development Banks. Moreover, the participation of the BNDE in such Table is underestimated, as the credits from the Banco de Brasil include a part for agriculture and the State Development Banks are largely dependent on credits extended to them by the BNDE and not computed in the latter's participation. Given its dominant role, we shall concentrate our analysis on the BNDE.

<u>Source</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
1) BNDE	55.3	57.0	44.7	49.7	51.6	52.3	52.5
2) FINANCE	6.2	5.7	6.3	7.0	6.4	5.8	5.7
3) (1) + (2)	61.5	62.7	51.0	56.7	58.0	58.1	58.2
4) Banco de Brasil	36.7	35.4	32.1	33.1	34.4	33.6	31.0
5) Others	1.9	1.9	10.7	10.2	10.2	8.4	10.8
Total	100	100	100	100	100	100	100
6) (1)-(5) as % of total credit	16.0	15.8	15.9	15.7	15.7	15.5	15.8

NOTES: 1/ Excludes civil construction

2/ Includes credit for agriculture

3/ Mainly State Development Banks, largely financed by the BNDE.

4/

SOURCE: Suzigen et. al. (1974), my estimates.

In spite of its almost unique role in the Brazilian economy and the fact that in 1967 it had increased the real value of its operations seven-fold since its foundation, the Bank remained, up to that year, a fairly specialised institution in terms of financed sectors. In fact, during its first 15 years over 70% of its resources had been allocated to the financing of electric power, transport (mainly railways) and iron and steel.^{1/} Thus only a limited range of capital goods, benefitted from the loans of the Bank.

Even after the Bank diversified its operations, from 1968, and set up a subsidiary - FINAME^{2/} - to finance purchases of individual items of machinery, their loan conditions were not competitive with foreign loans.

Table V-16 compares the conditions of credit for the Long Term Programme of FINAME; of the most favourable of the funds available at the BNDE, the Fundo de Reaparelhamento Economico (FRE) and the conditions of the foreign loans used for importing capital goods in 1971.

As can be seen from the Table, the FRE had two forms of operation: one in which the borrower paid a higher interest rate (12% p.a.) and had to repay the loan in, at the maximum, six years. The other, apparently more advantageous, provided for a period of repayment of up to twenty years and interest rates ranging between 8 and 4% per annum. The reason why many entrepreneurs chose the form laid in the monetary correction envisaged by the two forms of operation: while in the first the

^{1/} Calculations based on data from the 1972 Report of BNDE.

^{2/} FINAME was established in 1964 as a Fund in the Bank. Two years later it was transformed into a subsidiary of the Bank. One of its purposes was to provide credit for purchases of individual items of machinery. It did not require a full-fledged investment project as the BNDE, reducing thus the cost and time of the operations and widening the range of products financed.

From its foundation until 1971 the FINAME granted mainly medium-term loans (the modal period was 3 years - Suzigan *et al.*, 1972), operating through a network of agents, private and official banks, which contributed with 20% of the value of the loans (Short Term Programme).

In 1971, FINAME started a Long Term Programme, aimed especially at custom-built equipment purchases, in which the repayment period was extended up to 8 years and the interest rates were lower than in the Short Term Programme

TABLE V-16: LOANS FROM ABROAD AND FROM THE BNDE - 1971.

<u>Source</u>	<u>Interest</u>	<u>Correction</u> ^{2/}	<u>Duration (Years)</u> ^{3/}
Foreign Loans	7.8	13.8	6.4
B.N.D.E.			
(a) FRE	4 to 8	22.6	20
	or		
	12	10	6
(b) FINAME ^{1/}	7	22.6	8

- NOTES:
- 1/ Long-term programme (Finameo)
- 2/ For the foreign loans: exchange rate devaluation in 1971 for the long-term FRE and FINAME: change in value of the ORTN in 1971. For the "short" term FRE: Pre-established monetary correction.
- 3/ For the foreign loans: average period
For the Brazilian loans: maximum period

- SOURCES:
- Foreign Loans Interest Rate and Duration, Pereira (1974)
BNDE Interest Rate and Duration: CONCLAP (1972)
Correction: Foreign Loans: Table V - 6:-
BNDE: FRE "short" term: CONCLAP (1972)
FRE Long term and FINAME: Banco Central Bulletin,
Vol. 10 No. 10, October, 1974.

monetary correction was pre-established and set at 10% per annum, in the second it was variable, related to the value of titles of public debt (ORTN). In 1971, for instance, the latter increased 22.6%. In fact, under such circumstances, it required a considerable degree of optimism about the inflation policy of the Government (and those to come) to choose the second alternative).^{1/} For the FINAME loans, the monetary correction applied was of the second type described above.

Although the foreign loans had also a "monetary correction", represented by the devaluation of the cruzeiro, they benefitted from the policy of keeping such devaluations below the rate of increase of internal prices, with which, until 1974, the monetary correction rates kept apace.

Therefore, at the end of 1972, a new programme, the Special Programme, was set up at FINAME with lower interest rates and longer repayment periods,^{2/} but retaining the same form of monetary correction. In the following years, especially since 1974, the resources available for local financing of capital goods were substantially expanded.

The BNDE, which received substantial additional funds to manage, increased its loans 3.4 times, in real terms, between 1972 and 1975. In that last year its loans totalled Cr\$ 28,154 millions (about US\$ 3,400 millions), of which the bulk went to financing projects of intermediary industries (45% of the total), mainly steel and chemical and petrochemical

^{1/} It would be interesting to compare the choices of the entrepreneurs between the two alternatives. No such study has been made, to my knowledge.

^{2/} Its interest rates were lower (3 to 6% p.a., varying in accordance with the degree of "nationalisation" (i.e. local purchases), of the production of the financed goods) and its repayment period could reach, in exceptional circumstances, 15 years, although it was supposed to be normally 8 years (the maximum period of the Long Term Programme). The monetary correction was to be the same of the former Programme - variable, in accordance with the ORTN.

projects. The capital goods industry received 10% of such credits, mainly for the production of custom-built equipment (BNDE, 1972 and 1975 Reports).

In the same period (1972/1975), FINAME also increased its loans, in approximately the same proportion as the BNDE (3.3 times) and, in 1975, it had approved operations of a total value above US\$ 1,000 millions (CR\$ 8,519 millions). More importantly, the composition of such loans had changed decisively: the Short Term Programme accounted only for 5.8% of the loans, while the Long Term and the Special Programmes accounted for, respectively, 37.6 and 56.5% of the total loans.

The cost of the resources of the two institutions was also reduced. The BNDE reduced the interest rates according to a selective principle in which the lowest interest rates were charged to enterprises producing custom-built equipment (3% p.a.) and for intermediary industries (between 3% and 5% p.a.. see Table V-17 for details). FINAME, whose interest rates varied between 1% and 9% p.a. (see Table V-17), maintained its policy of charging favoured rates to custom-built equipment, especially if such equipment had a local content of purchases equal or above 67% of its value, and more so if replaced imports (BNDE, 1975 Report).

Probably more important, in 1975, the National Monetary Council established that the monetary correction for loans given by official credit institutions such as the BNDE and FINAME, should be 30% p.a. at the maximum, eliminating thus the uncertainty involved in the previous scheme of variable correction -- especially important at a time of increasing inflation.

Considering that in 1975 the increase in internal prices in Brazil was 29.4% and that rate is increasing (c. 46% in 1976), the present conditions of loans by the BNDE and FINAME imply negative interest rates. Also, under the present scheme of monetary correction, the loans from FINAME and BNDE

TABLE V-17: BNDE AND FINAME INTEREST RATES CHANGED - 1975.

<u>Programmes</u>	<u>Interest p.á. (%)</u>
Basic Inputs	
- Mining, Non-Ferrous Metallurgy, Fertilizers Cellulosis and Paper, Forged and Cast Products and Iron-Alloys	3
- Steel, Chemical, Petrochemical, Cement	5
Capital Goods	
- Custom-built capital goods	3
- Others	5
Infrastructure	4 to 8
Basic Consumption	4 to 8
Working Capital	8
Reorganisation and Modernisation of Enterprise	4 to 8
Technological Development	0 to 4
FINAME	1 to 9

have become more advantageous to the entrepreneur than loans from abroad, as it is unlikely that with internal rates of inflation around 40% to 50% p.a. the devaluation of the exchange rate will be less than 20%, especially if one bears in mind the need for increasing exports. In 1975 for instance, the devaluation was 22.6% and, in the first half of 1976, 16.7%. (Conjuntura Economica, August 1976).

Taking into consideration the expansion of internal resources for local purchases of capital goods and the competitive conditions in which such resources are being provided, it is probable that there will be some "import substitution via financing substitution", although with the data at hand it is not possible to estimate its magnitude. Such, in fact, is the hope of policy-makers in Brazil, which have used this policy as the main short-term instrument (together with the purchase policies of the State Enterprises, which we shall see below) to reduce the reliance on imported capital goods.

Moreover, in 1974, the Bank created a new subsidiary - EMBRAMEC (Mecanica Brasileira S.A.: Brazilian Mechanics) to provide additional capital to the Brazilian capital goods enterprises for two main purposes: to accelerate capital goods import substitution and to expand their capacity, inclusive for exports. In 1975, EMBRAMEC had contributed Cr\$ 204 millions (circa US\$ 35 millions) to 17 enterprises and planned to double the amount in 1976 (BNDE, 1975 Report).

More recently, FINEP has also decided to use part of its resources for risk-capital, giving priority to the capital goods industry too, but with emphasis on those enterprises with a potential for local technological development (see Section 6).

Both initiatives partially close an important gap in the set of policy instruments available to the Government - the scarcity of sources of risk-capital, which we commented upon in the preceding Chapter.

It is important to note that the credit policy is the only policy which contains an active discrimination in favour of Brazilian enterprises: the main law which regulates foreign investment in Brazil (Law 4131/62, as modified by the Law 4290/64) determines that the enterprises which have "a majority of voting capital belonging to persons non-resident in the Country" shall not use the investment credit of official institutions unless expressly approved by the Executive power (presently, the President).

It would be interesting to know if any important number of foreign enterprises have had their credit demand refused by the Executive power, but, unfortunately, such information is not available. However, given a policy which has encouraged foreign investment (see Sections 3.1 and 4), I suspect that the answer is negative.

There are two further limitations to this (partial) discrimination that are worth mentioning: first, and more general, is that the nationality of the enterprise is defined by ownership of the majority of voting capital. However, as it is known, the control of decisions of a firm does not require the ownership of the majority of its capital and so, probably many legally "Brazilian" firms are de facto foreign-controlled. In any case, the Laws give an important stimulus to joint-ventures, which, as we saw in Chapter IV, foreign enterprises were actively seeking in the capital goods industry.

Second, more specifically applied to the capital goods industry, the limitation above is largely inoperative in the operations of FINAME, as the Agency follows the policy that it is enough that one of the parties involved in the purchase of the machine to be legally Brazilian for the Laws to be obeyed (i.e. the seller or the purchaser of the machine). This excludes from its operations only the transactions between foreign subsidiaries.

V.4: Control of Entry in the Sector

In this section we shall consider briefly the criteria used by the main state institutions when appraising projects of entry or expansion in the sector, focussing especially on the criteria used for assessing the market and the technology of such projects.

In the second part we consider in more detail the entry of foreign enterprises, as their competition represents an important stimulus to the use of licensing by the Brazilian enterprises (see Chapter IV). As by law (Law 4131, art. 2) the foreign enterprises must be treated as are the national enterprises, except as regards the credit institutions (see Section 3), the criteria discussed in the first part apply to them too.

4.1) Assessment by the State Institutions of the Market and Technology Used.

During the first period of import-substitution the GEIMAPE and the institutions linked to it seem to have adopted an over-optimistic estimate of the Brazilian market (see Section 2). Although they did not seem to have explicit criteria for assessing technology, there was a general concern that it should be "modern" - for instance, although imports of used machinery were allowed and widely used (Leff, 1968), they seem to have been controlled by CACEX, to avoid dumping in Brazil of obsolete machinery (a controversial political point then and now) (Gorden and Grommers, 1962). One of the most important contributions of the foreign companies was considered to be exactly the technology they brought into the country.

Later, the CDI declined from interfering with entry in the sector by abstaining from analysing the aspects of costs, competitiveness and,

especially, market of the projects submitted to it (see Section 2) - an omission especially important in the case of the capital goods sector which seems to have suffered from considerable idle capacity until the early 'seventies.

There are, as is known, many conceptual differences^{1/} and problems of empirical measurement about "capacity" especially "full capacity", which are especially important for the case of custom-built equipment. Nonetheless, there seems to be a consensus among several studies that the degree of utilised capacity of most branches of the Brazilian capital goods industry (normally measured against one-shift possible production) was very low during the 'sixties until approximately 1973/1974 (Leff, 1968; MPPG, 1968; Leme, 1969; Tecnometal, 1971. Our interviews with the capital goods producers and, subsequently, in 1974, with the State Enterprises, corroborate this). Such over-capacity was probably caused by the combination of the great investments of the second half of the 'fifties with the depression of the period 1963/1967.

We have argued in Chapter IV that such over-capacity, to which foreign investment contributed considerably (see below) played an important role in leading the Brazilian firms to use licensing by stimulating a high present-time preference and an ad hoc choice of products.

As regards the technology to be used in the projects submitted to the CDI, although there was a formal concern about it (expressed in recommendations that the projects should lead to a "greater technological absorption"), the criteria used for appraising the projects as well as the number of projects involved when compared to its technical staff, made even a superficial

^{1/} There is, for instance, the difference between the "engineering approach" which defines full capacity by the maximum production obtainable with a given stock of capital during a given period of work, and the concept of capacity often used by economists of the output level which minimises average unit costs. See Klein (1960) for a full discussion.

analysis practically impossible. To give an example, in 1972 the CDI processed 2012 projects, an average of circa 40 projects per week. Considering that it had circa ten people in charge of appraising each projects each analyst would have little more than a day to appraise each project. (Suzigan et al., 1974). It is therefore scarcely surprising that the above-mentioned authors describe the process of analysis in the CDI as involving much more summarising the projects than really analysing them.

Among the other State institutions which, through their incentives, affect to some extent the entry of firms in the market and/or the expansion of the firms already existing, the BNDE is, to my knowledge, the one which has shown greater concern with market problems, which has been a point traditionally investigated in its project appraisals.^{1/} As regards the technology used in the projects, until recently, my experience is that the appraisal was concerned mainly with aspects of costs and reliability, with preference given to rather established methods, which probably tended to favour the use of foreign technology. However, since 1975, the fund that the Bank had for science and technology (FUNTEC - see Chapter IV) is being used in conjunction with the funds for physical investment in order to stimulate the enterprises to develop technology locally (see Section 6).

However, except indirectly, through its representatives at the GEIMAPE and later at the CDI, the Bank was, in general, not involved in the appraisal of foreign enterprises' projects (see Section 3).

The other State agencies, such as CACEX and CPA, differently from the Bank, are normally concerned with specific aspects of a project (e.g. the

^{1/} The Bank has played an important educative role by transferring the know-how of project appraisal to the regional and state development banks, as well as by obliging the enterprises to think in terms of projects. However, social prices are not used.

similarity of proposed imports to local production) and have thus their sphere of interference circumscribed, although they could be important instruments of control if used within a general policy for the sector. Their difficulties as regards the technical assessment of similarity of capital goods have already been commented upon (see Section 3).

Finally, although estimates of shadow prices for Brazil were elaborated by the Planning Ministry (Pecha et al., 1971), no State institution uses them, to my knowledge.

4.2) The Entry of Foreign Firms

The capital goods industry is not among the few sectors where there are restrictions to foreign ownership in Brazil (e.g. oil production, newspapers). Foreign investments must be, however, registered at the Central Bank, which is, however, an essentially bureaucratic procedure, mainly for the purpose of controlling remittances of profits abroad (i.e. the Central Bank does not appraise the merits of such investment). Apart from a brief period ranging from 1962 to the beginning of 1964, a policy of "open doors" to foreign investment has been maintained, strengthened by favoured conditions for the import of capital and remittance of profits.

During the first period of import-substitution of capital goods, the conditions of entry were especially favourable, being inclusive, more favourable than those received by Brazilian firms (see Section 3).

In fact, the entry of foreign firms in the capital goods sector dates mainly from the Targets Plan period (Leff, 1968) and was in good measure the result of deliberate policies with this purpose.

The incentives given by the GEIMAPE were mainly for imports of machinery for the sector under favoured conditions.^{1/} As almost 90% of such imports were made without exchange cover, it seems that they were mainly used by foreign enterprises investing in Brazil (see Bastos, 1976 and Section 3).

Moreover, as Leff, who interviewed several foreign enterprises of the sector in Brazil, comments: "one firm's decision to invest often triggered a similar decision by its competitors. Firms feared being excluded from the market by tariff protection and the advantages of an early foothold established by their rivals. ... Rather than themselves making a thorough study of the Brazilian market many firms accepted a competitor's decision to invest as proof of feasibility ... The Brazilian authorities played upon such fears skillfully by conducting negotiations with several firms simultaneously and by establishing deadlines, before which entrants were rewarded with special privileges and after which entrance would be possible only under less favourable conditions.... Within individual firms, investment plans were also made on a larger scale than would be otherwise have been justified, in order to "get under the wire" of the government deadline and install the plant under relatively favourable conditions" (Leff, 1968, p. 28 and 35, emphasis added).

Given the substantial investments envisaged by the Targets Plan, which implied a relatively large market for capital goods and the "defensive investment" strategy prevailing in the sector, of which the Brazilian authorities were aware, as shown by the quote above and by Gordon and

^{1/} According to the data presented by Bastos (1976), 19 enterprises had projects approved by the GEIMAPE during its existence (1960/1963). Such projects implied imports of capital goods in the value of US\$ 32.4 millions of which 89% were made without exchange cover (direct foreign investment), 7.3% with foreign financing and 4.7% with full exchange payment.

Grommers (1962) for the automobile industry, it is probable that part of the incentives given were, in practice, redundant, in terms of leading the foreign firms to invest directly in Brazil or that, at least better bargaining conditions could have been obtained.

The foreign enterprises contributed considerably to the quick expansion of the Brazilian production of capital goods. Although no precise information is available of the role played by the foreign enterprises, a rough estimate, using the data of Table V-1 and those of the destination of machinery imports under Instruction 113, suggests that the participation of foreign enterprises was considerably important in the capacity formation of the machinery sector during the second half of the 'fifties (close to 50% of the total).^{1/} It is possible that given the over-capacity above-mentioned, the growth of the sector (and of the economy) could have been achieved with less entry of foreign enterprises, at the time, although more detailed studies would be needed to substantiate this at the product level.

^{1/} The data on the total gross capital formation of the machinery sector comes from Table V-1, taking all mechanical industry and 20% of the value of the electrical industry assuming that the share of capital goods in the capital formation of the electrical industry was roughly proportional to their share in production (see Table V-1, Note). Such data apply to the period 1955/1958 and were converted to US\$ (1969 values).

For the foreign investment we have first, from Bergsman (1970) the information of the value of machinery imports for the machinery industry imported under Instruction 113. Although the Instruction operated from 1955 to 1960, this probable over-estimation of the foreign participation is probably more than off-set - first, because not all foreign investment came under the Instruction (circa 20% did not use it, according to Bergsman's data) and second, because the value presented by Bergsman for machinery imports is drawn from a sample that covers only three-quarters of the imports made under the Instruction.

From the data on imports, we estimated the total investment, taking from Leff (1968) the information that equipment accounted for circa 60% of gross capital formation in industry. This, of course, excludes local purchases of equipment and, therefore, underestimates the foreign investment.

Comparing the two values, the participation of foreign investment in the gross capital formation of the machinery sector is 50.6%. Needless to say, that this is a very rough estimate.

The foreign enterprises contributed also to increase the degree of technical complexity of the local supply of capital goods - as we have noted in the preceding Chapter, their role is especially important in the production of more complex goods. Such contribution has been one of the more highly valued aspects of their entry by the State institutions. Nonetheless, the evidence available about their technological activities in Brazil (Biato et al., 1972; Erber et al., 1974) suggests that their contribution to the development of preliminary design skills is very limited, as they tend to rely exclusively on licensing, performing only minor adaptations locally. It is possible that the State institutions failed, in their appraisal of the technical contribution of the foreign enterprises, to note the difference between the transfer of manufacturing technology and that of design skills or that they have erroneously assumed that the progress from the former to the latter is easy and "natural".

As we have discussed in Chapter IV the competition of foreign enterprises plays an important role in dealing the Brazilian enterprises to use licensing. Although such competition, par se, does not explain the lack of investment in SR concomitant to licensing (see Chapter IV), it probably discourages it, given the backing of foreign subsidiaries by their parent companies and the difference in risk-taking capacity between the latter and ^{1/} the Brazilian firms.

^{1/} For example, in 1968 the total sales of Brown-Boveri was superior to the value of production of the whole Brazilian mechanical industry (Fajnzylber, 1971), including the foreign subsidiaries. Although the latter are among the biggest firms in the sector (see Chapter I), their sales in the mechanical and electrical industries represented, respectively, 1.31% and 1.23% of the sales of their parent companies in 1972 and even less in terms of assets - 0.68% and 0.35% respectively (von Doellinger and Cavalcanti, 1975).

It is possible that the fast growth of local production of capital goods desired during the Targets Plan period could not have been achieved without some degree of direct foreign investment, even if technology could be provided by licensing agreements. Nevertheless, a more selective approach could have reserved some areas for Brazilian enterprises only, providing better conditions for local development of technology concomitant, eventually, to the use of licensing. The threat to local technological development posed by the entry of foreign subsidiaries was recently stressed in the case of the programme of local production of mini-computers (where licensing is used concomitant to local development), discussed in the Appendix B.

Although recently there has been some open questioning of the role played by multinational companies in Brazil, as shown by the setting up of Parliamentary Inquiry Commission on the subject, the Government policy remains firmly favourable to the entry of foreign investment and several Ministers have held personal contact with foreign entrepreneurs to induce them to invest in Brazil (Fung and Cassiolato, 1976).

As shown in Table V-13, which is based on the data from the Central Bank (which acknowledgedly underestimate the amount of foreign investment and re-investment in Brazil ^{1/} such investment and reinvestment in the mechanical and electrical machinery industries has increased substantially in the period 1971/1974 especially in the former industry, where in two years and a half it increased 2.4 times. As we have seen (Chapter I) the

^{1/} This underestimate, often pointed out in studies about foreign investment in Brazil, was confirmed by the then, Finance Minister in 1973, when he presented to the Chamber of Deputies data which showed that the registers of the Central Bank accounted for only circa 60% of foreign investment in Brazil, the rest being entered as loans and suppliers' credits (von Doelinger and Cavalcanti, 1975).

TABLE V-18: FOREIGN INVESTMENT AND RE-INVESTMENT IN THE MACHINERY INDUSTRY IN BRAZIL REGISTERED BY THE CENTRAL BANK VALUE (IN US \$ MILLIONS) AS SHARE OF TOTAL FOREIGN INVESTMENT AND RE-INVESTMENT - 1971 AND 1974.

Industry	31.12.71		30.6.76		Total (B)	%	B/A
	Invest.	Re-Invest.	Invest.	Re-Invest.			
Mechanical	95.5	28.2	221.0	80.7	301.7	5.9	2.44
Electrical & Communication	163.2	98.4	212.5	140.9	353.4	6-9	1.35

SOURCE: Banco Central Reports, 1973 and 1974.

mechanical machinery industry was, at the beginning of the 'seventies, the segment of the capital goods sector where the participation of the national entrepreneurs was strongest.

Moreover, it seems probable that the policy of import-substitution in the capital goods sector presently underway will increase further the participation of foreign subsidiaries in the sector (see also Sections 5 and 6).

V.5: Policies of the State Enterprises

5.1) Introduction

The State Enterprises play an important role in the Brazilian economy. According to the estimates of Baer et al. (1973), in 1969, the value of production of the Federal Government's and State Government's (SG) enterprises represented 36% of the GDP and such enterprises accounted for 26.7% of the country's total fixed investment. Two-thirds of such investment was concentrated in five sectors, as can be seen in Table V-19: energy (electric power generation mainly), transport (mainly railways), chemical industry (mainly oil and petrochemicals), steel and mining (mainly iron ore). The SG enterprises (as a whole) are the most important investors in electric power and railways (mainly because of the role played by the State of Sao Paulo), while Federal Enterprises predominate in the latter three (see Table V-19).

As it is estimated that the State Enterprises are responsible for circa 50% of the Brazilian demand for capital goods and, for an even higher participation in the demand for more complex (especially custom-built) equipment, the Research Group of FINEP undertook, in 1973/1974 a study of the purchasing policies of some of those enterprises.

TABLE V-19: GROSS CAPITAL FORMATION OF STATE ENTERPRISES ^{1/} BY SECTORS
- IN PERCENTAGE - 1969.

<u>Sectors</u>	<u>Percentage</u>	<u>Participation of Federal Enterprises in Investment of The Sector (in %)</u>
Energy	37.77	33.4
Transports	9.61	40.9
Chemicals	9.07	} 99.0
Steel	5.18	
Mining	3.52	
Others	32.85	
	<u>100.00</u>	

NOTE: 1/ Federal Government and State Government Enterprises.

SOURCE: Costa et. al. (1973)

We selected, for their importance and for access to information, the state oil monopoly company, the three integrated steel plants of the State and the two largest electric power utilities (one of which belongs to a State Government).

The results of such study are reported in several documents, cited in the text below. In this Section I have used mainly such documents, coupled with the original reports of the interviews,^{1/} besides other secondary data available. The latter serve especially to broaden the scope of the conclusions based on the FINEP study, which is, acknowledgedly, based on a limited - albeit important - sample of State Enterprises.

It is important to compare the policies and constraints of the State Enterprises here discussed with those of the military projects presented in the Appendix which have given more emphasis to local technological development, since the latter have faced less constraints than the State Enterprises.

5.2) The Complaints of the Capital Goods Entrepreneurs

During our interviews, as reported in Chapter IV, the Brazilian capital goods entrepreneurs expressed substantial reservations about the purchasing policies of the State Enterprises, except for Petrobras, the State Oil company, and, to a lesser extent, CESP, the electric power utility of the State of Sao Paulo (see Chapter IV for details).

^{1/} The study was conducted mainly through interviews with the technical staff (mainly Heads of Departments and Divisions) and with the Board of Directors of the Enterprises, exploring in considerable detail their policies as regards the purchase of capital goods and engineering services; credit planning for investment, price formation, and research and development. Such interviews were complemented by others with engineering firms, State planning agencies and State credit agencies.

Almost three years later (in September 1975), during a week-long meeting between capital goods entrepreneurs, State authorities and members of the research institutes and universities about "technology in the capital goods industry", under the sponsorship of the Secretary of Industrial Technology of the Ministry of Industry and Trade, such complaints were renewed, in even stronger terms than during our interviews (MIC, 1975).

The capital goods entrepreneurs stated, again, that, as regards the technology, the State Enterprises showed a great resistance to accept local designs, often imposing or "suggesting" the use of foreign licensors as a condition to act as their suppliers.

They also charged the State Enterprises with using what amounts to a double-standard in relation to local suppliers and imports, by being much more lenient to the latter as regards quality of the products, delivery times, and even prices.

With respect to delivery times, a special point of conflict between the State Enterprises and capital goods producers at the time, the latter strenuously complained about the lack of planning of the State Enterprises' investments, which made very difficult their own planning. Moreover, the capital goods entrepreneurs argued that the delay of the investment decisions about the State Enterprises' often put the local producers in a situation of having to accept a lower participation in the supply because of pressures from the Government to accelerate such investments.^{1/}

^{1/} Especially singled out for criticism with respect to this last aspect was the Stage II of the Steel Plan, decided after long delays (see below) and where, out of an investment in machinery of circa US\$ 455 millions, the local supply participated in circa 25%, much less than was originally expected (see Chapter IV.).

The purchasing policies of the State Enterprises came also under criticism as regards the lack of standardisation of their specifications, reflecting upon the diversification of designs needed by the capital goods enterprises. They were also criticised for the excessive use of foreign engineering enterprises, which led to imports of machinery or designs.

Related to the point above, but with wider implications, the capital goods producers expressed their reservations about the policy of free entry in the sector, inclusive of foreign enterprises, which, according to them, was a great obstacle to a greater specialisation, needed in the sector. Emphasis was put on the excessive number of producers in several areas of the capital goods sector (e.g. transformers and generators and turbines in electric power generation, spherical tanks for chemical industries, mills in steel equipment, etc.) in comparison with the size of the Brazilian market (see Section 4).

In fact, although seldom acknowledged in the meetings we are here reporting, the criticisms of the capital goods entrepreneurs were addressed to the Federal Government policy-makers as much as to the State Enterprises themselves, given the responsibility of the former in the policies of the latter, as we shall see below.

5.3) Purchasing Policies: Technical Criteria

As regards the choice of suppliers of capital goods and engineering services our interviews indicate that the prime criterion of selection is reliability.^{1/} In fact, an analogy that comes up quite often is with the selection of a "family doctor, who you have to trust".

^{1/} As regards delivery time, although the companies interviewed complained bitterly about the lack of compliance of delivery time of their suppliers it seems, to judge from the interviews, that this scarcely constitutes ground for discrimination between local suppliers and imports, as both are bad.

Such reliability is normally assessed through the past record of the enterprises, often complemented by visits of the technical staff of the State Enterprises to their suppliers. The emphasis on "traditional" suppliers (see Chapter II) is then quite strong.

This is, indeed, the main rationale for demanding that local suppliers have at least a licensing relationship with an experienced supplier and for the preference for imports, sometimes even if the foreign suppliers has a subsidiary in Brazil "because even if the design is the same, the experience is different".^{1/}

There are, however, some important differences between the enterprises interviewed.

Petrobras has, since 1957, followed a programme for increasing the domestic participation (subsidiaries and Brazilian enterprises) in its purchases of capital goods. Such programme aims at reducing the risks that Petrobras may not be able to purchase abroad the goods it needs.

Accordingly, (NIC, 1975), priority to domestic production is given to goods that:

- their import would imply substantial foreign exchange expenditures;
- their import may become for some reason impossible and thus could bring losses to the Enterprise;
- the local industry may be technically and commercially capable of manufacturing.

^{1/} The preference for foreign suppliers and the request that when domestic suppliers are used a foreign source of technology is employed, applies also to engineering services, as analysed in detail in another of FINEP's reports (Alves and Ford, 1975).

The letter is assessed through a specialised sector within Petrobras, which is in charge of keeping in touch with local suppliers. In cases of doubt, or new products or new suppliers, Petrobras has a scheme, called "pioneer purchases" whereby they purchase a limited number of the goods in question and test them. If approved, such goods are not imported anymore.

Local purchases of Petrobras have increased from 20% of the total in 1957 to a "conquered level" of circa 80% in the early 'seventies (MIC, 1975) (see Table V-20). We return to this programme of increasing the domestic participation below, as it is presently being extended to the other State Enterprises.

Between the two electric power utilities studied we found that although CESP had, on average, much larger projects than the Federal Government company studied, the interviewees in the former, in comparison with the latter, stressed much more the "present capacity" of their suppliers than their past record, pointing out that the problems they had had with "traditional" suppliers showed that the guarantee given by experience should be taken with caution.

The steel companies were probably the most conservative of the enterprises studied in terms of experience requirements for their suppliers, which can be to a considerable extent explained by their lack of experience of purchasing and the lack of experience of domestic suppliers in producing the equipments required. Nevertheless, here too, an important difference was found, as one of the enterprises had set up a subsidiary for producing machinery and equipment and was committed motu proprio to increase local purchases to a 50% level for the next Stage of the Steel Plan.

TABLE V-20: PETROBRAS - LOCAL CONTENT OF MATERIALS AND EQUIPMENT
- 1957; 1963/1975 - IN PERCENTAGE OF TOTAL
PURCHASES.

<u>Year</u>	<u>Percentage</u>
1957 ^{1/}	20
1963	81.4
1964	86.3
1965	89.1
1966	77.8
1967	78.5
1968	79.0
1969	77.2
1970	80.6
1971	73.9
1972	74.1
1973	75.4
1974	61.1
1975 ^{2/}	69.8

NOTES:

- 1/ Approximate Figure.
2/ Purchases made until April.

SOURCE: M.I.C. (1975).

It is important to discuss, albeit briefly, the causes of the behaviour described above.

As regards the emphasis on experience, our discussion in Chapter II has already shown that in such sectors the combination of performance requirements with heavy investments tended to make purchasers of capital goods highly quality-conscious, quality being largely identified with experience.^{1/}

To such techno-economic factors we have to add the specific role play by the State Enterprises interviewed in the Brazilian context. Petrobras is the only producer of oil in the country; the two electric power utilities studies are the suppliers of electric power for the industrial centre of the economy, and the three steel companies are responsible for about 60% of the total steel produced and for the totality of common flat steel, which feeds critical industries such as automobile production and machine-building.

To such a crucial role, one has to add that often the output of the State Enterprises has lagged behind demand, putting great pressure on the Enterprises, so that the two factors combine to accentuate their "natural" conservatism as regards using untried suppliers.

Although such elements explain the general preference for experience, the differences found in the criteria of assessing such experience have to be explained in terms of the past history of the enterprises (see also Erber, 1971).

^{1/} In contrast, the RFFSA, the State Enterprise for railways, which buys mainly standardised equipment, uses price as its main criterion of purchase (Tecnometal, 1971a), except when such equipment is supplied through barter agreements between Governments (see Part (ii) of this Section).

Petrobras was created in 1954 as a result of wide process of political mobilisation, representing the single most important victory for the nationalist faction within Brazilian politics (Martins, 1976). Its operations are considered a matter of national security and the enterprise has always been regarded as an instrument for achieving national objectives besides the production of oil, a view which is shared within the enterprise itself. Such view of the role of the Enterprise has, explicitly, influenced the programme of domestic purchases (see above).

A similar, although considerably more restricted in scope, history and concept of purpose, differentiates CESP from the other electric power utilities. CESP is practically wholly owned (almost 99% of its capital) by the Government of the State of Sao Paulo and, to quote one of FINEP's reports, "according to its staff, CESP is not only an electric power company but a 'development agency' of the State..." (Outra and Sales, 1975). In contrast, the Federal Company studied is noted by its "entrepreneurial" approach, prizing micro-economic efficiency above all and taking the view that the development of a local capital goods industry is not one of its roles.

Among the steel companies, the important differences noted above as regards the balancing of their double role, as "State" and "Enterprise", scarcely exists: the three view themselves primarily as "enterprises" and, in fact, two of them became State-owned only because they could not repay the loans and guarantees of credits from abroad given to them by the BNDE. The enterprise which has set up a subsidiary for machine-building, previously-mentioned, is, in this aspect, following the Japanese experience of integrated concerns, with which it got acquainted through the Japanese companies which participate in its capital.

The analysis above suggests in effect, that the so-called "technical" criteria, often invoked under the pall of the supposed neutrality of technology, are, in fact, deeply permeated by historical and political considerations and, in turn, have important political consequences; even if those who put them into practice do not recognise the determinations or the consequences, as in the case of the "micro-oriented" State Enterprises interviewed.

It is important to stress that the "technical" criteria of the State Enterprises represent one of the most important obstacles to a strategy of technological self-reliance in the sense that they lead to a vicious circle between lack of demand (trust) and lack of supply (technical capacity), the more difficult to break because there are no clear criteria to separate sensible risk-assessment and technical evaluation from prejudice and unwillingness to innovate, as too easily the latter are disguised as the former. The same difficulty imposes considerable caution in the adoption of measures which would oblige the State Enterprises to accept equipment which they consider too risky (see also 5.6).

5.4) Purchasing Policies: Financial Constraints

Apart from the reasons above-discussed, the State Enterprises in Brazil have had important financial reasons to use suppliers from abroad.

First, the State Enterprises have been among the main recipients of the incentives given to imports described in Section 3 above.

Second, foreign sources of credit have been widely used to finance the projects of the State Enterprises.

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As previously remarked (see Section 3) the State Enterprises have been the prime beneficiary of credits from international institutions (IBRD and IDB mainly). Such credits are generally highly prized by the state Enterprises not only because of their conditions (especially the long periods of repayment) but also because of the freedom they give the Enterprises in choosing their source of supply. Alves and Ford (1975) have shown that the criteria of selection suggested by such international institutions (especially the IBRD) impart some bias against Brazilian producers by their emphasis on previous experience, but the State Enterprises which use such credits do not mind this, as they tend to share such bias (see above).

The outstanding exceptions are, characteristically, Petrobras, which has never used such credits and CBSP which has used only (once) IDB credits, in contrast with the other companies interviewed, specially the other electric power utility, which are important clients of the IBRD and of the IDB.

However, when the foreign credits are tied-in the Enterprises often resent them, especially when such credits result from Government negotiations and they are faced with a fait accompli as regards their suppliers of capital goods. Several instances of this were mentioned during the interviews.

Two main reasons determine the intensive use of foreign sources of credit for the investments of the State Enterprises. One already discussed, is the relative lack of internal sources of long-term credit in Brazil (see Section 3). Although the BNDE for a long period concentrated its resources on projects of the State Enterprises (mainly railways, electric power and, subsequently, steel) the resources it has had available have been insufficient to finance local purchases of equipment in the scale

needed for such projects.

The second is the policy put into practice by the State as regards the prices charged by the State Enterprises for their products and services. Although this has varied over time and according to the sectors, the Brazilian Governments have often used the prices of the State Enterprises as an instrument of control of inflation and as a means of subsidising privileged categories of consumers, mainly industrial enterprises. This has been the case, for instance, for the prices of steel and electric power (Dutra and Sales, 1975) and for railway transport (Abouchar, 1972).

It is beyond our scope here to discuss the consequences of such controls for the economic development of Brazil. For the Enterprises concerned, however, they meant a reduction in their capacity of self-financing, which, coupled to the lack of internal sources of credit, implied, in turn, the need to resort to foreign sources of credit. In fact, one of the main reasons why Petrobras has been able to develop its programme of local purchases is that it has been largely self-reliant as regards financing and, indeed, the drop of the local content of its purchases in 1974/1975 (see Table V-20) is attributable to its use of foreign credits to finance the refineries set up in that period.

5.5) Planning of Investments

A further consequence of the lack of self-financing of the State Enterprise is the increased control exerted by other Government institutions (especially the financial authorities) over their investment decisions. Such control comes not only via the internal sources of credit (mainly the supply of capital (e.g. budget allocations) but also via the role played by the Federal Government authorities in the negotiation of external credits. Such authorities intervene not only in the negotiations

of Government backed credit and barter agreements (obviously) but also in the negotiations with international agencies, which normally request such intervention, such as in the case of electric power utilities in the 'sixties and steel in the 'seventies (Franken, 1975; Dutra and Sales, 1975). Moreover, official guarantees to suppliers' credits are often given by the DNDP and the Treasury.

Such subordination subjects the investment plans of the State Enterprises to a substantial degree of uncertainty, as the Enterprises must compete with other important pressure groups for the resources needed for their projects. Given the volume of resources involved in such projects and, consequently, their economic and political opportunity cost, the Government has often delayed commitments to the investment plans of the State Enterprises until shortages of supply have become imminent or actual. Then investments had often to be rushed on, reducing (as the capital goods entrepreneurs correctly complained) the possibility of local participation in the supply and, even more so, of local development of technology.

Probably the prime example of this pattern of decision-making is the Stage II of the Steel Plan, for which the companies had the plans made for a long time ^{were} but which ~~was~~ delayed for years (with the result that in the period 1974/1975 imports of iron and steel totalled over US\$ 2.7 billions); but similar patterns are observed also in electric power, especially during the 'sixties, in railways and in shipbuilding (Dutra and Sales, 1975; Suzigan et al., 1974; Tandler, 1968).

In other cases, such as in petrochemicals, decisions were delayed for years for more explicit political reasons: the conflicts about whether the State should act as a direct producer in the sector or not (Suzigan et al., 1974).

Moreover, especially when dependent on budget allocations, the investment plans of the State Enterprises have suffered from sudden expenditure cuts, normally aimed at controlling inflation and balance of payments problems, and often introduced without consultation with the Enterprises. The latest example of this has been the cuts made at the end of 1976, aimed, it is reported (Folha de São Paulo, 19/11/76) at reducing import expenditures and which have reduced the State Enterprises' investments for the next year by an average of ^{1/} 35%.

Nevertheless, within the boundaries of uncertainty set up by their dependence vis-a-vis the Federal Government, the planning procedures of the State Enterprises and the indications given to the capital goods producers as regards future purchases have considerably improved since the end of the 'sixties, especially in those sectors which have more certain sources of funds. Eletrobras, for instance, has had, since 1968, a five year rolling-on investment plan with broad indications of the equipment needed and, in 1976, it has presented the capital goods industry with a very detailed estimate of the purchases of the sector up to 1990 (Eletrobras, 1976). Similarly, Petrobras has, since the end of the 'sixties, lengthened its time-horizon when analysing potential sources of local supplies, which, in 1974, extended up to 1990 (Petrobras, 1974) and the newly established Nucleobras, in charge of the Brazilian nuclear programme, is planning its purchases up to 1994 (MIG, 1975). In contrast, a

1/ The case of railways is especially interesting in this context. The State Enterprise in charge of railways (Rede Ferroviária Federal S.A. - RFFSA) is practically wholly dependent on the Federal Budget for its resources (Tecnometal, 1971a). In 1974, following the oil crisis, railways were given a new priority in the transport policy (which had been oriented primarily towards road transportation) and huge investments were announced. Nevertheless, the RFFSA suffered the highest cuts in its 1977 budget - almost a third, according to the above-mentioned source. The effects of such measures on the suppliers of the State Enterprises can be gauged by the announcement made by one of the enterprises we interviewed that, following the Railway Plan of 1974, it intended to expand its capacity for producing railway equipment five times (Veja, 27/11/74).

a report on the RFFSA, in 1971, stated that "it has no conditions of making a long-term programme of purchases as its budget depends on (Federal) budget allocations which do not allow it, a priori, a knowledge of its resources' availability" (Tecnometal, 1971a, p. 6).

It is worth remarking, in view of the complaints of the capital goods entrepreneurs previously reported, that, during our interviews with the electric power utilities, several complaints were made about the lack of attention paid by the capital goods producers to the plans put forward by the utilities, which seems to corroborate our observations of Chapter IV about the strategy of the capital goods enterprises. ^{1/}

5.6) Recent Measures to Reduce Imports of the State Enterprises

For the reasons above discussed, the State Enterprises have been important importers of capital goods: in the period 1964/1974 they were responsible for about one-third of total imports and for a much larger share of custom-built equipment (over 60% in the period 1968/1970) for which there is data available) (see Table V-21). Therefore, since 1974, the Brazilian Government has taken several measures specifically directed to the State Enterprises beyond the general measures mentioned in Section 3, ^{2/} aimed mainly at reducing their imports, but which have important implications for the technological development of the capital goods industry.

Initially, in May 1974, it was "recommended" to the State Enterprises that they should make a "special effort" to increase their local purchases (CDE, Resolution of 23.5.74), and later on, in October, the State Enterprises were instructed to prepare investment plans for a minimum of four

^{1/} During such interviews it was also suggested that this may be partially due to problems of communication within the ABDIB (to whom the plans are communicated).

^{2/} From which the State Enterprises are often exempt.

TABLE:V-21: PARTICIPATION OF THE MAIN SECTORS DOMINATED BY STATE ENTERPRISES IN TOTAL IMPORTS OF CAPITAL GOODS AND PARTICIPATION OF STATE ENTERPRISES IN IMPORTS OF CUSTOM-BUILT EQUIPMENT - IN PERCENTAGE.

<u>Sectors</u>	<u>Participation in Total Imports - 1964/1974</u> ^{1/}	<u>Participation in Custom-Built Equipment</u> ^{2/}		
		<u>1968</u>	<u>1969</u>	<u>1970</u>
Electric Power	12.1	31.0	38.4	35.1
Steel & Metal	8.6	0.9	3.2	14.2
Oil	n.a.	9.4	2.8	12.2
Railways	2.3 ^{3/}	2.9	14.9	2.1
Mining	1.4	8.7	6.1	2.6
Telecommunications	6.6	n.a.	n.a.	n.a.
Total	31.0	52.9	65.4	66.2

- NOTES: ^{1/} Data include private enterprises' imports too, but in sectors above those tend to be small.
- NOTES: ^{2/} Imports made only by State Enterprises.
- NOTES: ^{3/} Data: 1973/1974 only.

SOURCES: Participation in total imports - Castelo Branco (1976), except for railways data, which come from Banco Central, 1974 Report.

Participation in Custom-Built Imports - Erber et. al. (1974), based on Tecnometel (1971) data.

years and to set up research groups in charge of absorbing and eventually developing the technology of the processes and products purchased by the Enterprises (Diario Oficial, 10.10.74).

However, to quote the Deputy Minister for Trade and Industry, speaking at the STI meeting in 1975: "such attempt had not the success expected because, as everybody will agree, the Enterprises have a greater commitment to profitability. ... They do not have the immediate responsibility of promoting technological development. The enterprises prefer to buy proved equipment that will give them operational safety. ... They cannot take exaggerated risks" (Beloti, 1975, p. 434/435).

Having failed to elicit voluntary action from the State Enterprises in the measure desired, the Government determined that all the Ministries and State Enterprises should present an "import budget" for 1976 with imports at least 15% below the 1975 import level.

Besides this "act of force", aiming at immediate import reductions a long-term measure was taken, with important potential results: each State Enterprise was to set up a Nucleus of Linkage with Industry (Nucleo de Articulacao com a Industria - NAI). Such Nuclei were supposed to act as a mechanism of coordination between the State Enterprises' departments of engineering, planning and industrial operations and the firms supplying capital goods and engineering services, following the model set by Petrobras, with the objective of increasing the domestic

participation in the supply of capital goods and engineering.^{1/}

By the middle of 1976, several State Enterprises had set up their NAIs: the three large steel companies (COSIPA, USIMINAS and CSN), the railway company (REFFSA), the mining company (CVRD), Eletrobras (the holding company for the electric power sector) and, of course, Petrobras whose NAI is going to be used also by its petrochemical subsidiary, Petroquisa (Jornal do Brasil, 9/8/76).

An important step towards increasing the effectiveness of the NAIs as an instrument of policy for the capital goods sector was taken, when in November 1975, a Commission was established to coordinate their work. The Commission seems to have political and technical support to carry through its work. FINEP is to act as its Technical Secretary.

Although it is still too early to assess the work of the NAIs, a few comments can be made about their probable effects on the capital goods industry.

In terms of expansion of local production of capital goods and import-substitution, the NAIs will probably be a useful instrument.

^{1/} In order to fulfill such role, they are supposed to "draw the attention of the capital goods producers to the characteristics and dimensions of the future demand for capital goods of the State Enterprises, so as to allow the producers time to become capable of supplying such demand" and, at the same time, "to inform the planning staffs responsible for the investment programmes of the State Enterprises about the technical possibilities of the national capital goods producers so as to allow, without foreaking quality, specifications which shall not make unfeasible the internal supply of the necessary equipment" (CDE, Resolution of 18/6/75, emphasis.).

Through their coordination they can also become an important instrument for better planning in the sector, which will probably include efforts to induce greater specialisation among the producers of capital goods - an objective of not only the producers already established (see Section 5.1) but also of some of the State Enterprises (MIC, 1975) and of FINAME (BNDE, 1975 Report).

However, as regards another objective of the Government - greater technological self-reliance in the capital goods industry (see Section 6) - their effect may be more limited.

Their present policy (as that of Petrobras in its nationalisation programme) is primarily concerned with increasing domestic supply, without differentiating between Brazilian producers and foreign subsidiaries, and much less so between local and foreign technology; local technological development being a secondary (and to some extent, ill-defined) objective. ^{1/}

Indeed, as regards this last point, it is worth noting the extreme cautiousness of their terms of reference with respect to the technical aspects of the choice of equipment; which probably reflects the reluctance of the State Enterprises in compromising what they view as their safety ^{2/} - a point accepted, as we have seen, by the highest echelons of the Government.

^{1/} As regards the objective of technological development, the NAIs are supposed to "identify questions related to the R&D of process and products which would orient the action of national centres of research and/or the opening of negotiations to purchase foreign technology, in conditions which shall make possible its effective absorption by the national enterprises producers of capital goods and basic engineering" (CDE, op. cit.).

^{2/} The cautiousness and risk-avoidance in technological matters of the State Enterprises we interviewed are also shown in other aspects, such as their R&D policy, studied by Reis and Redinger (1975).

It is, however, possible that through the experience of the programme itself, some of the reservations of the State Enterprises to local technology may be reduced, especially when the several projects included in the present Plan for Science and Technology which aim at improving the quality of the capital goods produced (some designed) in Brazil, inclusive through quality controls, become operational, (see Section 6).

It is also possible that, by comparing purchasing experiences of different State Enterprises, with information at the product level, the difficulty above-mentioned (Chapter IV and Section 5.3 above) of distinguishing between sensible risk-assessment and prejudice may be reduced; although, of course, it cannot be eliminated. The information collected from the NAIs will also be used by FINEP to identify capital goods enterprises which have a good potential for local technological development (see Section 6).

V.6: The Science and Technology Policy

This Section examines the main points of the Brazilian explicit ^{1/} policy of science and technology. In the first part we analyse the policy of import of technology and in the second the policy of support of local scientific and technological activities.

The Government's stated policy, is that the import of technology should be complementary to the local efforts, to be used as an instrument

^{1/} Implicit policies are those which although not intended primarily to affect technological development, affect it as a side-effect. The policies discussed in the preceding Sections would fall into this category. See Jones (1972) and STPI (1975) for a fuller discussion.

for furthering the local capacity for technological innovation (II PBDCT; pp. 11 and 14). Focussing on the capital goods industry, one of its top priority areas, the present Plan for Science and Technology (II PBDCT) states further "there, more than in any other sector, the import of technology is an alternative of limited efficacy, badly replacing the mastery over process, product and production engineering, notably in the segment producing custom-built equipment" (ibidem, p. 14).

6.1) The Policy of Imports of Technology

(a) Explicit payments for technology

The total Brazilian explicit payments for technology (which, however, it should be emphasised, represent only the "visible end" of the payments for imported technology) have increased substantially over time, especially since 1965, when they were almost one-fifth of the 1974 value (see Table V-22). However, although they have increased their importance in terms of the GNP, such payments represented, in 1974, less than 2% of the total Brazilian import bill (ibidem). Nonetheless, given the deficiencies of the register system of the Central Bank, which originates such data, it is certain that the values shown are an under-estimate of the total explicit payments, especially for the period prior to 1965, although it is not possible to estimate the extent of the under-estimation (Biato et al., 1973).

The importance of the capital goods industry and, within the industry, of the Brazilian enterprises to such payments can be assessed from two sources: for the period 1965/1970 from Biato et al (1973), who analysed the contracts signed by industrial enterprises and registered at the Central Bank, and for the period 1972 to June 1975 from Fung and Cassiolato (1976), who analysed the contracts approved by the INPI in the period.

TABLE V-22: PAYMENTS ABROAD FOR TECHNOLOGY ^{1/} - IN US\$ MILLIONS.

Year	Payments (A)	Index (1965 = 100)	(A) As a % of Imports (FOB) Total	Capital Goods ^{2/} ^{3/}
1947-1953 (av.)	13.5	31.8	1.1	3.5
1954-1961 (av.)	32.2	75.8	2.6	9.1
1962-1964 (av.)	14.6	34.4	1.2	4.6
1965	42.5	100.0	4.5	18.0
1966	45.8	107.8	3.5	12.5
1967	62.7	147.5	4.3	13.6
1968	70.2	165.2	3.8	11.2
1969	91.0	214.1	4.6	12.3
1970	104.0	244.7	4.1	11.0
1971	132.0	310.6	4.1	10.2
1972	154.0	362.3	3.6	8.5
1973	166.0	390.6	2.7	7.6
1974	212.0	498.8	1.7	6.6
1975			1.8	5.7
1976			2.1	6.4

NOTES

1/ Payments for patents, royalties, technical assistance and management fees.

2/ For the period 1950/1964, C.I.F. values.

3/ Data refer to period 1950/1953.

SOURCES:

Payments: 1947/1971:- Bi to et. al. (1974); 1972/1974:- Banco Central, yearly reports.

Imports: Total - 1947/1972:- Conjuntura Economica, Vol. 27, no. 12, December 1973. 1973/1974 - Banco Central, yearly reports.

Capital Goods:- 1950/1964:- Biato et. al. (1974); 1965/1974:- Costello Branco (1976).

75/76 - Tigno (1978)

The data provided by Biato et al indicate that the capital goods industry was responsible for circa 4% of the total payments abroad. The participation of the Brazilian enterprises in the payments of the industry was of circa 30% (see Table V-23).

The data from the contracts approved by the INPI show a similar picture for the industry: taking into consideration those contracts which have a specified payment, the industries producing mechanical equipment and electrical and communication equipment accounted for 3.3% of the payments^(same Table). This figure, however, under-estimates the participation of the capital goods industries in total payments as the latter are taken from 82.5% of the number of contracts (the rest not specifying the payment),^{while} the values for the mechanical and electrical and communications industries are taken from, respectively, 47.5% and 70.7% of the contracts of the respective industries.

As regards the participation of Brazilian enterprises, the data from Fung and Cassiolato show that they accounted for 39% of the payments of the two industries (see Table V-23). Although the data from the two sources are not strictly comparable, this seems to support the contention that the Brazilian enterprises have stepped up their use of foreign technology in the recent years. Also noteworthy is the difference in the participation of the Brazilian enterprises in the two industries: while in the mechanical industry they account for 55% of the payments, in the electrical and communications equipment industry such participation is only 7%, reflecting the dominance of foreign enterprises in the latter (see Table V-23).

TABLE V-23: PARTICIPATION OF THE CAPITAL GOODS INDUSTRY IN THE EXPLICIT PAYMENTS FOR IMPORTS OF TECHNOLOGY AND PARTICIPATION OF BRAZILIAN ENTERPRISES WITHIN THE INDUSTRY - IN PERCENTAGE.

Industry	Participation of Payments	Participation of Brazilian Enterprises in Industry
<u>A-1965/1970*</u>		
Capital Goods ^y	3.36	30.6
 <u>B - 1972/1975*</u>		
Industry		
1) Mechanical	2.3	55.0
2) Electrical & Communic. Equipment	1.0	7.0
3) (1) + (2)	3.3	39.0

NOTES: 1/ Mechanical industry, part of Electrical and Electronics Equipment and part of Transport Equipment.

* Data non-comparable - see text.

SOURCES: A - Biato et. al. (1973).

B - Fung and Cassi 1 to (1976)

My computations.

The figures presented above, notwithstanding their limitations, show the insignificant role played by the nominal payments for technology by the capital goods industry in the context of the present Brazilian imports, and even in comparison with the imports of capital goods only (see Table V-22).

The attempt to reduce the balance of payments deficit has been one of the main concerns of Brazilian policy-makers in the recent years. The constraint imposed on payments for technology, especially that purchased for capital goods, will, as shown above, have a very limited direct effect upon the balance of payments. Nevertheless, the Brazilian policy-makers hope that it will have an important indirect effect, by allowing for a greater participation of the internal sources in the total supply of capital goods, having identified the import of technology as one of the main causes of the imports of capital goods (see Section 3.1).

(b) Control of imported technology - recent measures

In this Section, we analyse the controls over the explicit transfer of technology from abroad, through technical assistance agreements and licenses for patents and trademarks. As mentioned in the preceding Chapter, such control is exerted mainly by the Instituto Nacional de Propriedade Industrial (INPI), subordinated to the Ministry of Industry and Trade, which is in charge of screening the contracts before they can be registered at the Central Bank, which will authorise payments remittances abroad.

We have already commented upon the main features of the control exerted by the INPI at the time of the interviews as well as on the complaints of the entrepreneurs about such control, which started in 1972 (see Chapter IV).

In 1975, after, it seems, consultation with entrepreneurs, ^{1/} the INPI promulgated new norms for the transfer of technology (Normative Act 15 of 16/9/75).

Under the Act, the INPI re-classified the seven categories of technological transfer which existed previously, and which were not precisely defined, into five new categories, ^{2/} including one specifically for capital goods.

The establishment of a different category for capital goods met one of the complaints expressed by the entrepreneurs of the sector, who claimed that the sector required a differentiated treatment, or, to quote one of our interviewees, "one cannot treat capital goods in the same way as aspirin".

However, contrary to pleas for greater freedom demanded at the time of the interviews, the Act introduced a considerable tightening in the conditions of transfer of technology.

As regards the content of the contracts, the Act requires full disclosure of the information, which includes, in the case of agreements for

^{1/} This was the impression conveyed during the interviews J. Cassiolato made in 1975 at the time of the promulgation of the Act; re. (Fung and Cassiolato, 1976). Private communication.

^{2/} The new categories are:-

- License agreements for patents
- License agreements for trademarks
- Agreements for the supply of industrial technology not covered by patents or trademarks - intended for the production of consumer and intermediate goods.
- Agreements for technical-industrial cooperation, for technology not covered by patents or trademarks - especially designed for custom-built capital goods.
- Specialised technical services agreements.

The Act determines that for each category there must be a separate contract; i.e. a contract cannot, for instance, cover payments for patents and for non-proprietary knowledge. Previously they could, which made control more difficult.

the capital goods industry, "the supply of all technical data, drawings and specifications for the product engineering and of the materials used in its fabrication, as well as all the methodology of technological development used" (op. cit., Art. 5.1.1.a; my emphasis), plus the guarantee of supply of information to keep the product up-dated and training of the technical staff of the purchaser of technology by the supplier.

The purchaser of technology from abroad must also show that equivalent knowledge is not available from local sources and present a plan for training its technical staff and a "time schedule for the absorption of technology" (op. cit., Art. 5.4.1.)

Moreover, the Act, again contrary to the demands of the entrepreneurs, seems to have put even greater constraints on the payments for technology. Although it does not specify the maximum percentages on the value of sales allowed, such percentages have been kept at the old levels (5% for capital goods). However, the "sales' value" has been explicitly defined as the "net price" - the value of sales net of: taxes, imported raw materials and components (a blow, incidentally, to tied-in purchases), commissions, return credits, freight, insurance and packaging expenditures, "as well as any other deductions which may be agreed between the contracting parties" (op. cit., Art. 5.2, Note). Formerly, although the INPI had been pressing for contracts to be signed under this concept, the "value of sales" was often accepted to be their gross value.

Furthermore, the Act establishes that when there is a "fixed value for the technical documentation initially supplied" this "will represent an advance on the remuneration due" (Art. 5.2.1). Applying, as it does, especially to custom-built equipment, this represents an important change from the past, when as we saw in Chapter IV, the Brazilian firms normally

paid their licensors the cost of the designs beyond the percentage, paid on the sales value.

However, as regards the payment of income and withholding taxes, the Act allows this to be determined by the two parties concerned, while previously the INPI did not permit the burden of tax payments to fall on the licensee.

As regards the duration of the contracts, the Act has retained the previous five-year period, which is, however, to be counted from the time of the effective beginning of the production, while previously it was counted from the signature of the contract. The Act foresees also the prorogation of such period, for an undefined period, provided that the charges paid are reduced.

Finally, the Act retained the former prohibition of restrictive clauses which implied limitations on sales (especially export restrictions), mandatory use of trademarks and/or purchases of components and raw materials and limitations on the technological activities of the local party, including the mandatory cession of improvements introduced by the latter.

Moreover, Fung and Cassiolato (1976), based on interviews with entrepreneurs in Sao Paulo in the middle of 1975, report that the INPI was not (previously to the Act) accepting contracts which involved the use of equity as payment for technology, a form of payment which, as we saw in Chapter IV, was becoming more common during the early 'seventies. Although the Act does not expressly forbid such form of payment, the INPI has the power to refuse to accept it and, presumably, bearing in mind the restrictive nature of the Act, has continued to follow such policy (but see below).

The policy of technological transfer faces some problems of implementation.

First, the INPI can do little to prevent collusion between the contracting parties if those wish to by-pass the constraints of the present policy. Such collusion, is far from improbable, given the importance of the imported technology for the Brazilian firms, especially for custom-built equipment (see also Chapter IV).

As regards direct payments, the local parties can sometimes resort to alternative means of paying for the technology, such as buying equipment from their suppliers of technology. Collusion is much easier as regards the restrictive clauses, as their effectiveness depends on the initiative of the local partner. This is strengthened by the lack of coordination between the several State institutions (see Section 2).

An illustrative example is given by Fung and Cassiolato (1976): one of the firms they interviewed had its agreement with a foreign company disallowed by the INPI because it included the use of equity as partial payment for technology. The form of payment was duly changed, but then the foreign supplier used part of it to purchase equity in the Brazilian firm. In such cases, the full implementation of the policy of the INPI would require stricter criteria as regards foreign investment from the Central Bank, which, however, merely registers the investments.

As regards the clauses of full disclosure the same possibility of collusion exist, strengthened by the weakness of the technical staff of the INPI in charge of assessing such disclosures. In fact, until 1975, as reported by Fung and Cassiolato (1976), such staff numbered circa ten persons, mostly lawyers and economists, in charge of processing circa 1500 contracts per year. Moreover, during the short existence of the

Institute, its staff has gone through a considerable turn-over, so that its experience is limited.

The same limitation impinges upon the capacity of the INPI of effectively controlling, through a follow-up at the level of the enterprise, the "absorption programmes" proposed in the contracts, although the Act 15 allows the INPI to delegate such task to other institutions.

However, if the policy is effectively implemented it may have important implications for the development of the capital goods industry in Brazil.

If implemented, the policy will probably lead to an increase of design performed in Brazil. However, the combination of full disclosure with restricted payments may also result in a retraction of supply of technology, especially where the Brazilian market is small and the revenue from the contract does not compensate for the risk and costs of full disclosure; more so when the technology is non-proprietary, as is quite often the case in capital goods and engineering.^{1/}

Such restriction is more likely to affect the licensing relationship where it is established between fully independent parties than that between subsidiaries and parent companies,^{2/} i.e. they will probably increase

^{1/} In the case of capital goods, our interviews strongly suggested that this would be the case and some more recent information I had in England about firms operating in Brazil through licensing seems to confirm this.

^{2/} The Act has no effect upon previous laws (Law 4.131 of 27/9/62 and Decree 55.762 of 17/2/65) which forbade payments from foreign subsidiaries to their parent companies on account of royalties for trademarks and patents. However, as discussed in detail in the two studies made about technology payments in Brazil - Biato *et al* (1974) and Fung and Cassiolato (1976), such prohibition has probably had little significance, as the law has several loopholes, such as payments for "technical assistance" or payments to other enterprises pertaining to the same group; not to mention other mechanisms of remittance of revenue such as tied-in purchases, over-invoicing, etc.

the competitive edge of foreign subsidiaries over their Brazilian competitors.

The present policy of technological transfer may also induce further direct investment of foreign enterprises in Brazil through the restriction of the revenues from licensing. The policy of reducing imports of capital goods imply that the possibilities of exporting to Brazil will be reduced, while the market for local purchases will be increased, which, coupled to the restriction in the revenues from licensing, may, in many cases, make the alternative of setting up a subsidiary attractive for international companies.

Therefore, if the policy achieves its objective of increasing the amount of design performed in Brazil, it is likely to be at the cost of increasing the internal importance of foreign companies in the Brazilian capital goods industry, in contradiction with the stated objectives of the Development Plan (II PND) and of the Plan of Science and Technology (II PBDCT) of increasing the role of national enterprises.

6.2) The Support to Internal Scientific and Technological Activities

(a) Introduction: the growing support and priorities of the Plans

Since the end of the 'sixties the development of scientific and technological capabilities in Brazil has received increased attention from the Federal Government and from some State Governments (especially that of the State of Sao Paulo). Because of its preponderant role we shall concentrate here only on the former.

The support to scientific and technological activities has been explicit and detailed in the two Basic Plans for the Development of Science and

Technology (I and II PBDCT), ^{1/} the first covering the biennium 1973/1974 and the second the period 1975/1979.

The Plans can be broadly described as comprising, first, a statement of the main points of the strategy for science and technology as envisaged by the Federal Government and, second, a brief description of the projects and programmes of the institutions attached to the Federal Government. The latter, include the R&D programmes of the State Enterprises as well as the programmes of financial institutions such as the BNDE and FINEP earmarked for science and technology, and compose the Budget of the Plan. The Budgets cover a three-year period, so that in the II PBDCT the Budget covers the period 1975/1977.

As regards technological development, both Plans stress the need to, at the same time, increase the absorption of technology from abroad and to increase the capacity for self-reliance, especially in Brazilian enterprises. The present Plan, however, places a greater emphasis on self-reliance than the First (see also Section 6.1).

Table V-24 presents the yearly budgeted expenditures for the two Plans. On average, yearly expenditures for the Second Plan are over the double of those of the First, showing the growing commitment of resources to the area. Presently, expenditures of the Plan correspond to circa 0.8% of the Brazilian GDP. Such investment is almost totally composed of internal resources (over 95% of the total) (see Table V-25).

The commitment of the Federal Government to science and technology development is also shown by the mobilisation of special resources to

^{1/} The role of scientific and technological development in the Brazilian General Development Plans has been analysed by Guimaraes and Ford (1975). Here we shall concentrate on the specific plans for science and technology.

TABEE V-24: PLANNED FEDERAL GOVERNMENT EXPENDITURES FOR SCIENCE AND TECHNOLOGY IN BRAZIL - 1973/1977.

<u>Plan</u>	<u>Year</u>	<u>Value</u> ^{1/}	<u>Growth Rate (%)</u>
I PBDCT	1973	314.89	
	1974	371.34	18
(average)		343.11	
II PBDCT	1975	669.35	80
	1976	750.72	12
	1977	807.57	8
(average)		742.41	21
Average	1973/1977	582.69	26

NOTES: 1/ Values in US \$ 1000.00. Data for I PBDCT presented in Cr. \$ 1973 and of II PBDCT in Cr. \$ 1975. After converting 1975 values into 1973 Cr. \$, conversion in dollars was made at average exchange rate of the year (Cn. \$ 6.218). Such exchange rate is probably over-valued.

SOURCES: I and II PBDCT.

TABLE V-25: FINANCING OF THE PBDCT - PERCENTAGE.

<u>Source</u>	<u>I PBDCT</u>	<u>II PBDCT</u>
Participating Institutions	65.8	44.0
Special Resources for Science & Technology	23.3	32.0
Other Internal Sources	6.1	19.8
Foreign Sources	4.8	4.2
Total	100.0	100.0

SOURCES: I and II PBDCT

finance the Plans. In the Second Plan such resources cover circa one-third of the budgeted expenditures, as shown in Table V-25.

In international terms, the investment in science and technology planned by the Brazilian Federal Government for the period 1975/1977 is, taking the average for the period, roughly comparable to the total (i.e. private plus government) R&D expenditures of an advanced country such as the Netherlands, at the beginning of the decade, or, to compare Government expenditures, it represented half of the UK's Government expenditure in 1970/1971 (see Table V-26). Bearing in mind, of course, the limitations of such comparisons (see Chapter II), they indicate nonetheless the order of magnitude of the present Brazilian investments in science and technology.

Responding to the deficiencies previously noted (Chapter IV and references therein), the emphasis of the Plans in terms of resource allocation has been on what can be termed the "infrastructure" (human and institutional) of the activities of science and technology.

In Table V-27 we present the resources' allocation of the two Plans according to their original breakdown. Although in the Second Plan "support activities", basic research and post-graduation receive 35% of the resources (29.5% in the First), this represents a gross underestimate of the resources for the scientific and technological infrastructure as a very substantial part of the sectoral activities - investments in industry, energy, transports, etc. - are in fact for the development of such infrastructure, especially the industrial programme, which includes, for instance, setting up systems of industrial information and quality control. ^{1/}

^{1/} The system of post-graduate education is receiving additional resources, from the National Plan of Post-Graduation, covering also the period 1975/1977, apart from the resources of the Plan for Science and Technology, which amount to 16.3% of the total resources of the latter.

**TABLE V-26: GROSS EXPENDITURES ON RESEARCH AND DEVELOPMENT (GERD)
IN SOME OECD COUNTRIES AND IN BRAZIL - US \$ 1000.**

<u>Country</u>	<u>GERD (Total)</u>	<u>GERD (Government)</u>
Belgium	363709	180400
Canada	1145412	799498
France	2920368	1874876
Italy	928986	401322
Japan	4040987	1357772
Netherlands	783807	352929
Sweden	538327	237941
United Kingdom	2596510	1487800
United States	27527600	16709253
Brazil	n.a.	742413

NOTES: OECD countries: Statistical Year 1970/1971
Brazil: average period 1975/1977 in 1973 U.S. \$.

SOURCES: OECD countries: O.E.C.D. (1975)
Brazil: II P.B.D.C.T.

TABLE V-27: ALLOCATION OF RESOURCES OF THE PLANS FOR SCIENCE AND TECHNOLOGY - IN PERCENTAGE.

<u>Main Programmes</u>	I PBDCT	II PBDCT ^{1/}
1. "New Technologies"	<u>16.38</u>	<u>10.45</u>
1.1 Nuclear Energy	9.40	6.31
1.2 Space Activities	5.91	2.70
1.3 Oceanography	<u>1.08</u>	0.90
1.4 Other sources of energy (solar energy, etc.)	-	0.55
2. Economic Infrastructure	<u>9.75</u>	<u>13.43</u>
2.1 Energy	7.66	6.09
2.2. Electric Power	5.25	3.24
2.2.2. Oil	2.41	2.85
2.2 Transport and Communications	2.09	7.35
3. Industrial Technology	<u>20.50</u>	<u>20.07</u> ^{2/}
3.1 Programme of the Ministry of Industry	11.23	
3.2 Special Programme	10.92	
3.3 Programme of the Army	3.70	
3.4 Programme of the Navy	0.16	
3.5 Programme of the Air Force	1.73	
3.6 Programme of the Ministry of Mines and Energy.	0.75	
4. Agricultural Technology	<u>11.16</u>	<u>13.66</u>
5. Projects Applied to Social Development	<u>4.76</u>	<u>7.33</u>
6. Basic Research and Post Grad.	<u>21.63</u>	<u>26.31</u>
7. Support Activities	<u>7.83</u>	<u>5.74</u>
Total	100.00	100.00
Value (1973 U.S.\$ millions)	686.2	2227.4

NOTE: ^{1/} Period 1975/1977.
^{2/} 3.3% for technological infrastructure (standards, quality control systems, etc.) and the rest (16.77%) for development of priority sectors.

SOURCE: I and II P.B.D.C.T.

Because of the way the Plans are prepared, the main part of these resources is earmarked to specific projects. However, in the Second, a small part (5%) represents resources for the BNDE and FINEP (especially the latter) to finance projects presented by industrial and engineering enterprises under their own initiative. ^{1/}

Since 1974, a considerable improvement has been achieved in the machinery for planning science and technology by bringing the National Research Council (re-named as the National Council for the Development of Science and Technology) under the Planning Secretary (formerly Planning Ministry) together with FINEP (which is in charge of managing the National Fund for Science and Technology (FNDCT), the main source of funds in the area) and the BNDE, as well as by changing the structure of the Council so as to enable it to perform its legal obligations as the "central organ" of the system of science and technology.

Such institutional changes, plus the experience of preparing and following-up two plans, plus the increased importance of the financial instruments controlled by science and technology planning institutions (the "special resources" of Table V-25) may, in the future, enable the planning process of science and technology in Brazil to become more anticipatory and interventionist (i.e. more effective qua planning - Sagasti (1973), than it has been so far; when, for the lack of political and financial leverage, deficiencies in the planning structure and organisations and lack of communication with the executive institutions, it has been a rather "passive" instrument of policy, rather receiving the ideas, projects and programmes from the executive institutions and then consolidating them into a budget than fostering and orienting such initiatives according to a defined strategy.

^{1/} Such resources were expanded, in 1976, for the period 1977/1978 - see below.

This general programme for science and technology in Brazil, involving as we have seen, substantial amounts of resources, has been the result of the exclusive initiative of the Federal Government; the industrial entrepreneurs being, at the beginning of the seventies, "satisfied" with a low level of local technological activities and a strong reliance on imported technology, as shown by several studies (Biato et al., 1972; Figueiredo, 1972), including our own.

This initiative, a prime example of "innovative action" by a Government, rests primarily on two groups within the Federal Government: the institutions involved with planning and financing economic development and part of the military establishment. In the first PBDCT, for instance, the programmes in which the military have a special interest (space activities, nuclear energy and oceanography, besides those specifically linked to their ministries) amounted to 22% of the budget of the Plan (see Table V-27). As shown in the Appendix, the participation of the planning institutions in many of those programmes go far beyond the provision of financial resources. Those two groups have been, of course, supported by what can be termed the "scientific and technological system" (universities, research institutes, etc.) but it is to them that the power to generate and coordinate such programme pertains. Their cooperation can be seen in the cases examined in the Appendix to this Chapter.

It is important to note that although recently the programme for science and technology has been linked to the urgent needs of imports containment (see Section 3) and may have, thus, gained additional political support, its conception and first major achievement (the I PBDCT) pre-date the present balance of payments crisis.

(b) Incentives to the capital goods industry's technological activities

The two Plans for science and technology assign high priority to the technological development of the capital goods industry; especially the second, where there is also more emphasis on self-reliance.

Given the short time-span of the First Plan its most important programmes are included also in the Second. For this reason, greater commitment of resources and longer span of time covered, we shall concentrate here on the II PBDCT.

The bulk of the Plan is composed of projects of the State institutions attached to the Federal Government (see (a)) but the Plan includes also funds to be used by the BNDE and FINEP to finance projects presented by private enterprises. We shall first analyse the implications of the projects presented in the Plan for the capital goods industry and then examine the use made by the industry of the funds made available at the BNDE and FINEP, especially the latter.

(i) the projects in the Plan:

The only information presented in the Plan about the projects is a brief description of their purpose and the name of the institutions in charge of the project. While some of the projects are very specific, referring for instance to the development of a specific machine (e.g. driers for tropical fruits based on solar energy), others constitute a programme, involving several projects, such as the "projects" for local production of airplane engines, and mini-computers.

The latter two programmes have a special importance in terms of:-

- (1) their purpose of creating new, technology-intensive industries in Brazil under national control;
- (2) their technological strategy of initially relying on licensing but at the same time investing substantial

resources in R&D, local design and improvement of manufacturing technology of Brazilian enterprises, and (3) their pattern of institutional cooperation which brings together the military ministries, the financial agencies of the Secretary of Planning (BNDE and FINEP), private Brazilian enterprises and academic institutions, under the leadership of the former two. Such features are examined in more detail in the Appendix to this Chapter (Appendix B).

In spite of the limitations imposed by the information available, an analysis of the Plan indicates that its projects will encourage the technological development of the capital goods industry in four important ways:

(1) local development of capital goods: several projects require, explicitly, the local development of capital goods, leading to an upgrading of manufacturing techniques (production to higher quality requirements) as well as to local design.

The main requirements to the mechanical industry will come from the aircraft programme above-mentioned, and from the programme of Nucleobras to produce locally the equipment for nuclear reactors. Although at the beginning both programmes will probably bear mainly upon manufacturing techniques and quality control, both envisage a progressive increase in local design.

The electrical and electronics industry, especially the latter, will be also heavily involved in the computer programme (see Appendix B), in the programmes of the military ministries (inclusive of space activities), especially for instrumentation, and the supply of equipment for telecommunications, under the sponsorship of the State Enterprise (Telebras) and of the Ministry of Communications. The programmes above-mentioned envisage not only importing technology, but also local design of part of the equipment.

(2) Applied Research and Development by users of capital goods - Several of the programmes mentioned above include also the setting up of applied research and development centres which will study, among other things, the main characteristics of the capital goods required. The Air Force is undertaking two R&D projects on airplanes and balloons, one specifically directed to aircraft equipment and another to aeronautical engines. The Navy is setting up an R&D programme on ships, which includes, explicitly, the specification of equipment and the Army is establishing a Centre for Mechanical Research, including equipment and materials. Finally, Telebras is planning a research programme on electronic commutation centres and setting up an experimental station for space communication.

(3) Applied research and development and improvement in production of parts, components and materials - We have already discussed the importance of suppliers of components, parts and materials for the technical progress of the capital goods industry (Chapter II) and the deficiencies of this supply in Brazil (Chapter IV). The Plan includes several projects for applied research and development and for improving present conditions of production (including the establishment of standards) of such inputs. Special emphasis is laid on electronic components and their materials (integrated circuits, silicone chips, thin films for micro-electronics, etc.), through projects of Telebras, the Army and the Ministry of Industry and Trade (MIC) and on metals (steel and special alloys), by the Air Force, for its aircraft programme and by the MIC (Ministry of Industry and Trade).

(4) Quality control and standards for capital goods - The Ministry of Industry is presently setting up a wide system for industrial quality control and technical standards to be followed by industry. Moreover,

there are several projects specifically directed to the capital goods industry, which will involve not only the establishment of standards but also the testing of equipment and certification of quality. Such projects will be for equipment for: aeronautics, ships, communication, steel making and transportation, as well as machine tools (especially for exports) and electrical machinery.

(ii) the funds for loans and grants from BNDE and FINEP:

(1) BNDE - Banco Nacional do Desenvolvimento Economico

The BNDE had, since 1964 a special fund for science and technology (FUNTEC) (see Chapter IV). Although the action of the Bank had important indirect consequences for the industry, especially the capital goods industry, through, for instance, its intervention in the aircraft and computers programmes (see Appendix B), in 1974 the Bank decided to give more emphasis to projects coming from enterprises (previously, all its resources had been used for funding universities and research institutes, mainly for post-graduation education, and for military programmes).

Such policy, implemented in 1975, envisaged that the enterprises would receive loans in extremely favourable conditions: interest rates of up to 4% p.a.; no monetary correction and repayment period of up to ten years, with up to three years of grace period. In some cases the financing could cover all the project's costs and outright grants are also possible. Operationally, the programme for technological development was integrated with the other activities of the Bank, so that when an enterprise goes to the Bank to ask for credit for fixed capital it is stimulated to get resources for technological activities as well; breaking thus the relative isolation previously suffered by the FUNTEC. Part of the resources used by the Bank for its programme of technological development come from the National Fund for the Development of Science

and Technology (FNDCT) via FINEP.

Although the operations for scientific and technological development represent an insignificant part of the total operations of the Bank (less than 1% in 1974), they increased substantially in 1975, especially in the programme "demand for technology" (to be used by enterprises), which in 1975, approved operations of circa US\$ 24 millions (Cr\$2000 millions) (see Table V-23).

As regards specifically the capital goods industry, we have some information for 1976, ^{1/} when loans totalling circa Cr\$ 175 millions were approved for it. Of such amount, 41% was used for projects of the electronics industry linked to the computer programme, representing thus a "downstream" financing of the Bank for that programme. Another 46% was used by enterprises we interviewed - the two large companies attempting self-reliance in design (Enterprises 3 and 5) and the company attempting self-reliance in manufacturing technology (see Chapter IV, Section 3, where we discuss the programmes of such enterprises).

(2) FINEP - Financiadora de Estudos e Projetos

FINEP (Financial Agency for Studies and Projects) can be roughly characterised as a development bank for science and technology. It started operating in the mid-'sixties, specialising mainly in financing feasibility studies (hence its name) but, in 1971, when it became the Executive Secretary of the National Fund for the Development of Science and Technology (FNDCT), its functions (as well as the Enterprise itself) were greatly expanded.

^{1/} Data kindly supplied by Amilcar Ferrari, former Head of the FUNTEC.

TABLE V-28: BNDE - PROGRAMME OF TECHNOLOGICAL DEVELOPMENT - 1974 -
LOANS GRANTED BY SUB-PROGRAMME (IN Cr. \$ 1000.00).

<u>Sub-Programme</u>	Loans	
	<u>1974</u>	<u>1975</u>
Supply of Technology	90752	88138
Demand for Technology	<u>2414</u>	<u>193871</u>
Total Programme (A)	93166	2188009
(A) in Total Loans of BNDE (%)	0.55	0.87

SOURCE: BNDE - 1975 Report.

Presently, besides continuing its traditional operations, mainly with its own resources, it is in charge of channeling the resources of the FNDCT and appraising the projects submitted to the Fund, which is the main financial instrument of the Plan for Science and Technology (PBDCT). In fact, some of those projects were originated by FINEP itself. Moreover, it is deeply involved in the planning and budgeting process of the PBDCT and it acts also as the Executive Secretary of the Commission in charge of coordinating the NAIs (see Section 5).

Since 1973, FINEP has been using part of the resources of the FNDCT for a programme presently called Programme of Support of the Technological Development of the National Enterprise. We shall concentrate here on this Programme; originated, in fact, by a case raised during one of the interviews of our study.

Presently, the programme may finance the whole range of scientific and technological activities of an enterprise - from R&D to improvement of management techniques, including expenditures for equipment, training of staff and purchase of technology from abroad.^{1/}

- 1/ Originally, the Programme aimed at funding the following activities: setting up of quality control systems; R&D of products and processes and setting up of research centres. However, recently the scope of the Programme has been widened to embrace the following activities:
- Setting up of R&D Centres, including expenditures for training administrative and technical staff abroad and importing specialists.
 - R&D of new product and processes, including expenditures for prototype construction and testing, feasibility studies, patenting expenditures, etc.
 - Adaptive R&D of imported technology
 - Purchase of technology from abroad, provided the national enterprise shows the intention and capability of absorbing such technology.
 - Setting up of quality control systems, including the financing of purchases of equipment, installation of laboratories, etc.
 - Support activities for production, such as production planning, manufacturing engineering, etc.
 - Activities needed for setting up new enterprises for the products locally developed (feasibility studies, strategic planning, etc.); inclusive of fixed assets funding, where BNDE and FINAME participate too.
 - Studies and procedures for improving the efficiency of services, such as transports, communications, and for improving general management efficiency. FINEP is also responsible for setting up a national programme for training managers and entrepreneurs in general and for another programme especially for research management.

The conditions on which such resources are offered are generous too; interests rates ranging between 2 and 4% p.a.; monetary correction of up to 10% p.a., which can be waived, and 12 years for repayment, including 3 years of grace period. The funding can cover all the projects' expenditures and grants can be given.

The reaction of the enterprises to the Programme has been positive, but cautious. This can be seen in Table V-29, where we show the evolution of the Programme in terms of the number and total value of loans granted between June 1973 (when the Programme started) and September 1976. The same Table shows also that although until 1976, the Programme's loans fell considerably short of its expectations (shown by the Budget allocations to it), in that year the value of loans granted increased steeply.

The increase in demand, both in terms of number of projects and in value is shown also in Table V-30, which presents the evolution of the portfolio of projects under analysis at FINEP, either at the stage of previous consultation or as a formal request for credit. Because of such increase the Programme was granted substantial additional resources in September 1976, so that its budget is presently Cr. 1.6 billions, up to the end of 1976.

As shown in Tables V-31 and V-32, the Programme has been used mainly for product development and the main users have been the capital goods industries. As regards the latter, we have a summary description provided in the FINEP report on the Programme (FINEP, 1976), the source used also for the information above.

As shown in Table V-33, over 80% of the projects of the capital goods enterprises are related to product development. There are two projects for quality control and two projects for process development; the latter

FINEP:-

TABLE V-29: /PROGRAMME OF SUPPORT OF TECHNOLOGICAL DEVELOPMENT OF THE NATIONAL ENTERPRISE - LOANS AND BUDGET ALLOCATION - 1973/1976 - Cr. \$ 1000.00.

<u>Year</u>	<u>Budget Allocation</u> (A)	<u>Loans Granted</u> (B)	<u>B/A</u> (%)	<u>No. of Operations</u>
1973	5,000	664	13.4	2
1974	65,000	38,840	59.7	14
1975	150,000	47,617	31.7	19
1976	350,000	250,231	71.5	20

NOTE : Period from ^{June} 1973 to September 1976

SOURCE: F.I.N.E.P. (1976).

FINEP:-

TABLE V-30: /PROGRAMME OF SUPPORT OF TECHNOLOGICAL DEVELOPMENT OF THE NATIONAL ENTERPRISE - PROJECTS UNDER CONSIDERATION - 1973/1976 - Cr. \$ 1000.00

<u>Year</u>	<u>Consultation Stage</u>			<u>Formally Presented</u>		
	<u>No.</u>	<u>Total Value</u>	<u>Part. FINEP</u>	<u>No.</u>	<u>Total Value</u>	<u>Part. FINEP</u>
Dec. 1973	1	1100	100	4	18,779	18,304
Dec. 1974	12	37,301	32,245	8	45,543	39,331
Dec. 1975	41	318,940	229,286	28	444,025	359,248
Sept. 1976	63	482,898	437,474	41	1,763,231	373,157

SOURCE: F.I.N.E.P. (1976)

FINEP:-

TABLE V-29: / PROGRAMME OF SUPPORT OF TECHNOLOGICAL DEVELOPMENT OF THE NATIONAL ENTERPRISE - LOANS AND BUDGET ALLOCATION - 1973/1976 - Cr. \$ 1000.00.

<u>Year</u>	<u>Budget Allocation</u> (A)	<u>Loans Granted</u> (B)	<u>B/A</u> (%)	<u>No. of Operations</u>
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NOTE : Period from ^{June} 1973 to September 1976

SOURCE: F.I.N.E.P. (1976).

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TABLE V-30: / PROGRAMME OF SUPPORT OF TECHNOLOGICAL DEVELOPMENT OF THE NATIONAL ENTERPRISE - PROJECTS UNDER CONSIDERATION - 1973/1976 - Cr. \$ 1000.00

<u>Year</u>	<u>Consultation Stage</u>			<u>Formally Presented</u>		
	<u>No.</u>	<u>Total Value</u>	<u>Part. FINEP</u>	<u>No.</u>	<u>Total Value</u>	<u>Part. FINEP</u>
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Dec. 1975	41	318,940	229,286	28	444,025	359,248
Sept. 1976	63	482,868	437,474	41	1,763,231	373,157

SOURCE: F.I.N.E.P. (1976)

FINEP:-
TABLE V-31: PROGRAMME OF SUPPORT OF THE TECHNOLOGICAL DEVELOPMENT OF THE
 NATIONAL ENTERPRISE - PURPOSE OF LOANS GRANTS - 1973/1976

<u>Purpose</u>	<u>No. of Projects</u>	<u>% %</u>	<u>Value (Cr. \$ 1000)</u>	<u>%^{3/}</u>
Product Development ^{1/}	31	56.4	164,401	48.7
Process Development ^{2/}	15	27.3	29,924	8.9
Setting up Quality Control Systems	2	3.6	3,420	1.0
Setting up Research Centres	4	7.3	33,016	9.8
Improvement of Technological Capability	3	5.4	106,541	31.6
Total	55	100.0	337,352	100.0

NOTES:

- ^{1/} Includes two credits for quality control and one for process development, given to the same enterprises doing product development.
- ^{2/} Includes one credit for quality control.
- ^{3/} Total was estimated by aggregating yearly results at current prices. Because of no availability of other data had to accept the presentation above, given in FINEP (1976).

SOURCE:

F.I.N.E.P. (1976).

FINEP:

TABLE V-32: PROGRAMME OF SUPPORT OF TECHNOLOGICAL DEVELOPMENT OF THE NATIONAL ENTERPRISE - LOANS BY SECTOR -1973/1976.

<u>Sector</u>	<u>No. of Projects</u>	<u>%</u>	<u>Value</u> <u>(.\$. 1000)</u>	<u>%</u>
1. Mechanical ^{1/}	20	36.4	98,025	29.1
2. Electrical & Electronics	13	23.6	84,091	24.9
Sub-Total	33	60.0	182,116	54.0
3. Chemical	6	11.0	8,238	2.4
4. Agro-Industry	3	5.5	109,064	32.3
5. Steel	2	3.6	5,382	1.6
6. Fertilizers	2	3.6	6,625	2.0
7. Energy	2	3.6	5,028	1.5
8. Mining	4	7.3	14,028	4.2
9. Shipbuilding	1	1.8	642	0.2
10. Scientific Instruments	1	1.8	4,000	1.2
11. Food Production	1	1.8	1,423	0.4
Total	55	100.0	337,352	100.0

NOTES: 1/ Includes two projects for metallurgy.

2/ Aggregation of current values - see Note 3/in Table V-

SOURCE: F.I.N.E.P. (1976).

FINEP:

TABLE V-33: / PROGRAMME OF SUPPORT OF TECHNOLOGICAL DEVELOPMENT OF THE NATIONAL ENTERPRISE - PROJECTS PRESENTED BY THE CAPITAL GOODS ENTERPRISES - 1973/1976.

<u>Type of Project</u>	<u>Number of Projects</u>	
	<u>Mechanical Industries</u>	<u>Electrical & Electronics</u>
Development of Product	15	12
Development of Process	2	-
Quality Control	<u>1</u>	<u>1</u>
Total	18	13

SOURCE: F.I.N.E.P. (1976), my estimates.

two from the same enterprise, to set up a laboratory for applied hydraulics complemented by an engineering firm which is to do projects for hydro-electric and hydro-agricultural investments, including the specification and design of equipment.

Most of the projects for product development presented by producers of electrical and electronic machinery producers "feed" into the programmes of the II PBDCT previously discussed, especially those of communications, aircraft and computer. A similar linkage will be probably established with the aircraft programme, for the mechanical industry too (see below). So far most of the projects presented by the mechanical industry's enterprises were for developing standardised batch-produced goods, mainly machine tools, cranes and agricultural implements.

In order to activate the Programme two important operational measures were recently taken, of special interest to the capital goods industry: first, the Programme has begun to decentralise its operations through regional agents. As of September 1976, two of such agreements had been already established, one with the Regional Bank of Development of the South (BRDE), which covers three states where there are many (generally small and medium) capital goods enterprises and the other with the Air Force Institute (IFI) which is in charge of the liaison with industrial enterprises for the aircraft development programme (see Appendix B). Other agreements, mainly with state development banks were being negotiated at the time.

Second, FINEP envisages abandoning its "passive" position - waiting for the enterprises to go to it with their projects - and, instead, go to them with project proposals. Priority will be given to capital goods

producers and engineering firms, which will be selected using the information from the NAIs about the State Enterprises' investment plans and their respective need for capital goods and engineering services. The proposed collaboration of FINEP includes participation in risk-capital.

As can be seen there is a considerable overlap of activities between BNDE and FINEP. At the end of 1974 some efforts were made to establish a formal system of consultation at the project appraisal level, which was to include the INPI as well. Such efforts, however, failed. Nevertheless, a "division of labour" is emerging, through which FINEP would leave the larger enterprises to the BNDE, concentrating on the small and medium enterprises. The coordination between the two agencies is made mainly through informal, personal contacts.^{1/}

^{1/} It is perhaps worth noting that the President and Vice-President of FINEP since its expansion are members of the staff of BNDE. Moreover, both had worked at FUNTEC of which the President of FINEP was one of the main originators and its Head for several years.

APPENDIX B:

THE PROGRAMMES FOR MINI-COMPUTERS AND AERONAUTICAL ENGINES ^{1/}

B.1: The Computer Programme

The computer project was started through the cooperation of the National Development Bank's FUNTEC and the Brazilian Navy, with the purpose of producing a real-time digital computer for processing naval tactical information. A Special Working Group (GTE) was set up in 1971 between the Ministry of Planning (to which the Bank is subordinated) and the Navy. The operations of the Special Working Group were supported by funds of the Bank and of the National Fund for Scientific and Technological Development, channeled through FINEP.

Its plans envisaged two lines of production: one for mini-computers and their peripherals for general purpose (pay-roll, stock controls, etc.) and the other to be used for process-control operations and military requirements. It is estimated that production will be placed in the internal market, primarily, but that there are good prospects for export.

Estimates of the size of the Brazilian market for mini-computers are vague. In 1977 it was suggested that sales up to the end of the decade (mainly of models costing up to US\$ 30,000.00) may vary between Cr\$ 500 and 800 millions (roughly between US\$ 30 and 50 millions). (Exame, 22/6/77). Government officials and private entrepreneurs estimate that the Brazilian market is the seventh in size in the West (idem).

^{1/} Information about the projects here discussed, comes from the I PBDCT (p. 61/62), from the commemorative publication issued by the BNDE on the tenth year of the FUNTEC, (BNDE/FUNTEC, 1974) from DIGIBRAS 1974 Report, and from personal contacts with the people involved in the projects.

One of the most interesting features of this project is its technological strategy. In the beginning the production of mini-computers is to rely upon foreign licensing, provided by two international manufacturers, one for the military computers and the other for the civilian ones. The members of the GTE travelled extensively abroad to negotiate the licensing agreements.

However, alongside with this transfer of technology, the project is putting great emphasis on the development of Brazilian technology in the field. Building on the experience of two universities (Escola Politecnica de Sao Paulo and Universidade Catolica do Rio de Janeiro), a project of a nationally-designed computer is being developed. The former is in charge of the hardware and the second of the software.

Using extensively the experience gained since 1968 with the experimental fabrication of a computer and using printed circuits technology, developed based on another grant from FUNTEC, for the Microelectronics Laboratory of the Escola), the Digital Systems Laboratory of the Escola Politecnica has already defined the main features of the machine.

At the University the project branches off in graduate education (60 persons were involved in 1974) and basic research. The main private enterprise firm involved in the manufacture and sales of the mini-computers is also involved in the project at the university.

The work of the Special Working Group was in 1973 transferred to a State Enterprise, later called DIGIBRAS, which is to participate as a minority partner in Brazilian enterprises producing computer equipment and act as a sponsor and coordinator of R&D projects in the area. This was preceded, in 1972, by the creation, at the Planning Ministry of a Special

Commission (CAPRE) in charge of rationalise and screen purchases of electronic processing equipment by State institutions (Decree 70.370).

In 1974 an enterprise (Computadores Brasileiros S.A. - COBRA) was established to produce the mini-computers as well as other computer equipment such as peripherals with private and Government capital. Originally, one of the foreign licensors participated in the capital but, following great increases in the capital, presently the majority share-holder is the BNDE, which is selling part of its share to purchasers of equipment, such as private commercial banks. The share of the licensor is presently negligible.

In 1977, because of the restrictions on imports, IBM indicated to CAPRE its intention to produce locally mini-computers (the /32 model). This was strongly objected to by the National Research Council, on the grounds that it would present an unbearable competition to COBRA, jeopardising the investments already made (Jornal do Brasil, 22/4/77). Finally, after the problem was discussed at the highest echelons, ^{1/} the Government decided (CAPRE Resolution 01/77) that the Brazilian market for mini-computers would be reserved for three enterprises, one of which would be COBRA. Foreign enterprises could enter the market, but only in association with Brazilian enterprises and provided the latter have an access to the technology used (Exame, 22/6/77). ^{2/}

- 1/ It is reported that the decision was subject to Ministerial consideration, unlike other CAPRE decisions (Jornal do Brasil, 22/4/77).
- 2/ It has been suggested that the association clause will effectively bar the entry of IBM as it is contrary to its general strategy. Other foreign enterprises have indicated their willingness to associate themselves to Brazilian enterprises (Exame, 22/6/77).

B.2) The Aircraft Programme

The Air Force programme for the aircraft industry presents many similarities, as well as some important differences with the computer project outlines above.

This programme started effectively in 1965 when the Air Force began, at its Technological Centre (Centro Tecnológico de Aeronautica - CTA) the development of a project of a two-engined turbo-propeller airplane to be used for passengers and cargo transportation and for other military services in the specific Brazilian conditions of air traffic and, especially, of short landing and take-off possibilities. This was successfully developed at the R&D Institute of the CTA (Instituto de Pesquisas e Desenvolvimento - IPD) - the "Bandeirante" model.

In order to produce the airplane industrially, a partially State-owned enterprise was set up in 1970 - EMBRAER, Empresa Brasileira de Aeronautica S.A., under the auspices of the Air Force.^{1/}

The aircraft programme presented in the First Plan for Science and Technology, comprising a project for "R&D in Aircraft and Aeronautical Equipment and Materials" and the "Airplane Engine Project", represent thus the backward integration of the EMBRAER experience. EMBRAER means to them not only a probable customer but also a repository of experience and know-how of easy access. The enterprise, staffed basically with people who had worked on the projects at the IPD/CTA, is also located adjoining the CTA, which is in charge of the above-mentioned projects.

^{1/} The EMBRAER is producing the "Bandeirante", the "Ipanema", a small airplane to be used for crop-dusting and other agricultural purposes, also a CTA/IPD project, and a jet training airplane for military purposes, the "Xavante", under a license of an Italian producer. At the end of 1973 it had produced 107 airplanes (Conjuntura Economica, January 1974).

The first project (R&D in aircraft and aeronautical equipment and materials) is concerned with the development of a wide range of sophisticated equipments (from meteorological radar to hangar equipment) and techniques of processing materials (vacuum melting procedures, high strength alloys, etc.) for ultimate manufacture in Brazil. Despite the obvious importance of such developments for the technological up-grading of the capital goods sector, I will concentrate on the second project (the Airplane engine project) because of its explicit policy of linkages with the industry.

The Airplane Engine Project aims at providing the Brazilian industry technical capacity to produce and export airplane engines.

In order to do that the CTA has contacted abroad, in Europe and in the US, airplane engine producers to get technical information (blue-prints, technical specifications, production processes, etc.) which then it passes on to selected Brazilian enterprises. The strategy that is being followed is to try first to produce and sell engine components and only afterwards to go for the whole engine.

Internally, the CTA visits and assesses the technical capacity of the industrial enterprises. It then places experimental orders with them to test further their capacity and, by means of quality control and inspection, certifies this capacity. The aim is to make products which are according to the flight-safety standards of the US Federal Aviation Agency.

In this slow process of technology transfer and gradual up-grading of the Brazilian enterprises, most of which were used to work for the much less stringent requirements of the automobile production, the CTA has been in

contact, at the end of 1974, with approximately 200 enterprises, out of which 50 were participating actively in the project.

The first results of the project are now surfacing - after four years work since the inception of the Project, the first contact for export was signed between Sifco, of Brazil, and Lycoming, of the US. Lycoming has also manifested its interest in becoming a minority partner in a joint venture with some of the Brazilian enterprises connected to the CTA to partially manufacture and assemble in Brazil an engine of world-wide acceptance, the O-235. Estimates of the CTA foresee exports of the value of US\$ 20 million for the period 1977/1979.

The complex linkage tasks being now performed by the IPD will probably be taken off its shoulders, when the structure of the CTA is completed with the final setting up of the Industrial Development and Coordination Institute (Instituto de Fomento e Coordenacao Industrial - IFI) which will be in charge of promotion, coordination and certification of the activities of the aeronautical complex, including here the products of the EMBRAER. The IFI will also act as an agent of FINEP for the Programme of Support of Technological Development of the National Enterprise, identifying potential clients for the Programme and analysing their projects (see Chapter V, Section 6).

The IPD has also another support within the CTA: the Instituto Tecnico da Aeronautica - ITA (Technical Institute of the Air Force), one of the best engineering schools in Brazil with a twenty-year long experience of educating electronic, mechanical and aeronautical engineers, inclusive at graduate level. The ITA is then in a position to provide the IPD with the basic research support it needs as well as ensuring a continuous flow of well-trained personnel.

B.3) Similarities and Differences between the Programmes

The computer and the Air Force programmes briefly described above have some important features in common and some important differences.

(a) Technological Strategy

It is interesting to note the similarities between the technological strategies followed in both projects. In both cases we have a strategy of obtaining foreign know-how for the immediate production, using thus the experience accumulated abroad, coupled with research and development activities designed to master this know-how and to gradually reduce the dependence from abroad.

This strategy of licensing-cum-R&D, however, is not easily reproducible. In the two cases above, there were two additional conditions, besides the others already mentioned, which made this "walking on two legs" possible.

First, there were technical and scientific resources available. The relative importance of technical and scientific knowledge differ in the two projects, the computer project being more directly R&D based than the other (but the R&D project of the CTA should not be forgotten), but in both cases the R&D leg of the strategy would not be feasible if considerable scientific knowledge had not been previously accumulated in academic institutions such as the Escola Politecnica, the Universidade Catolica and the ITA, inclusive for other purposes.

The second necessary condition, for "walking on two legs", the availability of cheap financial resources to cover the costs of developing and exploiting the necessary technical and scientific knowledge, was provided by the BNDE and FINEP which supplied funds which were, not only free, but also of a magnitude that seems appropriate. For instance, the

grant given by the Bank to the Escola Politecnica for the development of the computer hardware (Cr. \$17 million in the beginning of 1973) falls within the national ^{limit} threshold development cost estimated by Freeman (1974) for a small scientific computer.

Possibly also, in both cases, the existence of several producers in the international market made the acquisition of technology easier than it would have been for a product on the "technological frontier".

(b) Need for Government Intervention

Both programmes represent a great entrepreneurial effort from the Government to set up new economic activities, an effort which almost certainly is beyond the possibilities of Brazilian enterprises.

Both programmes in fact, have required a deployment of scientific, technical and organisational skills that only very large organisations can master and which is beyond the range of resources of the normally small and medium-scale Brazilian private enterprises.

Both projects have required considerable parallel investments, such as those for the Microelectronics Laboratory in the Escola Politecnica and the R&D project of the CTA on equipment and materials. In fact, another common characteristic of the two programmes is that both reaped benefits from previous investments in science and technology.

(c) Use of Brazilian Enterprises

In both programmes there was a political decision to use Brazilian enterprises rather than trying to bring into the country an international manufacturer. However, contrasting with the experience of the State Enterprises, it is important to point out that there were not foreign

subsidiaries already established in Brazil in those areas. This wider room for manoeuvre in areas where there are no vested interests against technological self-reliance is a point taken up again in the next chapter.

This decision has, in fact, made necessary the effort of imparting knowledge to the industry in which the CTA has been engaged. However, it is important to stress the fact that the necessary pre-requisite for such a learning process, the existence of fairly diversified and complex industrial structure was already there.

(d) Military Origin

Both programmes have, as we have seen, a military origin. In most military projects the relationship between the military ministry and the industrial enterprise is the usual contract, mission-oriented one, through which an objective is set by the ministry of an equipment to fulfill determined specifications of military performance: delivery times are established and then the enterprise sets down to the task, usually in close contact with the ministry's technical staff. For example, all the Army's projects ^{1/} in Brazil are developed in this way, as are several projects of the Navy and the Air Force (see I and II PB DCT).

The special features of the two programmes can be explained by a combination of ideological and techno-economic factors.

^{1/} The Army in Brazil has a relatively long tradition of this kind of development. It has been involved for over a decade in the development of electronic equipment for communications and in the successful design and production of armed vehicles, some of which have been exported. According to G. Kennedy (1974), in his study on the military in the Third World, the Brazilian Army is the only one among the thirty countries he studied to have achieved this level of technical proficiency.

The military's view of their role in Brazil finds its most articulate expression in the ideology developed at the Superior War College (Escola Superior de Guerra - ESG) and its key tenet is the close inter-relationship between national security and national development (Peregrino, 1966).^{1/}

By making inseparable economic, political, psychological, social and military factors, it became legitimate and necessary for the military to intervene whenever developments in any fields "threatened national security". It also became part of their role, as they perceive it, to sustain and promote economic activities which contributed to greater national security, especially if such activities have direct military implications, as in the two cases under discussion. The decision to concentrate the control of such activities in Brazilian enterprises can be probably attributed to such motivation.

In a previous Section, it was argued that the use decision-makers in an institution make of their purchasing power is influenced by their perception of their role and that of the institution they manage as regards the rest of the society. Thus, it is not insignificant that the Director of the Department of Aeronautical Engines of the CTA, Col. Sergio Valle, declares that:

"The purpose of the CTA as regards the country as a whole is to use this infrastructure of personnel (circa two thousand people), means and techniques in other sectors, such as the capital goods industry and engineering services."

(BNDE/FUNTEC, 1974, p. 64)

^{1/} This "new professionalism" to use Stepan's (1972) expression, which arises from the Cold War concept of total (internal and external) warfare, in which the enemy is acting inside the country as well as outside and from the failures, in the late 1950s and early 1960s, of the conventional armies in China, Indochina, Algeria, and Cuba, has provided a rationale for a progressive military involvement in all spheres of political and economic activities.

This view can be contrasted with the much more "entrepreneurial" attitude of most State Enterprises, which leave their suppliers of capital goods to sort their technological up-grading through the market, a policy which has led them to rely increasingly on foreign licensing, as discussed in the previous chapter.

Nevertheless, technical-economic factors probably played an important role in driving those originally military projects to a civilian purpose. In both cases, scale economies exist that would make the production for exclusive military use unfeasible. The number of ships being bought and/or built by the Navy and the number of airplanes built by EMBRAER would not justify setting up those industries so that the military had to look for alternative purchasers which would take the demand up to a minimum level. The efforts of the CTA to promote exports of the airplane engine components manufactured in Brazil can be ^{probably} attributed more to this cause than to an overriding concern with the national balance of payments.

The projects of the Army are illustrative of this point. The Army is subject to the same ideological influences as the other two Forces, and probably even more so, given its dominant role within the Armed Forces, but most of its projects have a civilian use only as a by-product. The possible reason is that their products can be produced within the technical capacity and scale of the Brazilian industry, especially the mechanical industry products, such as bridges and armoured vehicles. However, this is not the case for electronic equipments, and the Army, in the I PBDCT makes explicit "the need for encouraging diversification of the Brazilian electronics industry, currently oriented towards telecommunications and to entertainment (radio and T.V.)" (I PBDCT, p. 70).

(e) The Role of the Financial Agencies

We have already commented upon the importance of the provision of funds from BNDE and FINRP.

However, the role played by BNDE went further than the provision of funds, especially in the computer project. The action of the Bank was of critical importance at the inception of the project, lending it political support and using the experience of its staff to give the project a more industrial and commercial shape. Its previous contacts with the universities through the FUNTEC were also of great importance for bringing them into the project.

In the CTA projects the participation of the Bank and FINRP in non-financial matters was more restricted but, all the same, they played an advisory and critic role through their projects' appraisal.

The difference in the role played by the financial institutions is closely related to the different organisational institutional pattern of the projects. The computer project was elaborated by an ad hoc working group (albeit formalised by the agreement between the two Ministries) which undertook all the necessary coordinating activities and only afterwards, when the main features of the project had been defined was an institution established to run it. In contrast, the CTA projects are based on a large institutional frame, previously built for that purpose. On the whole, the computer project institutional arrangement seems easier to reproduce.

CHAPTER VI:

CONCLUSIONS

We showed in Chapter III several reasons why the State might adopt policies of support of local designs in the capital goods industry in a LDC. Prima facie most of such reasons could be found in the Brazilian case: there was a traditional local industry with an experience of design (based mainly on reverse engineering), competing with foreign enterprises, with an available technological infrastructure; but the market pressures were in the sense of increasing the use of licensing without an accompanying investment in design capacity. The economy had specific natural resources and suffered from chronic shortage of foreign exchange and underemployment.

Nonetheless, although it had considerable influence over the industry, until the early 'seventies the State in Brazil did not effectively intervene in favour of more local investment in design. ^{1/} Quite the contrary, the technological infrastructure was left undeveloped and, in fact, a considerable part of the market pressures above mentioned was the result of State policies, as we have seen in Chapters IV and V.

Such pattern of State action cannot be attributed to lack of information - as we have indicated in Chapter V several reports from international and Government agencies had suggested the need for State support of local technological development in the capital goods industry, nor, as mentioned above, to the lack of minimal technical conditions within the industry.^{2/}

^{1/} We are taking ~~as~~ accepted that a policy of total SR would be out of question in Brazil.

^{2/} It is possible however that the widespread notion in development economics that the "transfer" of technology represented a great advantage for "late-comers" allowing them "leaps forward", may have dulled the appreciation of the importance of having a local technological capacity, necessary, in fact, for an effective transfer.

What seems to have been lacking was the objective itself - the decision that more SR was necessary in the Brazilian conditions.

Such approach was not exclusive to the State - as we indicated earlier on there is no evidence of any substantial pressure from the capital goods industry on the State to change its policies to incentive of more investment in local design. In fact, both the industry, its customers and the State seemed (with some exceptions) satisfied with the pattern of licensing-cum-copying observed.

Such "satisfaction" can be understood in the light of the pattern of development followed in Brazil since the mid-'fifties and the composition of interests behind it, which reduced the importance of some of the reasons for a policy of more SR, provided alternative solutions to others and, at the same time, made more difficult the implementation of such policy.

As it is known, ^{1/} the growth of the Brazilian economy from the mid-'fifties until the early 'sixties was based on an intensive process of import substitution of durable consumer goods and capital goods, supported by State investments and incentives. Following the slump of 1963/1967, the remarkable growth of the period 1968/1973 was based on the internal market for durable consumer goods and on the growth of the capital goods industry, greatly supported by State investments. At the same time there was, since 1964, a great concentration of political power in the Executive, with the marginalisation of Congress and exclusion of the workers' institutions from policy-making. Throughout the period analysed great reliance was placed upon foreign investment, finance and technology. *KG*

^{1/} The literature available on Brazilian development is vast. On the period of import substitution see, for instance, Tavares (1964); Lessa *et al.* (1964); Baer (1965) and Bergsman (1970). MPCG (1969) is an excellent analysis up to 1966. On more recent policies, see for instance, Suzigan *et al.* (1974), Tyler (1976); Bacha (1977) and Malan and Bonelli (1977). On the political system the most fruitful approaches are probably found in the works of Cardoso, especially Cardoso (1973) and Martins (1976).

Within such pattern of development some of the possible reasons for a policy of State support of more SR became, in practice, negligible, especially that of employment creation. Economically, the growth of the internal market has been based on an increasingly skewed income distribution,^{1/} which favours sophisticated durable consumer goods,^{2/} widened, in part, by extensive consumer credit. The economic and political importance of the industries which would benefit most from local mass-consumption (mostly non-durable consumer goods) has steadily declined (see Table II-4) but their enterprises have been partially compensated by substantial incentives to export (especially textiles and footwear).

The emphasis on the development of the consumer goods industry on the similarity to consumption patterns of the ACs is probably reflected at the level of specifications of capital goods, especially since the durable consumer goods industry has been dominated by foreign subsidiaries (see Table I-7). In the intermediary goods industries (where the State Enterprises play a major role) the trend was also towards taking the sponsors' requirements of the ACs as the only acceptable ones, especially since there was little local research on process and product development and foreign firms usually acted as the main responsible for capital goods specifications.

Therefore, the pattern of development in Brazil emphasised the type of sponsors' requirements where there was a licensing alternative, rather than those requirements which would need specific local solutions.

^{1/} Several studies, starting with the seminal paper of Fishlow (1972) agree that there was a process of concentration of income from 1960 to 1970, due mainly to the wages policy. See, for instance, Hoffman and Duarte (1970). See Langoni (1973) for a dissenting view on the causes of concentration and Malan and Wells (1973) for a criticism of the latter.

^{2/} The trend towards increasing sophistication of consumer durables continues even presently when the credit for such purchases has been restricted (e.g. T.V. sets with remote control). See Exame, 22/6/1977.

We have argued in Chapter III that under such circumstances, given the greater experience of foreign producers, the pressure of the market forces would be for an increasing use of licensing, especially for the more complex goods, with little incentive for local design. This, as we saw in Chapter IV, seemed to be happening in Brazil at the time of the interviews.

Nonetheless, we argued in Chapter III that in order to achieve more future growth the State should accept such market indications only partially and intervene to support investment in local design. This, however, would require from the State a long-term prospect and, given the importance of other industries and services to design in the capital goods industry, a general industrial strategy.

Such conditions were absent in the Brazilian case where the State tended to follow a short-term and piecemeal approach to industrial policy, which, although not in conflict with the pattern of development followed, run against the conception and implementation of a policy of support of more SR in the capital goods industry.

We suggested in Chapter III that a nationalist ideology could provide the necessary framework for a long-term prospect, uniting State and entrepreneurs.

Although nationalism was a major determinant of some policy measures in Brazil (e.g. the creation of Petrobras in 1954), its influence declined substantially since the mid-'fifties and the industrial policy^{1/} has been characterised by strong incentives and pressures applied on foreign enter-

^{1/} Martins (1976) has suggested that the nationalists in Brazil in the mid-'fifties took the erroneous position that foreign capital would not be interested in investment in manufacturing industry and thus concentrated their attention on foreign investment in natural resources, such as oil.

prises to invest in Brazil, with no special protection (except in part for investment credit) given to national enterprises) Presently foreign enterprises play a major role in the most dynamic branches of the Brazilian industry, inclusive the capital goods industry (see Chapter I).

There is, however, no indication that such strategy was opposed by the majority of the Brazilian entrepreneurs, inclusive the capital goods entrepreneurs.^{1/} The evidence available from their lobbying actions, their intervention in policy decisions and studies of their ideology^{2/} suggests that they did not form a national bourgeoisie in the sense defined in Chapter III, that they did not oppose a pattern of development which, by relying strongly on foreign investment, allowed for fast rates of capital accumulation, even if at the relative cost of taking a subordinate role, economically and politically.

Moreover, the relationship between the State and the Brazilian entrepreneurs has been marked by a substantial diffidence from the latter towards the former - although welcoming its incentives they fear its control, in part, probably, because of their weakness within the power bloc in Brazil. However, as indicated by our preceding analysis, a policy of support for more investment in local design would require a close cooperation between the State and enterprises,^{3/} especially where, as in Brazil, the State is a major purchaser of capital goods.

^{1/} It is significant that the leading nationalist industrialists, such as Roberto Simonsen, had their interests linked to non-durable consumer goods such as textiles (Martins, 1976).

^{2/} We have discussed this to some extent in Chapter IV. See also, Martins (1976) on the participation of Brazilian industrialists in important policy measures, such as the creation of the automobile industry and Cardoso (1964; 1971) on the ideology of leading Brazilian entrepreneurs.

^{3/} For technology planning purposes such cooperation has to be very close since the information required has to go down at the product level and the inputs required for its design.

In practice, nationalism has remained an important determinant of policies only within parts of the State apparatus, although not within the most important institutions for economic policies, such as the Finance Ministry. Such motivation, coupled to the relative autonomy of some of such more nationalist institutions, especially those pertaining to the military establishment, probably explains the initiatives of technological self-reliance taken during the period under consideration, such as the computer and aircraft programmes (see Appendix B).

Finally, although the Brazilian economy has suffered from a chronic shortage of foreign exchange for its investment plans, the explicit payments ^{By S&T were small and other means} were used to overcome such problem: the above-mentioned incentive to foreign investment, intensive use of foreign credit and, from 1967 onwards, generous fiscal incentives to diversify and expand exports.

Therefore, up to about 1973, the pattern of design in the capital goods industry observed during the interviews did not present any major obstacle to the objectives of the power bloc which ruled the State in Brazil and was largely consistent with the policies adopted during the period.

In the recent past some important changes occurred, especially as regards the foreign exchange situation: imports expenditures have been substantially increased by the rise of the price of commodities, especially oil, by the debt service, while exports, especially of manufactured products have been adversely affected by the retraction in the ACs and some protectionist measures taken in such countries (e.g. footwear in the US). At the same time the external indebtedness resulting from the intensive past use of foreign credit has limited its use. ^{1/}

^{1/} The net foreign debt of Brazil increased from US\$ 6.2 billions in December 1973 to US\$ 17.8 billions in December 1975; while foreign exchange reserves declined from US\$ 6.4 billions to US\$ 4.1 billions. In 1975 the net external debt was equivalent to twice the value of Brazilian exports that year and the net debt service to 20% of the exports (Rocha 1977)

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In such circumstances, given the weight of capital goods in total Brazilian imports, the Government since 1974 has adopted several measures to substitute local production for imports of capital goods. Such measures include policies aiming at increasing the technical complexity of local production, as a "technological gap" has been identified as one of the causes of imports.

To some extent independently of the increased foreign exchange constraint the amount of resources allocated to the development of local scientific and technological activities has been increased, mainly for the development of human resources and for setting up of institutions which constitute the technological infrastructure, but including also some special programmes aimed specifically at the capital goods industry - mainly the suppliers of the aircraft industry and suppliers of electronic equipment (telecommunications and computers).

Most of such projects respond directly to the specific interests of the State institutions which initiate them. Some of such interests are specifically professional but some of the projects, especially those related to the capital goods industry and of military origin have also a nationalist motivation.

The investment in prestigious science and technology activities typical of the ACs, such as space activities, is also consistent with the myth of "Brazil Great Power" (Brasil Potencia) used as a legitimising device by the Government during the period 1968/1973, the period of the "Brazilian miracle".

More generally, it is probable that such increase in the investment in science and technology responds also to the new requirements of technical

services and qualified manpower of the Brazilian economy, following its recent growth and diversification and the lack of investment in such resources during the 'fifties and 'sixties. It is also probably a response to the increased political and economic importance of the technico-professional groups within the economy and especially within the State.

Therefore, there seems to be at the present a convergence of interests in the sense of increasing the level of scientific and technological activities in Brazil, especially of local design of capital goods. It is too early and we have too few data to assess the probable impact of such changes. Nevertheless, we can suggest some apparent implications of the present policy.

First, it is important to note that the main purpose of the policies related to the capital goods industry is to reduce foreign exchange expenditures. A recovery in the conditions of the balance of payments, following, for instance a sustained recovery in the advanced countries, or discoveries of great supplies of oil may reverse this priority and lead to another boom in imports, similar to that of the period 1968 to 1973. However, it is probable that the limitations of the Brazilian capacity for imports will continue for a considerable time (see Bacha 1977 for estimates).

Second, the emphasis of these policies is on local production, in general terms, which includes the production of foreign subsidiaries and, even more so, the production of companies operating with licenses. There is no indication that the State Enterprises and other companies have changed their attitude of preference for foreign technology. Therefore, the operation of market forces will continue to be in the sense of inducing reliance on licensing.

Although the present policy for licensing conditions the licensing to local efforts of design, we expressed many reservations ^{1/} about the capacity of the institutions concerned to effectively ensure that such condition is fulfilled. Moreover, we argued that, given the past pattern of design strategy of the Brazilian enterprises, the measures taken will probably have the effect of strengthening the position of foreign subsidiaries vis-à-vis the Brazilian producers of capital goods.

In fact, we have argued that, given the preferences of purchasers and the several other incentives and pressures applied to foreign investors, their role within the Brazilian capital goods industry is likely to increase. Their competition will probably encourage the Brazilian firms to use licensing, and may, as we have argued, discourage the latter from investing in their own technology, especially if the entry of foreign companies is free, ^{2/} in the products where the Brazilian firms might attempt to develop their own designs (see Chapter V).

If such is the case, from the point of view of creation of technical resources and externalities (see Chapter III), the importance of the controls exerted on effective substitution of local for licensed designs will be increased, since the international firms tend to follow a strategy of concentrating R&D and basic design activities in their parent companies.

^{1/} Such reservations come not only from the technical difficulties of control, compounded in the Brazilian case by the limited resources of the INPI, but also from the lack of coordination between State institutions. The latter is probably in part due to ideological differences, especially as regards foreign capital (see Chapter V).

^{2/} The solution adopted in the case of mini-computers, by allowing the entry of foreign firms only when in association with Brazilian enterprises and in limited numbers is probably indicative of the limit to which the Government is willing to restrict the entry of foreign enterprises in the capital goods industry, bearing in mind the substantial investments previously made in the programme and the resistance within the Government to the entry of foreign competitors in that industry.

Nevertheless, reflecting the divisions in the society and especially within the State, ^{1/} there are some areas in which the Brazilian enterprises will be especially protected - i.e. where the policy will have a nationalist content.

This is the case of some of the programmes of military interest previously analysed and in the use of financial resources by the BNDE and FINEP. As the data shown in Chapter V indicate, such resources have been used mainly to finance projects connected to the programmes above-mentioned and for standard mechanical equipment, but it is possible that the range of products may be widened to include custom-built equipment for the State Enterprises if FINEP carries on its policy of providing risk-capital to the Brazilian enterprises selected on the information from the MITs, provided, of course, the State Enterprises accept such products.

However, the range of products to which a nationalist policy is likely to be adopted will probably be very limited. First, as we have seen the experience of preliminary design of the Brazilian enterprises is limited, as a result of their past strategy; although of course, such experience can be expanded.

Second, the foreign enterprises in the industry will probably oppose any preferences given to Brazilian competitors on account of nationality (which, as we noted in Chapter V, is illegal, except for public credit). The economic and political power of such enterprises is considerable and is likely to increase.

^{1/} The lack of coordination between State institutions favours, in this sense, more nationalist policies, especially since the more nationalist institutions are not hegemonic within the Brazilian State.

Moreover, it is probable that the resistance of the foreign enterprises will be supported by many of the main purchasers of capital goods. Such support may come partly from risk-avoidance reasons, for the preference for using designs produced (eventually locally) by a "traditional" enterprise. In some cases this may be more simply a matter of standardisation of operations and maintenance of established links with suppliers. However, such support may also come for political reasons. In fact, as we stressed in Chapter V, when analysing the purchasing policies of the State Enterprises and contrasting them with the military programmes, political attitudes play an important, albeit often non-explicit and perhaps unconscious, role in such policies.

In this sense, the important role played by multinational companies in the Brazilian economy and the "micro" policy of the State Enterprises are an important limit to nationalism in design of capital goods.

The combined elements above-mentioned will probably tend to limit the range of products for which national designs will be developed mostly to the less complex and standard products.

Third, the resources available to use as risk capital are limited and represent only a small share of the resources for science and technology. In a period in which investments of important State Enterprises and other State institutions are being curtailed (see Chapter V) the competition for public funds is likely to be intensive. The relative weakness of the nationalist groups within the State will probably limit substantial increases of the resources for technological risk-capital or for expensive

programmes similar to the aircraft or computer programmes. 1/

Last but not least, a nationalist policy depends on a close cooperation between State and entrepreneurs. Although such cooperation has proved to be feasible in some cases, as in the military programmes, the attitudes of the private entrepreneurs in Brazil towards the State do not seem to have changed, as shown by the recent energetic campaign against the "stabilisation" of the Brazilian economy, in which some of the outstanding leaders of the Brazilian capital goods industry have participated (see Visao, 19/4/ 1976). However, in the present conditions in Brazil the intervention of the State institutions in projects of local design seems to be necessary, either as providers of risk-capital or as purchasers and probably as both.

1/ The rate of growth of expenditures for science and technology envisaged by the Government Plans tends to decrease and, in presenting the Second PBDCT, the emphasis of the stern address of the President of the Republic, was on efficiency in the use of the resources available, stressing that their allocation to science and technology expenditures implied sacrificing other investments. Despite the fact that expenditures for "defence and security" have risen for 4.5% to 7.7% of the Federal Budget between 1965 and 1969, the armed forces' budgets are heavily constrained by current expenditures - in the same period the percentage of their resources allotted to gross capital formation actually fell from 12.5% to 9.9% (Rezende da Silva, 1972). Total military investment in Brazil in 1969 amounted to about 10% of total manufacturing industry investment, (data from da Silva (op. cit.) and Suzigan et al. (1974)), which is not enough to base the development of the sector on it. An expansion of this investment so as to make it the leading factor is not foreseeable, as it would imply a redistribution of public resources which would probably meet considerable economic and political opposition. The very cautious way in which investments in space activities, nuclear energy and oceanography, (which would probably be the prime target for expanded military investment) are presented in the I PBDCT - the investments are to be "strategic", "applied to concrete problems of national development", with "financial limits set in advance" - is probably pre-emptive of criticisms about misallocation of resources. Furthermore, the counter-insurgency activities, which constitute one of the main occupations of the Brazilian Armed Forces, are not capital goods-intensive as are, for instance, space activities.

Therefore, to conclude, we have suggested that the present policy represents mainly an adaptation of the basic model of development followed in Brazil, especially since the last decade, to different international conditions but preserving its main characteristics. If successful, the present policy may at the same time reduce the foreign exchange constraint and create an internal capacity of basic design. However, we suggest that the range of products for which such policy is likely to be successful is rather limited. Such limitation seems to be intrinsic to the main political and economic conditions of the Brazilian pattern of development.