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INDUSTRIAL INVESTMENT IN AN 'EXPORT' ECONOMY: THE BRAZILIAN EXPERIENCE BEFORE 1914*

I - INTRODUCTION [1]

Under what conditions does an economy specialised in primary product exports become industrialised? More specifically, what induces capital to move into activities geared to the internal market, rather than the traditional export sector, and where does this capital come from? The Brazilian experience since the late nineteenth century is clearly relevant in connection with those questions: it represents - distortions and inequalities apart - an accomplished transformation of a typical export-based economy into one with a relatively high level of diversification. This paper brings some new evidence on the first steps of that process, in the period before the First World War. This evidence, it will be argued, brings into question some accepted notions on the early development of manufacturing production in Brazil, especially as concerns the role of tariff protection, and the relations between the new sector and the old export-oriented activities.

Two opposite views can be broadly recognised, in the literature, as to the relations between exports and industrial investment in Brazil.[2] In the initial interpretations of Brazilian industrialisation, much emphasis was given to the stimulus provided by demand shifts towards home-produced goods, in times of crisis in the external trade, as the basic factor of industrial growth - notably in the influential book by C. Furtado (1959, chs. 21, 22). Industrialisation was associated, thus, with unfavourable circumstances in the external sector (the so-called 'adverse shocks' argument). Although the conditions

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* This paper is partly based on ideas put forward, in a less developed form, in Versiani and Versiani (1975): I am obviously indebted to Maria Teresa R.O. Versiani, who co-authored with me - among other undertakings - that earlier paper. I am grateful to Dr. David E. Goodman and Dr. José Roberto Mendonça de Barros for their very helpful comments on an earlier draft; the paper benefited also from discussions in an Institute of Latin American Studies seminar. Of course the views expressed are the author's alone.

surrounding the decision to invest were not much explored in this context, the general view was that the development of internal productive capacity had largely been induced by the external trade 'shocks' themselves. That is, the rise in the internal price of importables, induced by the demand shifts (as during the Depression of the thirties, or the First World War), together with the enlarged profits of pre-existing domestic producers of those goods, would have been the basic inducement to invest in the manufacturing sector. To the extent that export activities were made relatively less profitable by these crises (certainly the case in the 1930s), it could also be assumed that funds originating from the agro-export business would have flowed to manufacturing; the same mechanism thus could also help to explain the financing of industrial investment [Furtado (1959, ch. 22); Baer (1965, ch. 2)].

This idea of a link between shock-induced demand upsurges and investment in manufactures was weakened, however, by later evidence on the actual evolution of investment [v. Villela and Suzigan (1973, chs. 4-6)]. In particular, a remarkable lack of correspondence is found between periods of growth in internal productive capacity and periods of rapid advance in industrial production; prima facie, a point difficult to conciliate with the adverse shocks argument. This is illustrated in Table 1, which shows that imports of industrial equipment before 1945 were concentrated in the mid-twenties and in the years before World War I, both periods of relatively sluggish output growth.

Table 1: Industrial growth and imports of industrial equipment in Brazil, 1900-1945

	Annual growth rate of industrial output (%)	Index of equipment imports (1939=100) [a]
1900-09	5.6	61
1909-14	3.0	147
1914-23	9.0	64
1923-32	1.0	134
1932-39	10.0	95
1939-45	5.7	109

a. Average of the periods, excluding the last year.

Sources: Industrial output series from Haddad (1977, pp. 147-48); index of industrial equipment imports from Villela and Suzigan (1973, p. 437).

The direct flow of capital from agriculture into industry, at least in the 1930s, was also found difficult to substantiate [v. Silber (1977)]. Under different forms, the view emerged, then, that the first industrial investment undertakings could be associated, not with crises in the external trade, but, on the contrary, with periods of boom in exports [Villela and Suzigan (1973); Baer and Villela (1973); Leff (1969); Mello (1975)].

As to industrialisation before World War I, two periods are generally emphasised (both coinciding with booming export activity): the 1890s, and the six to eight years preceding the war. A widely accepted view holds that significant industrialisation only started in the nineties, aided by the credit expansion of the period. Deliberate government policies, it is argued, played no direct part in the process; the protective effect of tariffs, in particular, is seen as unimportant [Fishlow (1972); Villela and Suzigan (1973)].

The evidence examined below points, in contrast, to the following conclusions, for the pre-1914 period:
(a) No simple relation between agricultural exports and industrial investment can readily be established. The behaviour of the export sector was neither 'favourable' nor 'unfavourable' to industrialisation; it was both - in different periods, and in different senses.
(b) The development of domestic manufacturing production depended crucially on tariff protection. This suggests that an adequate understanding of the emergence of industry in nineteenth-century Brazil requires a study of the conditions under which a high tariff barrier for manufactured imports was erected.
(c) While the 1890s witnessed a rapid growth of manufacturing production, evidence on the importance of pre-1890 enterprises (and on the role of profit-reinvestment as a source of finance for those enterprises) shows that this decade should not be taken as the starting point for the study of capital accumulation in industry.

The paper deals with the evolution of investment in the cotton textile industry before 1914. This sector was, then, the dominant form of manufacturing activity in the country. Another advantage of focussing on the cotton industry is derived from the fact that Brazil had some weight as an importer of cotton goods in the world market: the development of domestic production tended to be followed with keen interest by some foreign observers, including British diplomatic representatives, so that information from those sources partly compensates for the dearth of statistical data.

The next section (II) gives a general picture of the evolution of cotton manufacture in Brazil before World War I. It is followed by an examination of the role of merchants in the development of the industry (III), and of the possible

importance of exchange rate instability as a source of inducement to industrial investment (IV); these points are illustrated, next, by a review of the main traits of the four pre-1914 investment 'spurts' (V). The question of the origins of industrial capital is then briefly examined (VI); this is followed by a discussion of the protective effect of the tariff system (VII). A final section presents the main conclusions.

II - THE EARLY DEVELOPMENT OF COTTON MANUFACTURE: AN OVERVIEW

The first over-all picture of the Brazilian manufacturing sector was provided by the Industrial Survey prepared by the Centro Industrial do Brasil, in 1907. In that Survey, the capital applied to cotton mills was found to be 35% of the total capital in industrial activities; the sector had also 30% of the industrial labour force. These numbers underestimate, however, the relative importance of cotton manufacture in the period, insofar as a large proportion of what was defined as 'industry' in the Survey consisted of small-scale establishments, with a very limited degree of mechanisation, or of artisan shops. This is seen by the fact that, while in cotton mills the average number of workers per establishment was 285, in all other sectors this average was only 34; in capital per establishment, the value for cotton mills was more than ten times larger than that for the remaining activities. In the city of Rio de Janeiro (Distrito Federal), where the largest concentration of industrial establishments was found - about one fifth of the total - cotton mills had 52% of the labour force of those manufacturing establishments with 200 or more operatives [CIB (1909, Mappas, pp. 16-37, 150)]. There is no doubt that what is said of the cotton textile industry, in the period, will be largely true of manufacturing as a whole.

In 1907, internal production of cotton textiles surpassed 300 million meters, and was twice as large, in value, as total imports under the same heading. Two decades before, in 1885, production had been estimated at no more than 38 million meters, at a time when imports from England alone were about five times as large [CIB (1909, p.261; Mappas, p.144); BCR (1886, p.188); AST]. Clearly, the period 1885-1907 witnessed a very rapid growth of production, concurrent with a marked decrease in the relative participation of imported goods in internal consumption; a typical instance of growth by import substitution, as Fishlow (1972) noted. From 1907 to 1913, the industry continued to grow, if at a slower pace, while the level of imports did not change much; in 1912, the best year before the War, production reached 400 million meters [Stein (1957, p.193); IBGE (1939/40, p.1329)].

The rapid growth from 1885 to 1907 seems particularly noteworthy: the numbers quoted above imply an average growth rate close to 10% a year. It is generally accepted that the rapid devaluation of the mil-réis in the 1890s was a major factor in the boom, diverting demand towards domestically produced goods (more on this below). On the other hand, it has been suggested that a previous expansion in internal productive capacity, enabling local producers to respond to the increased demand, may have been induced by the sharp credit expansion that followed the banking reforms of 1888-89. Both the supply and demand shifts could, thus, be attributed to the same cause: easy money would have provided funds and stimulus for investment; and the ensuing exchange devaluation would have provided protection [Fishlow (1972)]. This interpretation gave support to the view, adopted in various recent studies, that the first important flow of capital into industry occurred in the early 1890s [Tavares (1974); Mello (1975); Cano (1975); Silva (1976)].

A closer examination of the available evidence shows, however, that industrial undertakings prior to 1890, in the cotton sector, were far more important than is generally recognised. This is indicated, for instance, by the fact that firms founded before 1889 had 47% of the total book value of machinery and equipment in the cotton textile industry, in the 1920 Census.[3] A more detailed picture can be gathered from the dates of foundation of the early mills: the numbers in Table 2 show that fully one-half of the stock of looms in the country, by 1905, belonged to mills established before 1889, and a substantial proportion was held by mills founded in the seventies, or at earlier dates. This indicates not only that the inducement to invest in manufacturing was clearly present before the 1890s, but also that the expansion of those early firms was a central element in the growth of the sector. This point will be explored below.

We know also that domestic producers had already conquered some sections of the domestic market from imports by the end of the eighties. In successive reports, the British Consul in Rio pointed to the decrease in Brazilian imports of 'domestics' - a coarse type of cloth, formerly the main single item in textile imports - due to competition from local production [BCR (1886); BCR (1887-A); BCR (1888)]. The numbers in Table 3 suggest an impressive advance of import substitution, in this class of goods: in seven years imports of 'domestics' fell by more than 40%, while total cotton textile imports increased by 22%. In 1888, another British diplomatic report remarked that 'the unbleached cotton [import] trade has been killed by local factories' [BCR (1889, p.20)]. This can be contrasted with the idea that '[the] first appearance [of import substitution in Brazil] was in the 1890s as a direct consequence of inflationary finances' [Fishlow (1972, p.311)].

Table 2: Brazil: cotton mills in existence in 1905, by date of foundation.

Date of foundation	Number of mills	Percentage of looms in 1905
Before 1888	50	50.7
Before 1870	10	4.7
1870-75	14	16.3
1876-79	2	5.1
1880-84	11	15.2
Before 1884, year not ascertained	4	1.5
1885-88	9	7.8
After 1888	26	32.5
1889-95	22	30.2
1896-1905	4	2.3
Date not ascertained	35	16.8
TOTAL	111	100.0 *

Sources: Data on 1905 mills from Cunha Vasco (1905). For dates of foundation, see Appendix A.

* Percentages do not total 100 because of rounding off.

The data in Table 2 suggest the existence of three periods of concentrated investment activity before 1905: 1870-75, 1880-84, and 1889-95. A fourth period could be added, covering the years preceding World War I (1907-1913),[4] when numerous mills were founded, especially in São Paulo state. Evidence on machinery imports from the United Kingdom, presented in Table 4, points also in the same direction: import values show marked increments in those four periods. Before trying to determine the distinctive characteristics of these periods, let us see what can be said about the agents of these industrial undertakings.

Table 3: Cotton textile imports into Rio de Janeiro, 1878-1886 [a]

(1,000 kilos., annual averages)

	'Domestics'	Total
1878/79 to 1880/81	3,314	7,594
1881/82 to 1883/84	2,744	7,769
1884/85 to 1885/86	2,247	7,610
1886/87	1,966	9,264

a. Comprehensive data on Brazilian external trade was not collected before 1900. Rio imports accounted for roughly half the total.

Sources: BCR (1886, p.187); BCR (1887-A, p.2); BCR (1888, p.2).

Table 4: Brazilian imports of machinery from the United Kingdom, 1860-1913

(1896-1906 = 100; period averages)

	Machinery [a]	Textile machinery [b]
1860-1870	17	
1870-1875	46	
1876-1879	34	
1880-1884	75	
1885-1888	75	
1889-1895	148	
1896-1906	100	100
1907-1913		307

a. 'Machinery and mill work, and parts thereof, not being steam engines, agricultural, or sewing machines'. Textile machines comprised 56% of this item, in 1893-98.

b. Separate data on textile machinery appeared for the first time in 1893.

Source: Data on British exports (in sterling) from AST (various issues).

III - MERCHANTS AS INDUSTRIAL CAPITALISTS

Who took the initiative in producing textiles for internal consumption? A detailed account of the sources of capital and entrepreneurship for the early industrial enterprises will not be possible until more information on the history of individual firms becomes available. Existing evidence suggests, however, that cloth merchants played a central role in the process.

In the case of the state of Bahia, for instance, where the largest concentration of mills existed by 1875 [Stein (1957, p.21)], mill founders were mostly merchants [Sampaio (1975, pp.52, 58)]. Also, in the Rio de Janeiro area, which succeeded Bahia as the main centre of production, cloth merchants are mentioned as founders, large stockholders, and directors of some of the largest mills. After 1880, in particular, various Portuguese cloth importers in Rio decided to invest in textile production, as 'many entrepreneurs had been long on ideas and short on capital' [Stein (1957, p.71; also pp.31-33; p.230 nn.23, 26, and 27; p.231 n.29)]. In its development in the following decades, the Rio cotton industry followed the same pattern: 'mill ownership remained in the hands of a few families; Portuguese cloth wholesalers played prominent roles in ownership, management, and distribution' [Stein (1957, p.100)]. In Minas Gerais, there is evidence of the preponderance of commercial capital in the foundation of the important group of mills owned by the Mascarenhas family [Mascarenhas (1972, pp.35, 118)].

The mills founded in the state of São Paulo by cotton planters following the fall in world cotton prices in the 1870s, which made that crop unprofitable, were an exception [Canabrava (1959, ch.9)]. Most of the these mills passed later, however, into the hands of cloth merchants and importers:

> 'Of the thirteen cotton mills built before the turn of the century in São Paulo, eleven, by 1917, were controlled by importing firms or by entrepreneurs who had started as importers. During the same period twenty-one more mills had been constructed, and of these sixteen were importer-controlled'
> [Dean (1969, pp.26-28)].

Take-overs of mills by cloth merchants, after the original founders had run into financial difficulties, are reported also in the Northeastern states, and seem to have been common in the period [Stein (1957, p.230 n.27)].

The merchants-entrepreneurs would be, in many cases, local shopkeepers or wholesalers who had moved up to the importing business. The import trade in textiles evolved from being initially dominated by British importers based in Brazil to a situation in which local traders had direct relations with

European manufacturers or merchant houses, expecially after the establishment of telegraphic communications between Europe and Brazil [BCR (1884); BCR (1899-D); Stein (1957, p.71)]. Cloth traders in Rio were mainly Portuguese; after the turn of the century, the importance of Italian immigrants in the import trade, especially in São Paulo, grew considerably. The relative position of immigrants in the cloth trade thus largely explains their important participation in the first manufacturing ventures.[5]

It can be assumed that cloth merchants would have many a priori advantages in turning to the production side of the business. Their degree of information on the sector would put them in a privileged position to judge the profitability of the new activity; their knowledge of commercial channels and access to sources of finance such as foreign banks were also obvious assets. Those advantages, it has been suggested, have caused trading groups to predominate, in the initial phases of manufacturing, also in the case of other developing countries [Aubrey (1955)].

IV - EXCHANGE INSTABILITY AND INDUSTRIAL INVESTMENT

Granted that merchants could have comparative advantages as prospective industrialists, it would be left to be explained under what conditions they would be driven into manufacturing. It will be argued here that two factors were instrumental in providing both the carrot and the stick for such moves: exchange rate instability and the protective effect of tariffs. First, something should be said about demand and labour-supply conditions.

Domestic demand and labour availability

Although no hard data are available on the internal consumption of cotton textiles in nineteenth-century Brazil, it is clear that the size of the market presented no obstacle to the development of domestic production, particularly in an industry where scale economies are relatively unimportant. This can be gathered from the size of Brazilian imports from the United Kingdom, the dominant source of supply. In the 1850s, for instance, U.K. exports of cotton piece goods to Brazil averaged 128 million yards per year, a volume sufficient to keep fully busy about thirty average mills of the time. In the next three decades this trade grew steadily, if at a moderate pace - an average rate of about 19% per decade - declining afterwards; in the 1880s Brazil absorbed around 5% of the total value of British cotton manufacture exports, ranking fourth among the largest importers under this heading.[6]

As to labour, three main sources of supply were tapped by the cotton mills of the period [v. Stein (1957, ch. 7); Clark (1910)]. Production managers and foremen, and some skilled workers, were commonly hired in England, often under a fixed-period contract. The poorest sections of the free population supplied unskilled workers and trainees; as usually is the case in textile manufacturing, these were in large proportion women and children. With the increasing flow of immigrants towards the end of the century, a third and important pool of prospective industrial workers was added. In São Paulo, for instance, where immigration was mainly concentrated, immigrant labour largely predominated in textile mills, after the turn of the century [Silva (1976, p.98)]. The impact of immigration was felt not only in an expansion of the labour supply, but also in an up-grading of the average skill level of the labour force. In the late 1890s, for example, it was noted that the availability of immigrant workers had made possible the establishment of a cloth printing mill in São Paulo, a line of production which could not, at the time, have been adequately manned by native hands [BCR (1899-B, p.24)].

Important as the participation of immigrant workers came to be, there is no reason to assume that labour availability was an insurmountable obstacle to industrial development in the years before the onset of large scale immigration (i.e., before the mid-eighties). By all accounts, local labour adapted easily to industrial employment; and it is well known that the tasks involved in textile manufacturing are simple to learn, especially in the coarser types of product, so that skill, although of course affecting productivity, is not a limiting factor [Stein (1957, p.60ff.); Robson (1957, p.321)]. Given the possibility of employing women and children, mill owners could recruit into the labour force contingents which before were underutilised; this was the case, for instance, of children and adolescents from orphanages and foundling homes, a source of cheap labour widely utilised in the period [Stein (1957, p.57ff.)]. These workers were often lodged in houses or dormitories close to the mills, and submitted to strict codes of discipline and behaviour, during and outside working hours [Stein (1957); Mascarenhas (1972, pp.75ff.); Sampaio (1975, p.89)]. It is significant that in 1891 it was found necessary to restrict the employment of children in factories by legislation, a minimum age of twelve being established; an exception was explicitly made, however, for textile mills, where apprentices could be as young as eight years old [Decree no. 1313, of 17/1/1891]. It has also been pointed out that the decline of old coffee plantations, as in the Rio de Janeiro area in the third quarter of the last century, left behind labour available for employment in other activities, especially women [Castro (1971, p.70)]. Even in rural areas of Minas Gerais, where numerous small mills existed in the early eighties [BCR (1887-B)], labour availability was not, apparently, the cause of much concern to mill owners.[7]

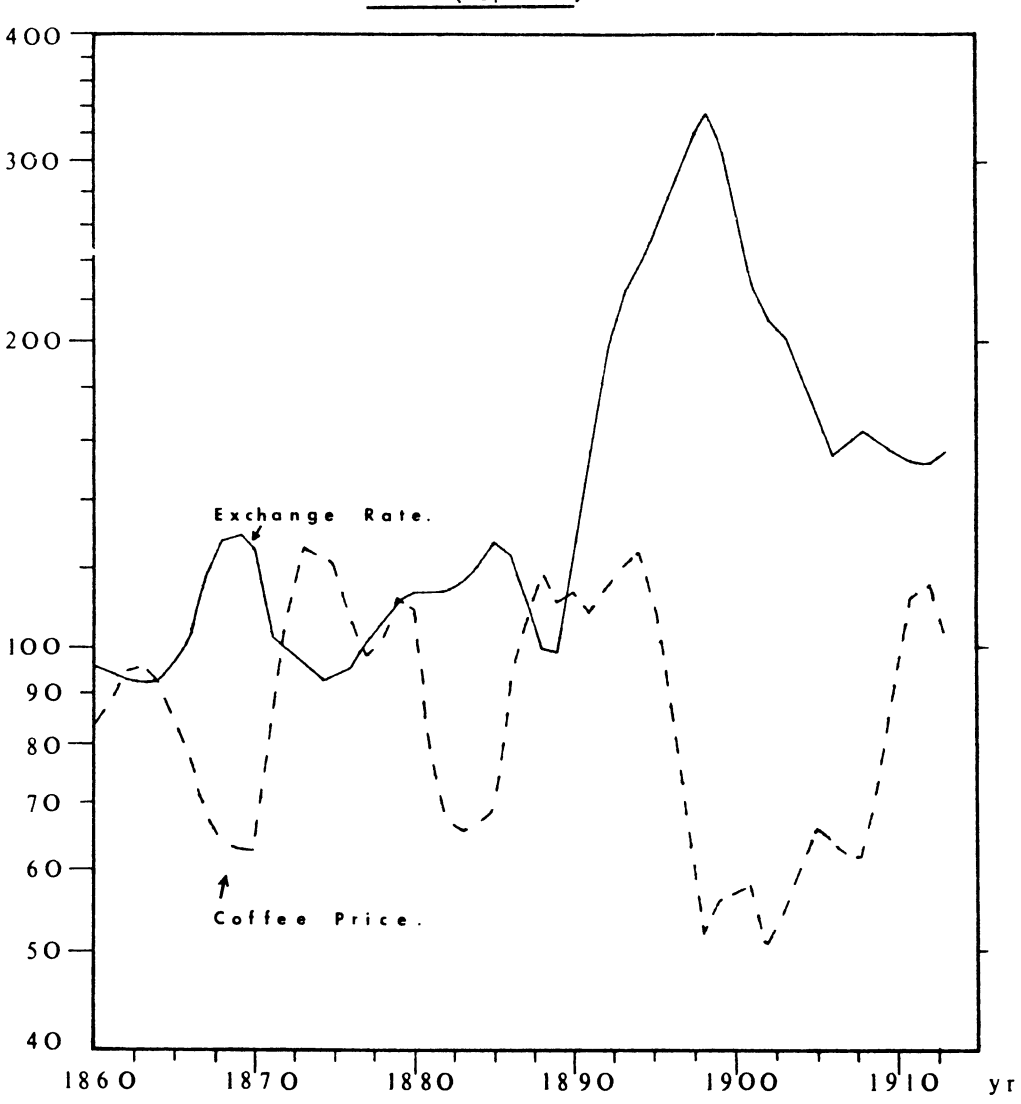
Exchange rate fluctuations

The recurrent oscillations of the exchange rate, and the problems they caused for the import trade, were topics that never failed to come up in the writings of contemporary observers of the nineteenth-century economic scene in Brazil. In fact, exchange fluctuations appeared then as a matter of such 'engrossing and universal interest, ...that various conjectures are continuously being advanced as to [their] cause' [BCR (1899-D, pp.19-20)]. (However, as put gloomily by the author of an early study of the subject, these speculations usually ended in 'seeking the explanation of the incomprehensible by the aid of the supernatural' [Wileman (1896, p.iii)]).

Two sorts of exchange rate movement can be distinguished in the period. In the short run, quotations were subject to a wide margin of fluctuation: from 1860 to 1890, the highest quotation of the pound sterling in Rio de Janeiro, over any two-year period, was on the average 24% above the lowest quotation of the same period.[8] This brought a considerable degree of uncertainty to the import business: importers could never be sure at what rate a particular transaction would be settled. Their problem was compounded by the customary practice of allowing long credit terms - up to one year - in the import trade [BCR (1878, pp. 1426-27); BCR (1883, p.1154)]. This trade was in good part financed by large European exporting firms, but the exchange risk apparently fell on the local importer; at times of violent exchange devaluation, bankruptcies among import firms were not uncommon. In any case, the margin needed to cover the possibility of exchange variations was in itself a protective barrier for the local producer [BCR (1899-D, p.17); BCR (1873, p.42); Hutchinson (1910, pp.34-35)].

The exchange rate followed also a roughly cyclical path in the period, with a precipitous devaluation in the 1890s (Figure 1). Two main factors seem to have been operative here. In the 1860s and 1890s, rapid increases in the stock of money could not fail to have an effect on the exchange market.[9] Second, a correspondence between exchange rate and coffee price movements is apparent from Figure 1, and has been stressed as significant by various authors, notably Furtado [1959, ch.28]. Clearly, the chain of causation linking coffee price and exchange rate oscillations could go either way; but there are indications that the price of coffee, especially in 1860-1890, may have been the prime mover.[10] According to Delfim Netto (1973), the cyclical movements of coffee prices in the period can be largely attributed to physical characteristics of the coffee supply, such as the lagged response to price rises (due to the fact that a coffee tree takes four to five years to attain full production), and the periodic occurrence of sharp drops in yields, for climatic reasons. Thus, the price increases in the early sixties, early seventies and late eighties were associated with

Figure 1 - Exchange rate (mil-réis/£) and export price of Brazilian coffee (£/bag), 1860-1913.
(three-year moving averages)



Source of basic data: IBGE (1939/40, pp.1358, 1377-78.)

crop reductions, while the opposite movements, in the intervening periods, seem to have been influenced by the delayed effect of those increases on the expansion of supply [Delfim Netto (1973, pp.37ff.)]. Variations in the stock of money and in coffee prices explain statistically most of the oscillations in the exchange rate, from 1860 to the early twentieth century.[11]

It appears, thus, that more often it was the coffee market that imparted its cyclical movements to the exchange market.[12] It is probable, furthermore, that external capital flows would reinforce that tendency. Coffee prices were generally viewed as an index of the state and prospects of the economy, so that a rise in prices would function as an inducement to foreign investment. According to Wileman (1896, p.68), the largest capital inflows to the private sector took place in periods of higher external value of the mil-réis, 'contrary to what would be generally anticipated'. Foreign investors would have been more attracted by favourable expectations than deterred by the lower mil-réis equivalent of their money, in those periods.

Be that as it may, it is clear that the exchange rate cycles would add to the instability of the import trade. Uncertainty as to the conditions and prospects of their businesses could, in principle, be seen as an inducement for merchants to diversify their capital investments. Furthermore, the periodic variations of the exchange rate would favour import substitution, via changes in relative prices. Three points may be stressed [v. Versiani and Versiani (1975)]:

(a) In periods of exchange devaluation, the increase in import prices would have a protective effect on the internal production of importables.

(b) To the extent that devaluation was accompanied by a fall in imports, and in import duty proceeds, the stage would be set for an increase in tariff rates, as tariffs were the main source of governmental revenue. This would bring about additional protection.

(c) A subsequent increase in the external value of the mil-réis could, on the other hand, create conditions favourable to actual investment undertakings, to the extent that imported equipment was made cheaper. This would be especially the case if tariff increases introduced in the 'devaluation' phase were not reversed.

It will be seen that the characteristics of the four periods of increased investment activity seem to support the above argument.

V - THE FOUR INVESTMENT SPURTS

1870-75 - In the late 1860s various tariff reforms were introduced, as part of the effort by the Government to increase its revenue, in view of the financial burden of the Paraguayan War (1864-1870). In 1867, 15% of the tariff dues were made payable in gold; in 1869, a new tariff schedule brought about further increases; and, in the same year, a general 40% surtax on tariff payments was introduced, replacing the gold quota.[13] In the case of textiles, additional protection was given through the adoption, in the 1869 tariff reform, of weights, instead of linear measures, as the basis of taxation. Intentionally or not, coarser types of cloth, widely used to clothe slaves, for instance, were heavily taxed [BCR (1872, pp.278-81)]. Increased tariffs and the devalued mil-réis, coupled with the stimulating effect of large budget deficits, brought about a demand boost for the few existing producers of manufactures [v. Luz (1961, pp.34-35)].

In the early seventies, in spite of the end of the war, the Government resisted pressures towards a decrease in the tariff rates, on grounds that the payment of war debts still weighed heavily on the budget [BCR (1872, pp.276-77)]. Even though some cuts in the tariff surtax were made, the average tariff rate actually showed a marked increase in the period.[14] This tended to offset the effect of the increase in the external value of the mil-réis. On the other hand, machinery imports (on which tariffs were not levied) could take full advantage of the rise in the exchange rate.

1880-84 - The latter part of the seventies brought some setbacks to the newly established industries. The falling trend in textile prices abroad was not offset by exchange rate movements, so that internal prices of imported cottons fell (see the next section). Some mills registered losses in the period; pressed by debts, the largest Rio mill asked for government help (which was denied) [Luz (1961, pp.38-39); Mascarenhas (1972, p.253)]. At the same time, the financial needs of the government, increased by the disastrous drought of 1877-79, not only made impractible the elimination of the 'temporary' tariff surtax inherited from the war period, but, on the contrary, prompted successive increases in its level, reaching 60% in 1882. Following the same trend, a new tariff reform occurred in 1879, with an avowedly protectionist bent [Luz (1961, p.49)].

Towards the beginning of the eighties, the rise in the price of foreign exchange, and the effect of the tariff increases, brought further prosperity to the industry.[15] On the other hand, it is probable that, in spite of the adverse exchange rate position, the internal prices of imported equipment did not increase, in relation to the 1870s, due to the decrease in

prices in the industrialised countries.[16] In this sense, investment was not penalised by the relatively high price of sterling in the period.

1889-95 - This period witnessed a drastic increase in the stock of money, accompanied by an equally dramatic rise in the price of foreign exchange (Figure 1). In addition, tariff dues had jumped upwards in the late 1880s.[17] For internal producers this was a time of unprecedented boom. One way of following the performance of the industry in this period, as Clark (1910) observed, is to look at the dividends distributed by smaller mills, as the larger ones were generally more conservative in their dividend policy. Taking this yardstick, the prosperity of the sector, especially in 1892-94, cannot be doubted. The record of munificence in a single year seems to have belonged to a mill in Caxias, Maranhão, which paid a 76% dividend in 1892; but perhaps happier were the shareholders of an Alagoas mill, who received 49% in 1892, 50% in 1893, and 47% in 1894. Other instances of exceptionally high dividends in these years were also registered in Minas Gerais and Rio Grande do Sul [Clark (1910, pp.44-45); BCR (1895-B, p.9); Wileman (1896, p.218); Mascarenhas (1972, p.254)].

The precipitous devaluation was, of course, in large part a consequence of the monetary expansion. The full impact of the latter on the exchange market seems, however, to have been felt only after a time lag, as Fishlow (1972) has observed. This was especially true in 1890: while the money supply doubled, the price of sterling increased only 17% over the previous year [v. Peláez and Suzigan (1976, Tab.A-3, M_1 data); IBGE (1939/40, p.1358)]. As a consequence, conditions were particularly favourable for investment in the early nineties: demand was booming, credit was easy, and machinery imports were still relatively cheap.[18]

1907-1913 - This period was also preceded by years of good results by existing mills, which followed a general setback in the late nineties [v. Clark (1910, p.45); also BCR (1897-A); BCR (1897-B); BCR (1899-D)]. Exchange devaluation was not, this time, important as a protective device: the prosperous years of the industry, after 1900, in fact coincided with a rise in the external value of the mil-réis. However, as the next section shows, this was largely offset by the increase in tariffs after the turn of the century. As cotton textile imports into Brazil did not vary materially from 1900 to 1913, the increase in internal production in the period was not so much a process of import substitution as of import 'pre-emption'; the underlying growth of domestic demand was certainly related to the contemporaneous boom in coffee revenues, as pointed out by Fishlow (1972).

On the other hand, machinery imports were certainly favoured by the falling trend in the price of foreign exchange (Figure 1).

It seems, thus, that the four investment spurts were associated with increased protection and with favourable conditions for machinery imports - resulting both from exchange rate movements and from the tariff policy. As pointed out above, the early 1890s stand out as a period in which the conjunction of those elements was especially propitious, paving the way for a rapid expansion of production.

VI - SOURCES OF FINANCE

As mentioned above, the available evidence indicates that funds accumulated in the textile import trade were a major source of capital for the establishment of the early mills. It is also known that banks, and specifically foreign banks doing business in the Brazilian external trade, in various cases took an active part in the financing of those mills [Stein (1957, chs. 3,6); Dean (1969, ch.4)].

Apart from the episode of the 1870s, when an abrupt fall in cotton export prices impelled landowners to try their hand at textile production, there is no evidence that the agrarian export sector was an important direct source of capital for the new activity, although this is an area in which more research is obviously necessary. Dean's study of São Paulo industrialisation has shown that, while coffee planters were much involved in non-agricultural ventures, in the period we are concerned with (in part because of the sudden falls in coffee prices), they usually confined themselves to activities more directly related to the coffee business, such as the building of railways to the coffee frontier [Dean (1969, chs. 3.4)]. In relation to other possible areas of investment, consumer goods manufacturing would probably appear to planters as too risky.

Capital could of course come from the export sector through the intermediation of banks or the incipient stock-market. For instance, one large São Paulo mill was owned by a bank founded by coffee planters [Cano (1975, pp.185,188)]; and it is probable that, during the speculative fever of the early nineties, a certain volume of small savings flowed into firms then being formed, or increasing their capital.[19] But fear of loss of

control on the part of the original founders would be an obstacle to any significant expansion of ownership; to the extent that the typical textile firm was controlled primarily by merchant interests, it is doubtful that much scope would be left for outside financing other than short-term credits.

Profit reinvestment, on the other hand, seems to have played an important part in the growth of the industry. In the 1890s, the rapid expansion in productive capacity was largely the result of the growth of existing concerns. In the Rio area (where industry was mainly concentrated, at the time), it can be estimated that expansion of pre-1889 mills accounted for one half of the total increase in capacity, from 1885 to 1899.[20] Data on the evolution of the capital stock of the major Rio mills shows that such expansion was financed mostly by profit reinvestment [Versiani and Versiani (1975)].

An association between size of firm and the propensity to reinvest was noted by Clark (1910, pp.42-43)]; his data on the largest Rio mills show that close to 60% of their capital stock in 1910 corresponded to accretions made in 1891-95, mostly through profit reinvestment. Evidence pointing in the same direction comes from a comparison of the ratios of reserves to capital for the mills whose shares were traded on the Rio stock exchange: for the seven largest mills, reserves averaged 62% of capital in mid-1905 (that is, after a period of good results), suggesting a tendency to plough back profits; for the remaining fourteen companies, that ratio was only 10%.[21] The picture that emerges is that of an industry growing largely through the expansion of old-established firms, financed by profit reinvestment.

We can only speculate on the characteristics of the growing, profit-reinvesting firms, as opposed to the stagnating ones. But a glimpse of the 'Faustian conflict between the passion for accumulation, and the desire for enjoyment', to use Marx's expression, is given by the evolution of the dividend policy of Cedro e Cachoeira, a family-owned Minas Gerais mill. From 1887 to 1894, this firm enjoyed handsome profits, averaging 25% per year as a percentage of capital, and paid dividends at the annual rate of 22% on capital. In the crisis of the late nineties, the firm was faced with serious cash-flow problems, but this was not thought to justify a change in its policies: shareholders were still paid high dividends, which, however, they had to collect in kind (in pieces of cloth), or else in the form of IOUs, on which the firm would dutifully pay a 5% annual interest. Clearly, the mill owners, a family of prosperous merchants and planters, viewed their industrial enterprise more as rentiers than as capitalists. Following repeated clashes in the board of directors, where a minority favoured the establishment of a dividend ceiling and larger reserves for re-equipment, a maximum dividend of 12% was finally adopted in 1900. By then, the firm had largely lost the chance to expand, or modernise, with its own funds: the average

profit rate, up to 1913, was only 9% [Mascarenhas (1972)]. This example also illustrates well the importance of the boom of the early nineties for the industry: a time of high profits, and a signal for growth opportunities. This was grasped by firms such as the Fiação e Tecidos, of Pernambuco: sticking to a 10% annual dividend, it was able to finance an almost fourfold increase in its productive capacity, in 1890-94, entirely by profit reinvestment [BCR (1895-B)].

VII - THE PROTECTIVE EFFECT OF TARIFFS

The idea that tariffs may have provided incentive for industrial investment poses some questions. The tariff system was, at that time, basically designed to furnish revenue rather than protection; indeed, free-trade policies should be expected to prevail in a society in which the interests of the landowner-exporter élite were clearly preponderant. The successive tariff reforms up to 1900 show that high duties were viewed largely as a necessary evil: rate increases, adopted as a rule under the pressure of financial crises, were always followed by a reaction towards liberalisation [Luz (1961)]. Those facts have led to the widely accepted view that the protective effect of tariffs was unimportant in the period [for instance, Fishlow (1972)].

Not much is known, in point of fact, about the extent of the increase in the price of imports brought about by tariff payments: it is not easy to ascertain the level of tariff rates, at a particular point in time. Duties were levied on the basis of percentages applied to an official price list of importable goods (which could only be changed by Act of Parliament). Even assuming that such lists correctly reflected market prices when they were prepared (a doubtful assumption, as a new set of prices was sometimes arrived at by a simple proportional increase, applied across the board to the existing list), it is clear that price changes occurring between tariff reforms could materially alter the relative burden of tariffs. Now the evolution of import prices is itself difficult to follow, as Brazilian trade statistics for the period before 1901 only indicate the 'official' value of imports (that is, the value arrived at by using the official price list).

The index of implicit tariff rates on cotton textiles, presented below (Table 5), is an attempt to throw some light on the question of the price mark-ups resulting from the tariff. The index is based on tariffs levied on types of cotton cloth which can be taken as representative of domestic Brazilian production at the time. As an indicator of import prices, the price index of cotton textile exports from the United Kingdom is used. The method of construction and the sources of data are discussed in Appendix B.

Table 5: Brazil: effect of tariffs on cotton textile import prices, 1870-1913

(1870 = 100, period averages)

	(A) Import prices	(B) Tariff rates	(C) Estimated internal prices (A)x(B)
1870-1875	86	103	89
1876-1879	77	110	84
1880-1884	78	113	88
1885-1888	69	124	85
1889-1895	100	132	130
1896-1900	163	126	204
1901-1906	115	162	186
1907-1913	113	168	189

Sources and method: (A) Average price of cotton piece goods exported from the United Kingdom, from Mitchell and Jones (1971, p.195), converted into mil-réis at exchange rates given in IBGE (1939/40, p.1353); (B) See Appendix B.

As seen in Table 5, the resulting index (column B) presents a few surprises, in view of the received wisdom on this point. In the first place, a consistent rising trend is found (with the exception of the late 1890s): in spite of frequent tariff changes, a tendency towards an ever higher protective barrier is apparent. It is significant that, in the base year of 1870, nominal rates, which in this case were probably close to actual rates, already reached almost 50% (Appendix B). Second, it is clear that tariffs were an important element in the upward trend of mil-réis prices of textile imports. This is suggested by a comparison of the indices in column A (a price index for British exports of cottons, in mil-réis), and in column C; the former can be taken as an index of internal prices of imported textiles, in the absence of tariffs, while the latter points to the evolution of prices paid by importers, including tariff dues. Both in the 1880s and after the turn of the century, declines in import prices (column A) were largely offset by increases in

tariff rates. What happened in the second of those periods is especially remarkable when we consider the abrupt fall in pre-tariff import prices from 1896-1900 to 1901-1906 (caused by the appreciation of the mil-réis in the period). In the absence of the compensating influence of tariffs, domestic producers would probably have suffered a heavy blow from the competition of cheap imports.

The above findings suggest that a combination of tariff increases and exchange devaluations provided a definite and consistent pattern of protection for domestic mills from 1870 on. Increases in the price of foreign exchange, in the 1890s, early 1880s, and late 1860s, were followed by higher levels of tariff protection, cushioning internal producers from the effect of subsequent appreciations of the mil-réis. Thus, while exchange devaluations had important short-run protective effects, enduring protection was mainly secured by the tariff system.

Tariff policy and tariff politics

If the above argument is correct, why did the repeated efforts in favour of trade liberalisation fail to halt the trend towards increased protection? One reason, no doubt, was the very fall in import prices in the 1870s and 1880s (resulting from the decrease in British prices in the depression of that period), and again in the first decade of the present century (following the appreciation of the mil-réis). It may be assumed that resistance against tariffs would stem mostly from their effect on the final price of imports; the implicit level of protection should not be a matter of general concern. In a situation of falling external prices, it would be comparatively easy, in political terms, to maintain a certain absolute level of tariff payments - or even to raise it. And, of course, merely keeping tariffs constant, when import prices were falling, meant an increase in the relative level of protection.

On the other hand, the financial authorities, hard pressed by a chronic budgetary deficit, could be expected to welcome any opportunity to increase governmental revenues.[22] On this, however, the limits given by political feasibility were rather narrow. Utilisation of some of the more obvious sources of revenue was effectively precluded by the influence of large landowners on governmental decisions: a limited tax on land, for instance, many times considered as a possibility, was never adopted, ostensibly on grounds that it would be too difficult to assess and administer [BCR (1885, pp.399-400); Normano (1935, ch.5)]. Taxes on exports were mild and ceased to provide revenue for the central government when, after the republican constitution of 1891, the right to tax exports was reserved to the states. Import tariffs remained, thus, by far the main source of revenue for the government, up to the First World War; the participation of Customs receipts in total revenue fluctuated around 60% from 1860 to 1914.[23]

Tariffs on cotton textiles made up an important proportion of Customs revenues [close to 30%, in 1878-82: v. BCR (1885)]. It is arguable that the characteristics of the demand for imported cottons made this item especially suitable to provide revenue increases, in the short run (or, at least, that unsophisticated tax collectors found reason to believe so). An early investigation of the effects of the 1844 tariff had found, for instance, that a doubling of tariff rates on cotton goods had been followed by a decrease in imports by 10%, at the same time as tariff proceeds from this source had increased by one third [Commissão ... (1853-A)]. A similarly positive reaction of tariff receipts followed the increase in rates under the 1879 tariff reform, generally supposed to have had a protective effect [cf. BCR (1885, pp.365-66)]. The idea that, as to tariff policy, 'the fiscal and industrial interests were in accord' [Normano (1935, p.141)], although somewhat simplistic as a generalisation, may have been largely true in the case of textiles.

If adoption of protective tariffs was made easier by falling import prices and governmental revenue needs, this course also was actively sought by the industrialists themselves. The pressure of their demands, with the backing of nationalistic voices in Parliament and in the press, was felt with increasing force in the last decades of the nineteenth century [Luz (1961, esp. chs. 3,4)]. Various pieces of legislation with an openly protectionist intent appeared in the 1880s. In the Budget Law of 1888, for instance, the government was authorised to introduce a tariff surtax to compensate domestic manufacturers for the appreciation of the mil-réis, and, specifically, to increase duties on cotton and jute goods, 'so that products from national factories are not penalised by competition'.[24] In 1887 the non-existence of a locally produced 'similar' was made a condition of tariff exemptions - an early version of the Lei dos Similares, which would play such an important role in later stages of industrialisation.[25] Also indicative of the weight of manufacturing interests is the fact that cotton mills, ironworks, and shipyards were, with no apparent justification other than protection, made exempt from the new tax on industries and professions, shortly after its introduction, in 1869.[26]

It is interesting that even at the level of the provinces, where the influence of agricultural interests could be expected to be relatively larger, an alliance between the fiscal needs of local administrations and the demands of industrialists for protection was frequently operative. This is clear, for instance, in the case of the additional export tax on goods shipped from Bahia in bagging not produced in that province, established as early as 1849. The tax was apparently an important protective element for the early Bahia textile industry; when it was later abolished, mill owners petitioned successfully for its reinstatement [Stein (1957, p.21); Sampaio (1975, pp.55ff.)].

Provincial import tariffs (which, although repeatedly declared to be unconstitutional by the Imperial government, generally re-appeared under different guises) were also reported to be used to protect local enterprises [Sampaio (1975, pp.55-56); BCR (1884, p.1603)].

The bargaining position of industrialists seems to have improved after 1889, under the new republican regime. In the first years, at least, the government in fact viewed the strengthening of the industrial sector as a guarantee of the new order: 'the development of industry is, for the Nation, not only an economic issue, but above all a political one' - wrote the Finance Minister Ruy Barbosa in the preamble of the Decree establishing a new tariff in 1890 (Dec. 836, of 11/10/90). The influence of industry on policy making in fact increased [Luz (1961)]; it is significant, for instance, that rises in the gold quota, the main instrument of tariff increases after 1900, were often preceded by strong campaigns in their support, on the part of cotton manufacturers [ibid.].

The internal price level: an over-valued mil-réis?

A flaw in the analysis above is that the behaviour of prices other than those of imported textiles was not considered; the competitiveness of domestic production could also have been affected by changes in the internal price level. Direct evidence on Brazilian prices in the nineteenth century is, however, very scarce. One of the few indices available for an extended period of time is that compiled by Lobo and others (1971) for the price of some food staples in the city of Rio de Janeiro. Even though its coverage is very limited, the index may be useful in illustrating long-term trends.

The Lobo index indicates a rising trend in food prices in the second half of the nineteenth century (Table 6, column A). It can be assumed that this would be reflected in increased labour costs for mill owners; Stein (1957, ch. 7) in fact mentions a tightening of the labour market in the period. Thus, although the incipient manufacturing sector had a labour supply which was, within limits, probably elastic, as pointed out above, it had to contend with the increasing cost of reproduction of the labour force.

Columns B and C of Table 6 show the results of deflating the series of mil-réis prices of imported cottons, from Table 5, by means of the Lobo index. To the extent that wages were the major differential production cost of domestic mills in relation to producers abroad, the numbers in those columns may be seen as a rough indicator of the price of imported textiles expressed in terms of local costs of production.[27] If this is granted, the trend revealed in column B implies a steady and sharp decrease in the competitiveness of local production, vis-à-vis imports,

Table 6: Estimates of real prices of Brazilian cotton textile imports, 1850-1913

(1870-74 = 100, period averages)

	(A) Rio food prices	(B) 'Real import prices' without tariffs	(C) 'Real import prices' including tariffs
1850-1859	49	169	
1860-1869	72	177	
1870-1874	100	100	100
1875-1884	114	77	83
1885-1894	137	71	89
1895-1904	244	67	90
1905-1913	222	56	92

Sources and method: (A) Rio food prices from Lobo (1971, Table 1, series with 1919 weights); (B) Import price index as in Table 5, column A, deflated by the Rio price index in (A); (C) Import price index as in Table 5, column C, deflated in the same way.

through the whole period 1860-1913 - in the absence of tariffs. On the other hand, the index of column C, which takes into account the effect of tariffs, indicates a reversal of this trend, from 1885-94 on, with imports becoming more expensive in terms of domestic costs. These results emphasise again the crucial role played by tariff protection, at the same time as they suggest an additional explanation for the rapid expansion of the industry, after the mid-eighties.

The striking falling trend in the index of column B (Table 6) is, if it can be taken at face value, a very interesting phenomenon. There are indications that the downward trend would persist, even if more broadly based indicators of internal and external price levels were used.[28] In other words, there would have been a long-run trend towards an over-valuation of the mil-réis, in the nineteenth century, in terms of the purchasing-power-parity standard. This point cannot be pursued here; but it may open new possibilities of interpretation of some aspects of the development of the Brazilian economy in this period.[29]

VIII - CONCLUSION

Two major types of question arise, in relation to the industrialisation of peripheral, export-oriented economies: those related to the impulses of the process, and those referring to the origins of capital and labour for the new sector.

As Hirschman (1968) points out, the impulse to import-substitution industrialisation is usually explained in terms of one of three causal forces: wars and balance-of-payments difficulties, gradual growth of income through export expansion, or deliberate development policies. The evolution of Brazilian cotton manufacture before 1914, reviewed above, suggests that while export-led income growth provided an expanding market for the new activity, especially after the turn of the century, the stimulus for development of domestic production originated from two factors: (i) The protective effect of the tariff system. The evidence examined above suggests that, in the absence of the tariff barrier gradually erected in the second half of the last century, industrial investment could hardly have proved profitable, in the period. (ii) Imbalances in the external sector, in the form of frequent, and sometimes drastic, oscillations in the exchange rate. Those imbalances were, it is argued, largely related to the behaviour of coffee prices and to shifts in the monetary supply.

Tariff protection did not come about, at the time, as part of a 'deliberate development policy', but was largely the result of public finance practices then prevailing; an important element of those practices was, no doubt, the resistance of the export-landowning élite to other, more direct forms of taxation. But it would be a mistake to consider protection as a mere by-product of a fiscally oriented tariff system: the fact that the protective effect of tariffs increased consistently, at least after 1870, suggests that this may also have been an intentional objective of policy. The very emergence of an industrial nucleus would bring into play new social forces, and new vested interests, intent on the preservation and expansion of the new activity. The tariff policy could not fail to be influenced by these changes.

As to labour supply, it appears that women and children provided an ample reservoir of cheap unskilled labour to be tapped by the textile mills, both in urban and rural areas. On the sources of capital and entrepreneurship, the available evidence strongly suggests that the role of cloth merchants was preponderant. Profit reinvestment was another important source of funds. The idea that the coffee sector may have been a basic direct supplier of capital to industry does not find support in the data examined above.

These findings point to a considerably more complex pattern of relations between the agricultural-export sector and the new industrial activities than some current interpretations might suggest. The emergence of textile manufacture as a field of investment can hardly be associated, at least not in a mechanistic way, with 'crises' in the traditional export-import structure, as extreme versions of the 'adverse shocks' argument would have it [cf. Frank (1969, ch. 3)]. In fact, as indicated above, investment in internal production tended to coincide with periods of good export performance (and relatively high external value of the mil-réis).

On the other hand, a direct association between export booms (as in the 1890s) and the growth of industrial capital seems no more convincing, nor warranted. We have seen that the development of manufacturing productive capacity was a more gradual process than is commonly realised: domestic supply could respond as it did to increased demand in the 1890s, largely because of the previous growth of the industry. No doubt the behaviour of coffee prices can be said to have indirectly favoured that growth (as argued above); but this was only true because the tariff system effectively shielded local producers from the worst consequences of the periodic appreciations of the mil-réis. In this sense, industrialisation in the period was not a 'spontaneous' process; it would be clearly inadequate to think of it in terms of the standard 'staple' models of trade and growth.[30]

The above findings suggest certain similarities between the period examined and the post-1914 industrialisation process. Recurring phases of increased production, for example, occurred in both periods (cf. Table 1); and the importance of profits generated by these demand expansions in financing subsequent increases in productive capacity, before 1914, recalls similar arguments in relation to the boom in production during World War I [Fishlow (1972)], and in the 1930s [Furtado (1959, ch. 32)]. The role of tariff protection, before 1914, also underlines an analogy with later developments [cf. Bergsman (1971)]. Upsurges in internal demand, and favourable (if not always intentional) governmental policies, seem to have been basic elements in the initial growth of industrial capital in Brazil.

APPENDIX A - Dates of foundation of cotton mills in existence in 1905

a) Founded before 1870 - Santo Antônio do Queimado (BA): 1834; Conceição (BA): 1835; São Pedro de Alcântara (RJ): 1840s; Todos os Santos (BA): 1845; Santo Aleixo(RJ): 1849; São Carlos de Paraguaçu (BA): 1857; União Mercantil (AL): 1857; Modelo (BA): 1858; Nossa Senhora do Amparo (BA): 1862; São Luís de Itu (SP): 1869.

b) Founded in 1870-1875 - Cedro (MG): 1870; São Salvador (BA): 1870; Brasil Industrial (RJ): 1871; Bonfim (BA): 1872; Brumado,Pitangui (MG): 1872; Cachoeira (MG): 1873; Nossa Senhora da Penha (BA): 1873; Petropolitana (RJ): 1873; Magdalena (PE): 1874; Major Barros (SP): 1874; União Itabirana (MG): 1875; São Brás (BA): 1875; Carioba (SP): 1875; Beribéri (MG): 1875.

c) Founded in 1876-1879 - Pau Grande (RJ): 1878; São Roque (SP): 1879.

d) Founded in 1880-1884 - Aliança (RJ): 1880; Sabarense (MG): 1880; Nossa Senhora da Ponte, Sorocaba (SP): 1881; Caçu, Uberaba (MG): 1882; São Sebastião, Curvelo (MG): 1882; Mineira (MG): 1883; Confiança (RJ): 1884; Anhaia (SP): 1884; Fabril (RS): 1884; Aracaju (SE): 1884; Industrial Caxiense (MA): 1884.

e) Founded before 1884 (year not ascertained) - Montes Claros (MG); Bom Jardim, Araçuaí (MG); Tatuí (SP); Machado (MG).

f) Founded in 1885-1888 - São Silvestre, Viçosa (MG): 1885; Carioca (RJ): 1886; Cachoeira dos Macacos (MG): 1886; Bernardo Mascarenhas (MG): 1887; Fiação e Tecelagem Maranhense (MA): 1887; Cachoeira (AL): 1888; Pedreira, Itabira (MG): 1888; Mascarenhas, Alvinópolis (MG): 1888; São Roberto, Gouveia (MG): 1888.

g) Founded in 1889-1895 - Corcovado (RJ): 1889; Progresso Industrial (RJ): 1889; Andorinhas (RJ): 1890; Camaragibe (PE): 1890-94; Paulista (PE): 1890-94; Industrial Goiana (PE): 1890-94; Sanharó (MA): 1890-94; Codó (MA): 1890-94; União Caxiense (MA): 1890-94; Rio Anil (MA): 1890-95; Industrial Maranhense (MA): 1890-95; Empório Industrial (BA): 1891; São-joanense (MG): 1891; Santanense, Itaúna (MG): 1891; Mageense (RJ): 1891; Votorantim (SP): 1892; D. Isabel (RJ): not later than 1892; São Joaquim, Niterói (RJ): 1893; Fabril Maranhense (MA): 1893; Manufatora Fluminense (RJ): n.l.t. 1893; São Bernardo (SP): n.l.t. 1895; São João Nepomuceno (MG): n.l.t. 1895.

h) Founded in 1896-1905 - Itabira do Campo, Itabirito (MG): 1896; Melancias, Sete Lagoas (MG): n.l.t. 1897; Moóca (SP): 1897; Mariângela (SP): 1904.

Notes: (a) The 1905 totals include, in some instances, new mills belonging to the same firm. (b) Abbreviations: AL: Alagoas; BA: Bahia; MA: Maranhão; MG: Minas Gerais; PE: Pernambuco; RJ: Rio de Janeiro (city and state); SE: Sergipe; SP: São Paulo; RS: Rio Grande do Sul; n.l.t.: not later than.

Sources: BCR (1877); BCR (1887-B); BCR (1890); BCR (1895-B); BCR (1896); BCR (1897-A); BTJ (1888); Branner (1885); Canabrava (1951); Clark (1910); Comissão...(1853-B); Cunha Vasco (1905); Dean (1969); Decree no. 6162, of 24/3/1876; Decree no. 7843, of 31/3/1880; Juiz de Fora...(1901); Mascarenhas (1972); Rio News: RMF (1899); RMI (1896); Sampaio (1975); Stein (1957); Vaz (1977); Wileman (1896).

APPENDIX B - Construction of an index of implicit tariff rates on cotton textiles

The objective is to obtain an index of the addition to import prices brought about by the imposition of tariffs; that is, a series of values $(1 + d_t) / (1 + d_o)$, where d is the proportional increase in price due to tariffs, t indicates the year of reference, and o the base year.

We can write:

$$\frac{1 + d_t}{1 + d_o} = \left[\frac{1}{d_o} + \frac{d_t}{d_o} \right] \frac{d_o}{1 + d_o} \qquad \text{(I)}$$

and:

$$\frac{d_t}{d_o} = \frac{\frac{D_t}{D_o}}{\frac{P_t}{P_o}} \qquad \text{(II)}$$

where D is the absolute value of the tariff payment, and P the price of the imported goods (in mil-réis).
From (I) and (II), we obtain:

$$\frac{1 + d_t}{1 + d_o} = \left[\frac{1}{d_o} + \frac{\frac{D_t}{D_o}}{\frac{P_t}{P_o}} \right] \frac{d_o}{1 + d_o} \qquad \text{(III)}$$

The index was constructed on the basis of equation (III).

(D_t / D_o) is an index of the tariffs levied on the more common types of cloth produced in Brazil in the period; the index was arrived at by averaging indices for tariffs on the more inferior type of grey cloth (weight 2), bleached cloth (weight 1), and dyed cloth (weight 1). The period covered is 1870-1913, with 1870 as the base year; before 1869 tariffs were based on a different system of measures, so that no comparison is possible. Account was taken of the following surtaxes, in force in the period:

a) surtax of 5% on the official values of imports, in 1870-74 and the first half of 1875;

b) surtaxes imposed on the tariff payments themselves: 40% (1870, 2nd half of 1874, and 1875); 34% (1871); 28% (1872-73, and 1st half of 1874); 45% (1876-77); 50% (1878-82); 60% (1883-86, 1st half of 1887, and in 1892-95); and a sliding surtax of up to 20%, according to the exchange rate (1889-90);

c) additional 5% surtax on the basic tariff (Fund for the Emancipation of Slaves), from mid-1887 to 1890;

d) gold quota: up to 20% in 1890; 100% from 15/11/1890 to the end of 1891; 10% in 1899; 15% in 1900, 25% in 1901-05, and 50% in 1906-13.

(P_t / P_o) is the index of prices of cotton piece goods exported from the United Kingdom, converted to mil-réis.

d_o was taken to be 0.47, which is the nominal tariff rate on the above mentioned types of cloth, in the base year (1870). As the 1869 tariff schedule was based on a carefully revised official price list [TRF (1869)], it is probable that the actual price mark-up caused by the tariff was close to that fraction in 1870. Compare also BCR (1874, p.41).

Sources: Tariffs from TRF (various issues). For the surtaxes, see, in addition to the Budget Laws of the period, and the Decrees introducing each new tariff, the following Decrees: 1750, of 20/10/1869; 4601, of 24/9/1870; 2035, of 23/9/1871; 5580, of 31/3/1874; 6053, of 13/12/1875; 6829, of 26/1/1879; 9593, of 7/5/1886; 10170, of 26/1/1889; 391-C, of 10/5/1890; 804, of 4/10/1890.

For (P_t / P_o), see Table 5.

The following table shows the indices D_t / D_o, P_t / P_o and (1 + d_t) / (1 + d_o), for 1870-1913.

Table A-1: Brazil: indices of the absolute value of tariffs, import prices, and implicit tariff rates, for cotton textiles, 1870-1913

(1870 = 100)

	Abs. tariff values (D_t/D_o)	Import prices (P_t/P_o)	Implicit tariff rates $(1+d_t) / (1+d_o)$
1870	100	100	100
1871	96	88	103
1872	92	90	101
1873	92	84	103
1874	93	80	105
1875	93	75	108
1876	97	73	111
1877	97	76	109
1878	100	78	109
1879	100	79	109
1880	107	79	111
1881	107	77	113
1882	107	81	110
1883	114	77	115
1884	114	77	115
1885	114	81	113
1886	114	76	116
1887	120	64	128
1888	126	56	140
1889	143	53	154
1890	137	64	137
1891	187	98	129
1892	222	114	130
1893	222	120	127
1894	222	127	124
1895	222	127	124
1896	275	156	124
1897	275	169	120
1898	259	172	116
1899	327	169	130
1900	331	149	139
1901	348	126	156
1902	341	118	160
1903	340	121	158
1904	338	129	152
1905	304	97	168
1906	346	101	178
1907	360	115	168
1908	361	114	169
1909	361	107	176
1910	345	110	168
1911	347	115	165
1912	347	112	167
1913	347	117	163

NOTES

1. The following abbreviations will be used for quotations in the text: AST - Annual Statement of Trade of the United Kingdom; BCR - British Consular Reports; BTJ - Board of Trade Journal; CIB - Centro Industrial do Brasil; DGE - Directoria Geral de Estatística; IBGE - Instituto Brasileiro de Geografia e Estatística; RMF - Ministério da Fazenda, Relatório; RMI - Ministério da Indústria, Viação e Obras Públicas, Relatório; TRF - Tarifa das Alfândegas. Complete references will be found at the end of the paper.

2. References to the literature on Brazilian industrialisation can be found in Versiani and Mendonça (1977).

3. DGE (1927, pp.22-23). Of the ten largest mills, in 1919, five had been established before 1888; see Pearse (1923).

4. From 1905 to 1915 the number of mills roughly doubled (111 to 240), and so did the stock of spindles and looms [Garry (1920)].

5. In 1888, of the 125 cloth wholesalers inscribed in the list of payers of the Industry and Professions Tax, 112 were immigrants, 60 of them being Portuguese [RMF (1888, p.58)]. On the importance of Italian immigrants in São Paulo trade, see Dean (1969, ch. iv).

6. Data on British exports from AST (various issues). The average production of a British cotton mill in the 1850s can be estimated at about 4.4 million yards per year, from data on production per loom (in 1859-61) and average number of looms in integrated mills (in 1850) given by Ellison (1886, pp. 69-72). Conversion of pounds into yards was made by means of the ratio 7.5 yd./lb. [cf. Fishlow (1972, Table 1)].

7. In answer to a questionnaire presented by local authorities, the owners of a textile mill located in a rural area of Minas Gerais stated, in 1882, that there had been no difficulty in obtaining workers for the mill, although they found the labour force lacking in 'industrial education'. Of the firm's 264 workers in 1884, 111 were women and 101 were boys and girls under eighteen; the foremen came mostly from England [Mascarenhas (1972, pp.89, 128-29)].

8. Data on extreme yearly exchange rates from BCR (1899-E, p.34).

9. The increase in the 1860s was related to monetary emissions to help finance the Paraguayan War; the money supply (M_1) more than doubled from 1864 to 1870. In 1890-91, following a liberal banking reform, the monetary stock increased threefold. In between, a very restrictive monetary policy was followed: in per capita terms, the stock of money actually fell by 20% from 1869 to 1889. See data in Peláez and Suzigan (1976, Tab. A-3). IBGE (1939/40, p.1293).

10. To the extent that changes in coffee prices were accompanied by variations in export proceeds in the same direction, a decrease in price would be associated with a smaller supply of foreign exchange, and pressure towards devaluation; conversely, a devaluation brought about, say, by an increased demand for imports at home, could be expected to bring down the world price of coffee, given the predominant share of Brazil in total supply.

11. A regression linking the average yearly exchange rate, E, to the export price of coffee in sterling, C, and the per-capita stock of money, M, for the period of larger exchange rate oscillations (1860-1906), yields a coefficient of determination $R^2 = 0.86$. The equation is (standard errors in parentheses):

$$E = 7.13 - 1.77\ C + 0.44\ M$$
$$(1.6) \quad (0.46) \quad (0.03)$$

The Durbin-Watson statistic (0.64) indicates, not surprisingly, runs above and below the estimates. Data from IBGE (1939/40), Peláez and Suzigan (1976).

12. Such a relation was taken for granted, contemporaneously, as seen in the following quotation from the Board of Trade Journal:

> 'If the new [coffee] crop, ... which will be in bloom about the end of October, and then susceptible of estimation, should turn out, as it is likely, to be a good one, a considerable decrease in the prices seems inevitable. This would naturally bring about a decrease in exchange.' [BTJ (1902, pp.560-61)].

13. Decrees nos.1507 (26/9/1867), 4343 (22/3/1869), and 1750 (20/10/1869). To pay for the gold quota of the duties, importers had to buy gold coins or gold certificates in the market, which were received by the Customs at the official par value (8.889 mil-réis per £ sterling). If the price of sterling was one third above par (as in the late sixties), a 15% gold quota would mean a 5% increase in tariff payments.

14. The average tariff rate (customs revenue divided by the total value of imports) increased from 28%, in 1866/67-1869/70, to 35%, in 1870/71-1875/76. [RMF (various issues); IBGE (1939/40, p.1358)].

15. Indirect evidence on this comes from the fall in imports of 'domestics'; see above. Data on profits of the Mascarenhas mills, in Minas Gerais, show a sharp turnabout in 1879, after a period of bad results [Mascarenhas (1972, p.254)].

16. Although there is no direct evidence on the prices of imported equipment, it is significant that the price index of industrial products in England, multiplied by the index of the price of sterling in mil-réis, falls from 116, in 1870-74, to 104, in 1880-84, and to 91, in 1885-89 (1875-79 = 100). Basic data from Mitchell (1962, p.472) and IBGE (1939/40, pp.1353-54). Textile equipment was imported mainly from England.

17. Partly in consequence of worries about the increased competition faced by the domestic industry, due to the appreciation of the mil-réis; see below.

18. The increase in the inflow of immigrants, especially after the emancipation of slaves in 1888, was no doubt another favourable element, particularly through its effect on the availability of skilled labour.

19. The case of the largest mill founded in the early nineties - and one of the very few cotton mills whose evolution has been studied - is illustrative. Established in 1891, in Bahia, the Empório mill had about 30% of its capital in the hands of its founders, three cloth merchants, and of a bank; each of the other 146 shareholders held less than 2% of the stock [Sampaio (1972, ch. 2)].

20. Of the total increase in the number of looms in the state and city of Rio de Janeiro, from 1885 to 1899, 49.5% corresponded to expansions in mills established before 1888. Cf. data in Branner (1885), BCR (1886), BCR (1895-A), and BCR (1899-C).

21. Computed from data in Cunha Vasco (1910).

22. From 1860 to 1913, government expenditures exceeded annual receipts by 23%, on the average [v. IBGE (1939/40, p.1410)].

23. For data on the composition of the government revenue see RMF (various issues). The relative importance of Customs revenue tended to decrease up to 1890, but increased again under the republican government, reaching a maximum of 75% of the total revenue, in 1892-97.

24. Law no. 3396, of 24/11/1888. An analogous protective provision appeared already in the Budget Law of 1886.

25. Law no. 3348, of 20/10/1887. The 'similar' clause was later made more explicit by Decrees nos. 947-A, of 4/11/1890, and 8592, of 8/3/1911. On the importance of the Lei dos Similares, v. Baer (1965).

26. V. the Budget Law of 1870 (Law no. 1836, of 27/9/1870). The exemption was later incorporated in the decree regulating the tax (Decree no. 5690, of 15/7/1874).

27. Raw material and labour costs made up 70% to 80% of total costs. Cotton, being an export crop in Brazil, had its price determined in the world market; local mills could not count on any significant cost advantage from this source, all the more so as the same export taxes were levied by the cotton-producing Northeastern states on cotton sold abroad as on that shipped to the Southern states. When the external value of the mil-réis declined, for instance, local mills had to put up with an increase in the prices of Brazilian cotton in line with the mil-réis equivalent of quotations on the Liverpool exchange [Cunha Vasco (1910), Sampaio (1972), BCR (1899-B); BCR (1900)].

28. The trend is maintained, for instance, if a general price index for England [from Mitchell (1962, pp.471-72)] is substituted for the cotton export prices. On the other hand, some additional evidence available for Brazilian prices, a crude index for some isolated years given by Ónody (1960, p.25), shows a long-run tendency broadly similar to that of the Lobo index.

29. It may, for instance, help to explain the comparatively late start of a process of diversification in the productive structure in the nineteenth century [cf. Leff (1972)]. One clue to the tendency of internal prices to rise in the period may be the decrease in food crops following the rapid expansion of coffee plantations, in the second half of the century [Martins (1973, pp.65, 114)].

30. The classical analytical description of a staple-based process of growth is that of Caves (1965).

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