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DISCUSSION PAPER

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Eliana A. Cardoso

Federal Government of Brazil

**Secretariat of Strategic Affairs of the
Presidency of the Republic**
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DISCUSSION PAPER

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TEXTOS PARA DISCUSSÃO INTERNA

Nº 22

"Política do Café e Des-
valorizações Cambiais du
rante a Década de 30"

Eliana A. Cardoso

Agosto de 1980

Política do Café e Desvalorizações Cambiais
Durante a Década de 30*

Eliana A. Cardoso
INPES, agosto de 1980.

Este ensaio é um adendo a "Furtado Revisitado I", RBE, 33(3). Ao contrário daquele, aqui se trata explicitamente da variável monetária. Mostra-se que o comportamento da taxa de câmbio durante a década de 30 respondeu aos desequilíbrios externos gerados pela política de sustentação do café. Como o produto industrial, durante aquele período, cresceu tanto face a depreciações reais quanto face a apreciações reais, argumenta-se que os efeitos gastos foram mais importantes nos anos 30 que os efeitos preços, induzidos pelas políticas fiscais e monetárias.

* Agradeço as sugestões de Rudi Dornbusch.

The paper discusses the role of fiscal and monetary policies in an LDC, with a major commodity export, facing a depression abroad. The analysis is conducted in the context of a general equilibrium model, which comprises a commodity-producing sector, and an import-competing sector, that produces both consumption and investment goods. Idle capacity and labor unemployment are assumed. Flexibility of the real exchange rate and industrial output response to demand are the main adjusting mechanisms.

Having presented the model in the first section, we use it as the basis of our discussion of industrialization in Brazil, in the years of the Great Depression. The key to understanding the behavior of the Brazilian economy in the thirties is the government coffee-support policy, which held the income of the export sector at a high level, and hence enabled the manufacturing sector to expand.¹ We show that stockpiling expanded income, and that when it was financed by export duties, the trade balance improved, but when financed by credit, a trade deficit arose. The fact that the currency was devalued during periods in which the coffee sector was supported through domestic credit expansion, but appreciated when coffee purchases were financed via duties, strengthens the hypothesis that devaluations were a response to the external disequilibrium created by the coffee policy. The fact that industrial output expanded in the face of both real depreciation and appreciation points to the importance of expenditures effects, relative to depreciation and price

effects, induced by fiscal and monetary policies during the thirties.

1. THE MODEL

The economy has two sectors: a coffee-producing sector oriented to the export market, and a manufacturing sector that produces goods for domestic consumption and investment. Imported goods compete with domestic manufactures on the internal market.

There are markets for three types of goods: coffee (C), domestic manufactures (Q), and imported manufactures (M). The prices of these goods in home currency are, respectively, P_C , P and P_m . The nominal wage is denoted W . The world supply of imported manufactures is perfectly elastic at the international price P_m^* , so that $P_m = e P_m^*$, where e stands for the exchange rate.

Using imported manufactures as the numeraire the real prices are:

$$p_C \equiv \frac{P_C}{P_m}, \quad p \equiv \frac{P}{P_m}, \quad w \equiv \frac{W}{P_m}$$

We assume unemployment and a given nominal wage rate.

1.1 - The coffee market

In the coffee sector, the fixed factor (suitable land planted in coffee and served by adequate transport) can be

combined with varying quantities of labor to obtain the crop. The grower maximizes profits by equalizing the value of the marginal product and a given nominal wage. When the price of coffee rises, so does employment and output. The coffee supply is therefore a rising function of the price of coffee in wage units:

$$(1) \quad C^S = C^S(p_C/w)$$

Coffee is exported. Foreign demand is a function of the real income of the coffee-importing countries, y^* , and of the dollar price of coffee deflated by the world price of imported manufactures.

$$(2) \quad C^D = C^D(Tp_C, y^*)$$

where $p_C = (P_C/e P_m^*)$ and $T \equiv 1 + t$, with t being the duty rate on coffee exports, P_C and P_m^* the home price of coffee and foreign currency price of manufactures.

Part of the coffee is bought by the government rather than sold abroad. These purchases are financed through foreign loans, domestic credit, and export duties on coffee. The real coffee purchases on the part of the government are designated G .

Equilibrium on the coffee market requires that:²

$$(3) \quad C^S(p_C/w) = C^D(p_C T, y^*) + G$$

Equation (3) determines the real producers' price of coffee, p_C , as a function of the exogenous variables:³

$$P_C = p_C (y^*, G, T, w)$$

and: $\frac{\partial p_C}{\partial y^*} > 0$; $\frac{\partial p_C}{\partial G} > 0$; $\frac{\partial p_C}{\partial T} < 0$; $\frac{\partial p_C}{\partial w} > 0$.

We also define real export earnings, X , and real disposable income of the coffee sector, y_C , measured in terms of imported manufactures, respectively, as:⁴

$$(4) \quad X \equiv T p_C C^D(T p_C, y^*) = X (y^*, G, T, w).$$

$$(5) \quad y_C \equiv p_C C^S(p_C/w) = y_C (y^*, G, T, w).$$

Real export earnings and real disposable income of the coffee sector are increasing functions of foreign income, government purchases and real wages. A rise in export taxes raises export earnings but reduces disposable income.

An increase in the real income of the coffee-importing countries, y^* , enhances external coffee demand and raises the real price of coffee, real export earnings and real disposable income of the coffee sector.

An increase in government coffee purchases boosts the price and since the demand for coffee is inelastic, export earnings and real income of the coffee sector rise.

An increase in export duties, T , raises the dollar price and reduces international demand for coffee bringing on a decrease of the real price received by the grower. Since the demand for coffee is inelastic relative to its price, export earnings rise. But disposable income of the coffee

sectors fall , because both the quantity produced and the price received by the grower diminish.

An increase in the real wage rate lessens coffee supply and pushes the real price of coffee up. Both export earnings and real income rise inasmuch as demand is inelastic.

1.2 - The Market for Domestic Manufactures

The price of domestic manufactures is cost determined. The real price of domestic manufactures, in terms of imported manufactures, is:

$$(6) \quad p = \beta w$$

where β stands for the output/labor ratio.

Manufacturing output is determined by demand, which depends on real domestic income, y , on their price in relation to that of imported similars, p , and on real balances, h . Real domestic manufacturing output, y_q , thus is:

$$(7) \quad y_q = p Q(p, y, h).$$

Real income is defined as:

$$(8) \quad y \equiv y_c + y_q$$

Equations (6), (7) and (8) allow us to determine internal equilibrium and to express real income as a function of the income of the coffee sector, real balances and the real wage.⁵ Given the money stock, the fiscal policy and the

money wage, internal equilibrium can be depicted by an inverse relationship between real income and the exchange rate, as illustrated in figure 1, by schedule yy.⁶ Assume an initial combination of the real income and the exchange rate, for which there is internal equilibrium. An increase in the exchange rate reduces the real wage, real balances and income of the coffee sector. Both the reduction in real balances and the reduction in the income of the coffee sector contribute to reduce the demand for domestic goods. The reduction in real wages, and thus in the price of domestic goods in relation to imports, however, increases demand for domestic manufactures in substitution for the imported goods. As long as the two first effects dominate, a depreciation of the exchange rate reduces demand for domestic manufactures. Consequently, industrial output falls and real income is reduced. It is implied that a depreciation is contractionary, when the nominal money supply is held constant.

1.3 - The Balance of Payments

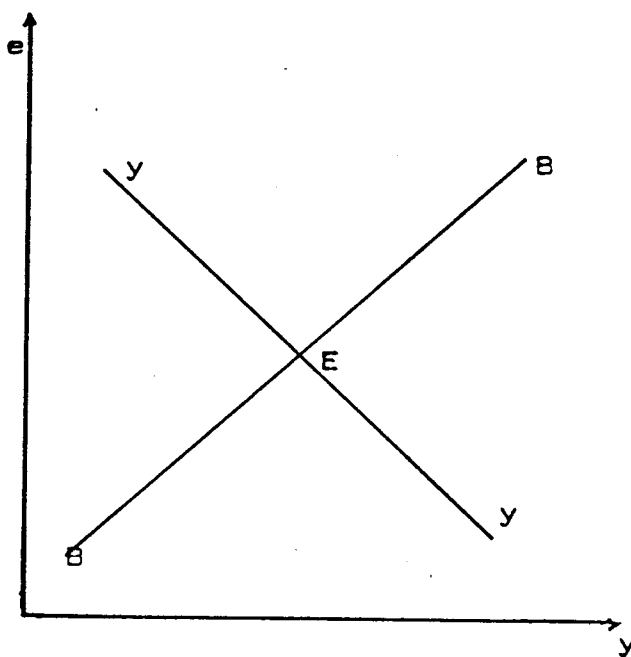
Imports of manufactures, M , are a function of their price relative to that of domestic similars, of real income and of real cash balances:

$$(9) \quad M = M(p, y, h)$$

The balance of payments measured in terms of imported manufactures, is:

$$(10) \quad B = X - M + F$$

Figure 1



where F stands for independent movements of foreign capital, expressed in terms of imported goods.

External equilibrium, $B = 0$, can be represented by a positive relationship between the exchange rate and real income, as illustrated by schedule BB in figure 1.⁷ If real income increases, the demand for imports rises, generating a trade deficit. To restore equilibrium, the exchange rate has to depreciate. For the depreciation to improve the balance of payments, the reduction in coffee export revenues has to be smaller than the reduction in import spending, obtained through the substitution effect and the reduction in cash balances, induced by the depreciation.

As illustrated in figure 1, internal and external equilibrium prevails at E , where yy and BB cross. We shall now illustrate the model by presenting some historically relevant comparative static exercises.

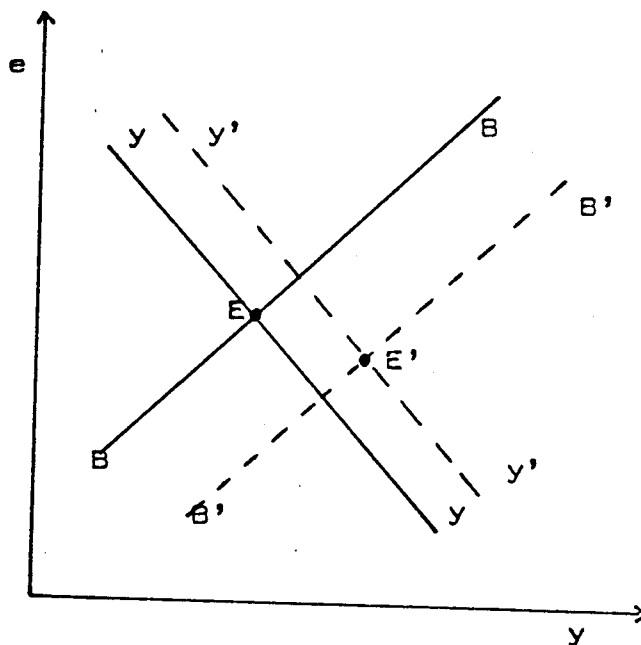
1.4 - Coffee Purchases Financed by Export Duties

Assuming that $G = t = 0$, at the outset, the result of the government increasing expenditures while maintaining a balance budget ($dG = dt C^D$) is as follows.

Since the demand for coffee is inelastic, the initial impact of government outlays financed by export duties is to raise coffee prices and export earnings,⁸ creating a trade surplus and shifting BB to the right,⁹ as in figure 2.



Figure 2



On the other hand, as the income of the coffee sector rises, the demand for manufactures is promoted and industrial production expands. (yy shifts to the right).¹⁰ At the higher income level, there still is a trade surplus.¹¹ The higher the marginal propensity to save, the larger is the balance of payments surplus, because less expenditures on foreign manufactures will be induced by the higher domestic income. The exchange rate appreciates to correct for the external surplus.

We thus conclude that coffee purchases financed by export duties are expansionary and induce an appreciation of the exchange rate.

1.5 - Coffee Purchases Financed by Foreign Loans

Next we consider coffee purchases financed by foreign loans. As in the preceding case, increases occur in the price of coffee, in export earnings, and in income of the coffee sector. Likewise, industrial output expands and domestic income grows. With the increase in imports, a trade deficit, lower than the government deficit arises. Since the government deficit is offset by foreign loans, the balance of payments improves. Coffee purchases, financed by foreign loans, are thus expansionary and induce an appreciation of the exchange rate, ceteris paribus.¹²

1.6 - Coffee Purchases Financed by Printing Money

Consider now, coffee purchases financed by printing

money ($p_c dG = dh$). As already seen, the increase in government expenditures on coffee will raise the price of the product, export earnings and the income of the coffee sector. Observe that the increase of the income of the coffee sector, for an increase in government expenditures on coffee, is larger than the increase in export revenues, since it also grows by the government deficit.

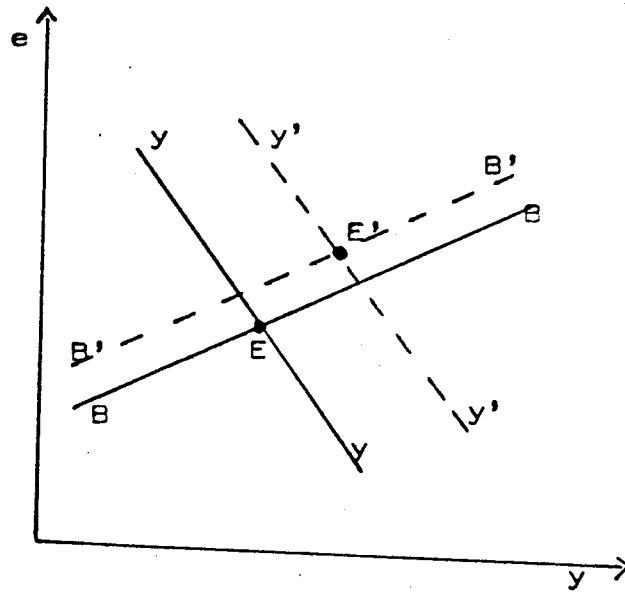
The increase in money balances induces more spending on imports. If this effect exceeds the increase in export revenues, even at the initial income level, a trade deficit appears, shifting BB to the left,¹³ as shown in figure 3.

On the other hand, at the going exchange rate, the increase in real money balances and in the income of the coffee sector contribute to create excess demand for domestic goods. Accordingly, the equilibrium output level of the manufacturing sector is enhanced and real income grows.¹⁴

At the going exchange rate, a balance of payments deficit appears. The external disequilibrium is corrected as the exchange rate depreciates: domestic goods substitute for imports and the reduction in real balances reduces demand for both domestic and imported goods.

We thus conclude that financing coffee purchases through credit or duties has far different effects for the balance of payments. The government can also finance its coffee purchases through a combination of duties, credit and foreign loans. The final effect will certainly be an expansion of

Figure 3



income, but the effect on the exchange rate then depends on the shares of credit, export duties and foreign loans in the total government expenditures on coffee, and on the savings propensity.

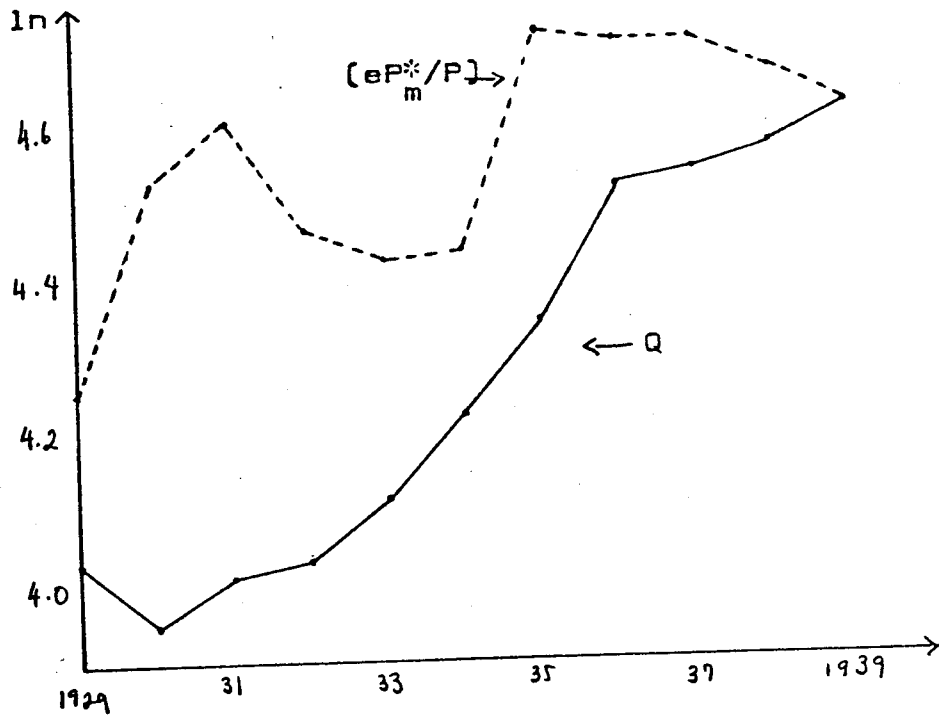
2. THE NINETEEN THIRTIES: AN APPLICATION

Figure 4 exhibits the Brazilian industrial output expansion during the thirties, in the face of alternating real depreciation and appreciation. The model developed in the previous section asserts that the coffee support policy pursued during the thirties in Brazil accounts for the industrial output expansion observed in the period. It also follows from the model that the observed appreciation rates shown in table 1, can be attributed to the fact that, in the periods 1931-33 and 1935-37, stockpiling was mainly financed by export duties; and that the observed depreciations, in the years 1933-34, and 1937-39, can be attributed to the fact that, during those periods, coffee purchases were mainly financed by domestic credit. We further explore these facts in this section.

In the course of the nineteen-twenties, the coffee support program proved quite effective. By purchasing unsellable stocks, the government held the international coffee price at high levels. Due to this artificial stimulus, coffee production nearly doubled from 1925 to 1929, at the same time that exports remained approximately constant. In 1927-1929, it was possible to export only two-thirds of the harvest.¹⁵

Figure 4

Real Industrial Output and the Real Exchange Rate
Brazil : 1929-1939



Source: Table 2.

When the crisis erupted in 1929, both the federal government and the state of São Paulo abandoned their coffee support programs because the possibility of external financing had vanished and the Instituto Paulista do Café was in financial straits.¹⁶ Between 1928 and 1930, the coffee price index in cruzeiros fell from 100 to 63.7.¹⁷

These facts can be fit into the model presented in section 1. With the relinquishment of the support policy and the drop in the coffee price, both export earnings and domestic income decrease. This, in turn, lowers industrial output (the industrial production index fell from 58 in 1928 to 52 in 1930 (base = 1939),¹⁸ as well as causing expenditures on manufactured imports to decrease more than export earnings. Even so, the trade surplus¹⁹ is outweighed by a withdrawal of capital. Given the lack of foreign reserves, the government is forced to devalue the exchange rate in order to deal with the balance-of-payments deficit.

In mid-1930, the São Paulo state government managed to arrange a foreign loan for the purpose of guaranteeing coffee prices,²⁰ though at this point the mechanism must be qualified due to the fact that the year 1930 was marked by serious political disturbances and a withdrawal of capital that contributed to the deterioration of the balance of payments, as well as to the devaluation of the exchange rate. By assuring minimum purchase prices that were profitable for the majority of the coffee growers, the program actually maintained the employment level of the export economy, and, indirectly, of the

production sectors linked to the domestic market. Thanks to the coffee policy, industrial production began to recover from its 1930 bottom.

In May 1931, the Conselho Nacional do Café was established to support the coffee sector by purchasing and destroying stocks. The purchases were financed through duties levied on coffee exports and funds obtained from the Banco do Brasil and the National Treasury. In 1931 and 1932, the coffee bought by the government accounted for roughly 30% of the export revenues. Between May 1931 and February 1933, 65% of these expenditures were financed by duties, and the remaining 35% by credit from the Banco do Brasil and the National Treasury.²¹

As the income of the coffee sector recovered from its lowest levels thanks to the price support policy, the increasing demand for manufactures led to a rise in industrial output. Since government expenditures were in part financed by duties, higher income levels were compatible with the improvement in the balance of trade and the appreciation of the exchange rate.

Between February 1933 and December 1934, the shares of the financial sources changed considerably, with domestic credit coming to assume a more important role. To better understand this policy, one might glance at figure 3, where the manufacturing sector expands in the presence of exchange depreciation.

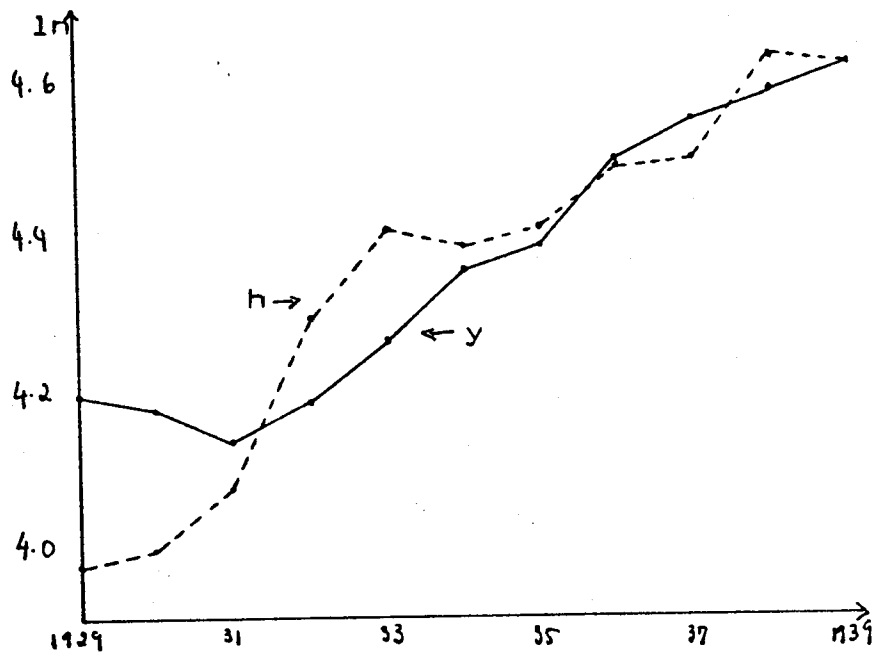
Between 1935 and 1937, the Departamento Nacional do

Café controlled the export supply through a quota system whereby coffee growers were obliged to turn part of their production over to the government for the formation of stocks. This was similar to financing coffee purchases through duties. During this phase there were less financial resources,²² and the manufacturing sector expanded in the presence of a slight exchange appreciation.

Figure 4 and 5, and tables 1 and 2 summarize the main facts.

Figure 5

Real income and the Real Money Stock
Brazil: 1929-1939



Source : Table 2

Table 1
Rates of Depreciation Brazil: 1928-1939

Period	$(e - e_{-1})/e_{-1}$
1928-31	0.68
1931-33	- 0.11
1933-35	0.37
1935-37	- 0.07
1937-39	0.19

SOURCE: Table 3.

Table 2
Real Output, Real Money and Real Exchange Rate Indices
Brazil: 1928-1939

Years	Index of Real Industrial Output: Q	Index of Real Output y	Index of Money Balances Deflated by the GAP Deflator	Index of Import Prices Deflated by Industrial Prices eP_m^*/P
1928	58	65.2	51.5	67.2
1929	56	65.9	52.9	69.9
1930	52	64.5	54.1	91.7
1931	55	62.4	64.8	99.7
1932	56	65.1	72.1	86.2
1933	61	70.9	81.2	83.0
1934	68	77.4	80.2	84.0
1935	77	79.7	81.8	110.6
1936	91	89.3	88.0	110.3
1937	93	93.4	89.2	110.0
1938	96	97.6	101.9	105.5
1939	100	100.0	100.0	100.0

SOURCES: Column 1 : Fishlow (1972), Table A-1.
 Column 2 : Haddad (1977), pp. 11 and 191.
 Columns 3 and 4: Table 3.

Table 3

Money Stock and Price Indices

Brazil: 1928-1929

Years	Money Stock Annual Average	Dollar Exchange Rate	Import Prices	Industrial Prices	GPD Deflator
	H	e	e P* m	P	
1928	52.9	44.3	56.7	84.4	102.7
1929	52.2	44.3	54.6	78.1	98.7
1930	46.8	48.4	59.4	64.8	86.5
1931	49.9	74.5	69.2	69.4	77.0
1932	56.5	73.4	60.1	69.7	78.4
1933	62.2	66.1	59.4	71.6	76.6
1934	65.4	73.4	63.0	75.0	81.5
1935	70.0	90.6	85.7	77.5	85.6
1936	76.5	90.1	91.3	82.8	86.9
1937	84.8	83.9	94.8	86.2	95.1
1938	100.1	91.7	99.0	93.8	98.2
1939	100.0	100.0	100.0	100.0	100.0

SOURCES: Column 1: Pelaéz and Suzigan (1976), Table A.3

Column 2: Malan et al. (1977), Table 1.3

Column 3: Idem, Table A.V.12. This is a tariff inclusive cruzeiro price of imports.

Column 4 and 5: Idem, Table A.V.14.

NOTES

1. This hypothesis is advanced by Furtado(1963). Furtado is criticized by Pelaez(1972), who contends that a large share of the income generated by the multiplier effects of the coffee-support expenditures was canceled by the offsetting negative multiplier effects of the taxes levied to finance coffee purchases. Fishlow(1972) argues that the coffee-support program generated demand in a somewhat more complex manner than Furtado believes. Basing his argument on a partial equilibrium model, Fishlow maintains that the greater part of the export duties were passed on to the foreign consumer. The transfer of the duties was guaranteed by the inelasticity of demand and the high elasticity of supply. Our more complete model incorporates the mechanism described by Fishlow, while at the same time analyzing the coffee policy from the standpoint of its impact on real income in accord with the approach advised by Pelaez and Suzigan(1976).

A monetary explanation for the industrial upsurges during the thirties is found in Pelaez(1972) and Neuhaus(1973). The monetary factors explaining the behavior of economic policy in the Brazilian experience during the Depression are also incorporated in our model.

2. It is assumed that domestic coffee consumption is negligible.

3. From (3): $p'_c = \frac{1}{\epsilon_c + \eta_c} (\epsilon_c w' + \eta_{y^*} y^{*'} + \sigma - \eta_c T')$ (i)

where a line beside the variable indicates its logarithmic derivative, i.e. $x' = dx/x$.

$$\sigma = dG/C^d$$

ϵ_c = price elasticity of the coffee supply

η_c = absolute value of the price elasticity of the demand for coffee.

η_{y^*} = income elasticity of the demand for coffee.

Equation (i) is an approximation. It is exactly correct only if initially $G = 0$ or $C^s = C^d$.

4. The effect of changes in the exogenous variables on real export earnings can be studied using the following equation:

$$X' = \left(\frac{1 - \eta_c}{\epsilon_c + \eta_c}\right) (\epsilon_c w' + \sigma + \epsilon_c T') + \left(\frac{1 + \epsilon_c}{\epsilon_c + \eta_c}\right) \eta_{y^*} y^{*'} \quad (ii)$$

The effect of changes in the exogenous variables on the income of the coffee sector is given by:

$$y'_c = \left(\frac{1 + \epsilon_c}{\epsilon_c + \eta_c}\right) (\eta_{y^*} y^{*'} + \sigma - \eta_c T') + \left(\frac{\epsilon_c}{\epsilon_c + \eta_c}\right) (1 - \eta_c) w' \quad (iii)$$

5. Assuming that initially, $G=t=0$, and $X=M$, where M stands for imports, we have: $y_c = X = M$ and from (8):

$$dy/M = y'_c + (y_q/M) y'_q \quad (iv)$$

From (7):

$$y'_q = (1 - \eta_q) p' + q(dy/y_q) + \lambda_q h' \quad (v)$$

where:

η_q = absolute value of the price elasticity of the demand for domestic manufactures.

q = marginal propensity to consume domestic manufactures.

λ_q = elasticity of demand for domestic manufactures in relation to real balances.

Substituting (v) into (iv) and observing, from the budget constraint, that: $\{y_q/M\} \{1-\eta_q\} = \eta_m$, where η_m is the price elasticity of the demand for imported manufactures, we obtain:

$$dy/M = (1/(1-q)) (y'_c - \eta_m p' + \theta \lambda_q h') \quad (vi)$$

where, $\theta \equiv y_q/M$.

6. Note that $h'=p'=w'=-e'$, for given nominal money stock and nominal rate. For given fiscal policy, we also have:

$$y'_c = \phi_c w', \quad \text{where } \phi_c = (1-\eta_c) \varepsilon_c / (\varepsilon_c + \eta_c).$$

We can thus rewrite (vi) as:

$e'/(dy/M) = - (s+m) / (\phi_c + \theta \lambda_q - \eta_m)$, where s = the marginal propensity to save.

yy is downward sloping, as long as $(\phi_c + \theta \lambda_q) > \eta_m$.

7. To obtain the slope of BB we assume $B = 0$, $X = M$ and $F = 0$, at the outset. We thus differentiate (10) totally to obtain:

$$e'/(dy/M) = m/(\eta_m + \lambda_m - \phi_c)$$

m = the marginal propensity to spend in imported manufactures.

λ_m = the elasticity of demand for imports in relation to real balances.

8. Observe that: $dX = dy_c = ((1+\epsilon_c)(1-\eta_c)/(\epsilon_c + \eta_c)) p_c dG$

9. BB shifts to the right in the following proportion:

$$dy = (1/m)dX$$

10. yy shifts to the right in the following proportion :

$$dy = (1/(s+m))dy_c$$

11. At the going exchange rate, the trade surplus can be measured by:

$$dB = (s/(s+m))dy_c$$

12. Observe that, when coffee purchases are financed by foreign loans, $dX = (1-\eta_c)/(\epsilon_c + \eta_c)$ and $dy_c = (1+\epsilon_c)/(\epsilon_c + \eta_c)$. In terms of our figures, yy shifts to the right in the following proportion: $dy = (1/(s+m))dy_c$ and BB shifts to the right in the following proportion:
- $$dy = ((1/m)(1+\epsilon_c)/(\epsilon_c + \eta_c)) \quad dF = (1/m)dy_c.$$

13. The shift in BB can be measured by:

$$dy = \{ (1/m) \left((1 - \eta_c) (\epsilon_c + \eta_m) - \lambda_m (M/h) \right) \} dh$$

14. The shift in yy is measured by:

$$dy = \{ (1/(s+m)) \left((1 + \epsilon_c) (\epsilon_c + \eta_c) + (y_q/h) \lambda_q \right) \} dh$$

15. See Furtado, op.cit., p. 198.

16. See Silber (1977), p. 189.

17. See Malan et. al. (1977), Table I.2.

18. See Fishlow (1972), Table A-1.

19. Between 1928 and 1930, export earnings fell from US\$ 473.4 to US\$ 319.4 million, and imports from US\$ 383.3 to US\$ 225.1 million.

20. See Silber (1977), p. 190.

21. See Silber (1977), p. 192.

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