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The Political Economy of Agricultural Pricing Policy

Trade, Exchange Rate, and Agricultural Pricing Policies in the Dominican Republic

Volume II *Appendixes: Data and Methodology*

Duty D. Greene and Terry L. Roe

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The World Bank
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Abstract

Although agriculture is still an important part of the economy of the Dominican Republic, the sector's share of gross domestic product (GDP) and of total exports decreased substantially during the period 1966-85. These changes can be attributed in large part to the government's import-substitution/industrialization policies and to its intervention in the country's coffee, rice, and sugar markets.

For most of the period, direct government intervention in prices tended to benefit sugar and rice producers while implicitly taxing coffee growers. But if indirect intervention (in the form of an overvalued currency and industrial protection) is taken into account, one finds that producers of all three crops suffered losses. These disincentives to production were part of the reason why agriculture's share of total exports fell from 76 percent to 55 percent during the period. This drop was accompanied by reductions in the foreign exchange earnings of the three crops.

It seems clear that sugar and rice growers benefitted from direct government intervention in producer prices because of their political influence, and that this political influence, in turn, was the result of geographic concentration. Coffee growers carried less weight politically because of their geographic dispersion and the generally smaller size of their farms.

The concentration of political influence among urban labor-surplus households and import-competing enterprises served to protect the domestic industrial sector from foreign competition and to overvalue the country's currency. Consequently, the consumer prices of rice, coffee, and sugar were kept low in relative terms. The low prices of these commodities tended to subsidize the consumption of low-income rural and urban consumers relative to others in the economy.

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APPENDIX A: THE DATA AND METHODOLOGY USED IN THE ESTIMATION OF THE SHADOW EQUILIBRIUM EXCHANGE RATE

Appendix A: Estimation of a Shadow Equilibrium Exchange Rate

A. Introduction

Our approach to the estimation of the shadow equilibrium exchange rate is closely related to the material supplied by Maurice Schiff. Our approach differs only in the sense that we derive our exchange rate formula directly from the conditions for equilibrium in the foreign exchange market. As in the case of Maurice's approach, equlibrium in the foreign exchange market is soley determined by trade in goods and services, i.e., the capital account is not considered. The uniqueness of the approach is that the determination of the demand and supply of foreign exchange is directly related to the trade in goods and services in a manner that facilitates the estimation of a shadow exchange rate under alternative situations.

Following a brief literature review, the model is illustrated graphically. Then, algebraic forms are assumed for the excess supply and demand functions. From these equations, the foreign exchange market equations and an equation for the currency exchange rate are derived. Clearly, this is a simple model of a complex process and hence results needed to be interpreted accordingly. Nevertheless, the results for the Dominican Republic seem quite plausible in our opinion.

B. Background

The literature on the primary determinants of the supply and demand for foreign currency and, thus, the equilibrium exchange rate is extensive. However, there appears to be no generally accepted consensus on the correct procedure to estimate exchange rates that might prevail under alternative regimes (Krueger, Bacha and Taylor, Blitzer, Dasgupta, and Stiglitz) or with resource discoveries and terms of trade changes (Diaz-Alejandro).

Krueger's 1983 review of exchange rate determination points out that in the 1960's the literature focused primarily on the current account and the determinants of the balance of payments under fixed exchange rates. In the early and middle 1970's the focus was primarily on the capital account and monetary theory. She also states (Krueger, p. 103) that the more recent literature on exchange rate determination has brought the current account back into the focus of analysis because of three interrelated analytical developments, namely:

1. Recognition that changes in asset holdings can come about only through imbalances on current account so that the current account position is accompanied by asset accumulation or decumulation.

2. Rational expectation models of exchange rate determination have been developed that focus on particular links between the current and capital accounts, including (a) the recognition that the expected current account path implies an expectation of the future path of foreign asset accumulation and consequently an expectation about future prices of those assets and (b) the identification of exchange-rate changes with terms-of-trade shifts in response to real disturbances.

3. Analysis of the current account balance as an expression of savings behavior has focused attention on the intertemporal aspects of the current and capital account linkages and their role in exchange rate determination.

These recent developments have tended to support the widely-held view that financial asset market variables are the primary determinants of exchange rates in the short-run, while current account variables are the principal determinants in the longer-run.

C. Graphic Analysis

The demand for foreign exchange is derived in figure 1.a. The chart is divided into three quadrants. The excess demand function is depicted in the first quadrant. Excess demand is expressed as a function of domestic price of imports P_m. Domestic price equals the product of the exchange rate E_1, border price P_m^* and tariff $(1+t_m)$. Other variables that cause the excess demand function to shift, such as prices of substitutes, income etc. are held constant in this analysis. Assuming that the country's level of imports has no effect on world market price, the mapping between the quantity of imports M and foreign exchange is linear. This is depicted in quadrant II. The demand for foreign exchange is depicted in quadrant III. The curve in quadrant III is derived by choosing an exchange rate value, E_1, and moving in a clock-wise manner, the coordinate point is established at (E_1, Q_m). The locus of points implied by the curve D_f is obtained by holding $P_m^*(1+t_m)$ constant and selecting other exchange rate values, such as E_0. Notice that the curvature of D_f in E, Q_m space is directly related to the curvature of D_m in P_m, M space since P_m^* is linear.

The supply of foreign exchange is derived in figure 1.b. The excess supply of goods and services, as a function of domestic price P_x, is expressed in quadrant I. Domestic price is a product of the exchange rate, border price P_x^* and taxes $(1-t_x)$. Assuming that the country's exports has no effect on world market price, the mapping between the quantity of exports X and foreign exchange is linear, quadrant II. Selecting arbitrary exchange rate values E_1 and E_0, the coordinates in quadrant III are obtained by pivoting clock-wise. Hence, this simple graphic analysis relates the demand and supply of foreign exchange to the goods markets. All "shift" variables in the excess supply and

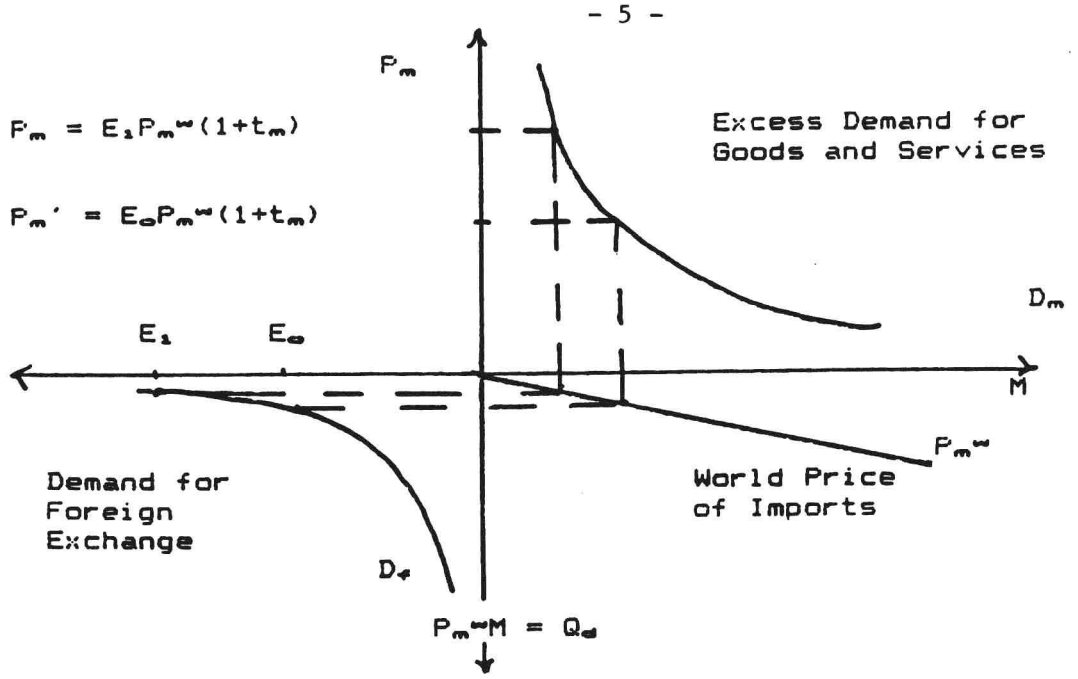

Figure 1.a: The excess demand for imports and the derived demand for foreign exchange

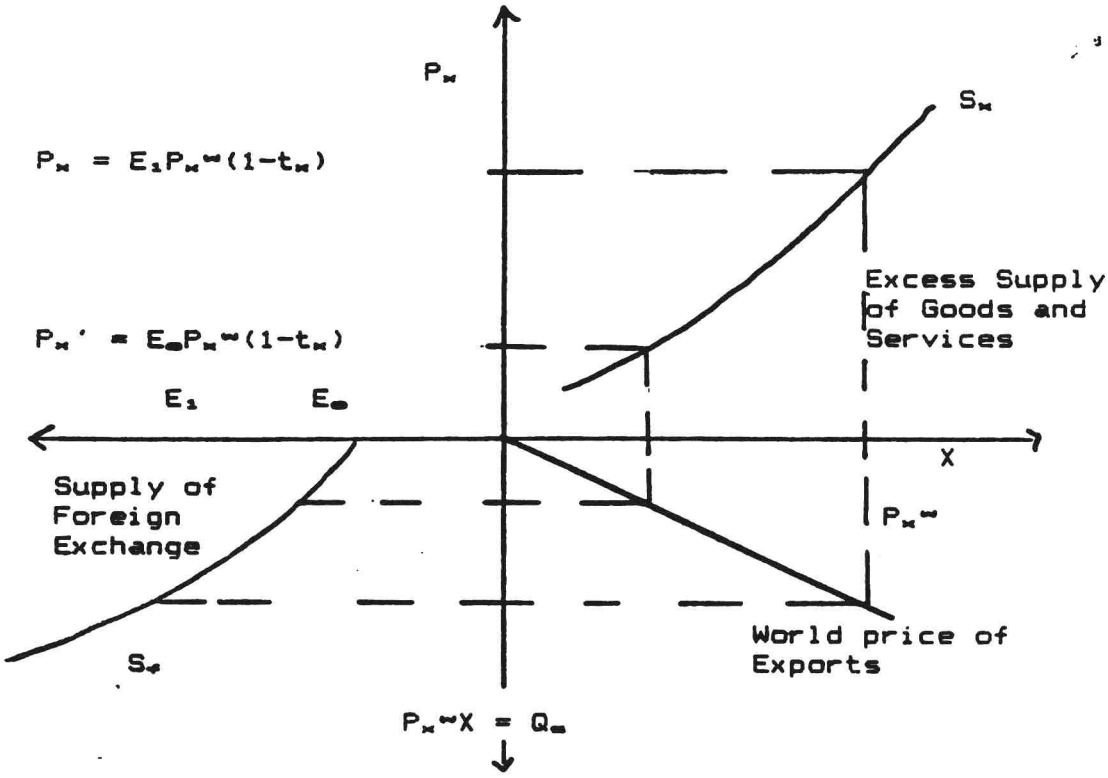

Figure 1.b. The excess supply of exports and the derived supply of foreign exchange

demand functions are held constant. The next step is to assume functional forms for the excess demand and supply functions, and then to derive the demand and supply functions for foreign exchange.

D. Algebraic Analysis

Let:

(1) $M_t = B^*(Z_t)[P_{mt}]^{\eta} = B^*(Z_t)[E_t P_{mt}^*(1+t_{mt})]^{\eta}$

denote the excess demand for goods and services depicted in figure 1.a where Z_t is a vector of some other exogenous variables and subscript t denotes time. The demand for foreign excnange (the curve in quadrant III) can be simply derived by multiplying both sides of (1) by the border price P_{mt}^*. The result is:

(1') $Q_{dt} = B^*(Z_t)(P_{mt}^*)^{1+\eta}[E_t(1+t_{mt})]^{\eta}$

The supply of foreign exchange can be derived likewise. Let

(2) $X_t = A^*(W_t)[P_{xt}]^{\epsilon} = A^*(W_t)[E_t P_{xt}^*(1-t_{xt})]^{\epsilon}$

denote the excess supply of goods and services depicted in figure 1.b where W_t is a vector of some other exogenous variables, possibly including those in Z_t. Multiplying both sides of (2) by the border price P_{xt}^* yields the supply function for foreign exchange:

(2') $Q_{st} = A^*(W_t)(P_{xt}^*)^{1+\epsilon}[E_t(1-t_{xt})]^{\epsilon}$.

Notice that the elasticity of E_t in the foreign exchange equations is identical to the elasticity their "parent" equations. Moreover, it is not necessary for $Q_{dt} = Q_{st}$.

The simplicity of this framework for computing exchange rates that might prevail if the current account and/or taxes on exports and tariffs were changed from historical levels can now be shown.

The first step is to derive values for $B^*(Z_t)$ and $A^*(W_t)$ for each period t. From (1') we obtain:

(1'') $B_t \equiv B^*(Z_t)(P_{mt}^w)^{1+\eta} = Q_{mt}/[E_t(1+t_{mt})]^{\eta}$

and from (2') we obtain:

(2'') $A_t \equiv A^*(W_t)(P_{mt}^w)^{1+\epsilon} = Q_{mt}/[E_t(1-t_{xt})]^{\epsilon}$.

Thus, if we have data on the value of imports (Q_{mt}), the nominal exchange rate E_t, tariffs $(1+t_{mt})$, and, if we know the value of the elasticity η, then the "intercept" term in (1') can be computed. Likewise, knowledge of Q_{mt}, $(1-t_{xt})$ and ϵ permit the calculation of the "intercept" term in (2').

Suppose these equations are denoted as follows

(1''') $Q_{mt} = B_t[E_t(1+t_{mt})]^{\eta}$

(2''') $Q_{mt} = A_t[E_t(1-t_{xt})]^{\epsilon}$.

Now, equating (1''') and (2''') and solving for E_t permits an estimate of the exchange rate that might prevail under alternative assumptions of t_{mt}, t_{xt} when the current account is in balance. To evaluate exchange rates that might prevail under alternative current account assumption, simply substitute (1''') and (2''') into

$$Q_{mt} = Q_{mt} \cdot k,$$

and solve for E_t, where k is a parameter. Values of $k > 1$ imply a current account deficit, $k < 1$ a surplus and $k = 1$ implies a balanced current account.

For the case $k = 1$, the equation is:

(3)

$$E_t = (B_t/A_t)^{1/(\epsilon-\eta)}((1+t_{mt})^{\eta/(\epsilon-\eta)}/(1-t_{xt})^{\epsilon/(\epsilon-\eta)})$$

Setting $t_{mt} = t_{xt} = 0$, yields an estimate of E_t that might prevail for the case where the current account is in balance and tariffs and taxes have been removed. The variables Z_t and W_t are exogenous; their effects on E_t are

implicit through the observed levels of the variables (M_t, X_t, etc.) used to compute B_t and A_t.

Clearly therefore, this is a partial equilibrium model.

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TABLE A.1: EXCHANGE RATE DATA AND THE EQUILIBRIUM EXCHANGE RATE

YEAR	EXPORTS (MILLION US$) (1)	IMPORTS (MILLION US$) (2)	TRADE BALANCE (MILLION US$) (3)	SERVICE EXPORTS (MILLION US$) (4)	SERVICE IMPORTS (MILLION US$) (5)	SERVICE BALANCE (MILLION US$) (6)	DONATION TRANSFER (MILLION US$) (7)
1966	136.7	166.9	-30.2	21.7	82.9	-61.2	16.5
1967	156.2	174.7	-18.5	30.5	85.2	-54.7	7.0
1968	163.5	196.8	-33.3	37.0	88.9	-51.9	9.0
1969	183.4	217.2	-33.8	44.6	103.9	-59.3	8.4
1970	214.0	278.0	-64.0	44.5	113.9	-69.4	31.2
1971	240.7	309.7	-69.0	51.0	128.8	-77.8	17.4
1972	347.6	337.7	9.9	65.0	152.5	-87.5	30.6
1973	442.1	421.9	20.2	74.3	221.7	-147.4	30.6
1974	636.8	673.0	-36.2	98.4	338.2	-239.8	89.0
1975	893.8	772.7	121.1	121.4	354.3	-232.9	39.0
1976	716.4	763.6	-47.2	136.7	344.5	-207.8	125.8
1977	780.5	849.3	-68.8	159.3	358.4	-199.1	139.6
1978	675.5	862.4	-186.9	173.3	448.1	-274.8	149.8
1979	868.6	1137.5	-268.9	298.2	566.4	-268.2	205.8
1980	961.9	1519.7	-557.8	351.2	651.0	-299.8	187.8
1981	1188.0	1451.7	-263.7	336.4	671.0	-334.6	193.0
1982	767.6	1257.3	-489.7	378.5	535.8	-157.3	205.0
1983	785.3	1282.2	-496.9	463.5	602.6	-139.1	215.0
1984	868.1	1257.1	-389.0	480.0	650.0	-170.0	220.0

(1) Value of total Dominican exports (Table 6.1, p.61).
(2) Value of total Dominican imports (Table 6.1, p.61).
(3) Value of Dominican trade balance (Table 6.1, p.61).
(4) Value of Dominican service exports (Table 6.1, p.61).
(5) Value of Dominican service imports (Table 6.1, p.61).
(6) Value of Dominican service trade balance (Table 6.1, p.61).
(7) Value of donations, grants, and transfers to the D.R. (Table 6.1,p.61).

TABLE A.1: EXCHANGE RATE DATA AND THE EQUILIBRIUM EXCHANGE RATE

YEAR	BALANCE CUR.ACCT (MILLION US$) (8)	SUPPLY Qso (MILLION US$) (9)	DEMAND Qdo (MILLION US$) (10)	Ewo EST. NOM. EX.RATE (DR$/US$) (11)	SUPPLY ELAST. es (12)	DEMAND ELAST. nd (13)	IMPLICIT M.TARIFF RATE (1+tm) (14)
1966	-74.9	174.9	249.8	1.006	1.0	-2.0	1.350
1967	-66.2	193.7	259.9	1.008	1.0	-2.0	1.350
1968	-76.2	209.5	285.7	1.009	1.0	-2.0	1.350
1969	-84.7	236.4	321.1	1.008	1.0	-2.0	1.350
1970	-102.2	289.7	391.9	1.012	1.0	-2.0	1.352
1971	-129.4	309.1	438.5	1.010	1.0	-2.0	1.359
1972	-47.0	443.2	490.2	1.008	1.0	-2.0	1.351
1973	-96.6	547.0	643.6	1.012	1.0	-2.0	1.317
1974	-187.0	824.2	1011.2	1.010	1.0	-2.0	1.246
1975	-72.8	1054.2	1127.0	1.014	1.0	-2.0	1.232
1976	-129.2	978.9	1108.1	1.019	1.0	-2.0	1.244
1977	-128.3	1079.4	1207.7	1.028	1.0	-2.0	1.242
1978	-311.9	998.6	1310.5	1.039	1.0	-2.0	1.245
1979	-331.3	1372.6	1703.9	1.044	1.0	-2.0	1.294
1980	-669.8	1500.9	2170.7	1.046	1.0	-2.0	1.249
1981	-405.3	1717.4	2122.7	1.073	1.0	-2.0	1.226
1982	-442.0	1351.1	1793.1	1.192	1.0	-2.0	1.239
1983	-421.0	1463.8	1884.8	1.306	1.0	-2.0	1.282
1984	-339.0	1568.1	1907.1	2.373	1.0	-2.0	1.320
				3.145	1.0	-2.0	n.a.

(8) Value of Dominican current account balance (Table 6.1, p.61).
(9) Supply of US$ from the current account (column 1+4+7).
(10) Demand for US$ from current account (column 2+5).
(11) Estimated weighted average nominal exchange rate (Column 6, Table 6.2, p.64).
(12) Assumed supply elasticity for exports (or supply of US$).
(13) Assumed demand elasticity for imports (or demand for US$).
(14) Implicit import tariff rate. Based on data in Table 2.3, p.11, IBRD (1985).

TABLE A.1: EXCHANGE RATE DATA AND THE EQUILIBRIUM EXCHANGE RATE

YEAR	EST. COEFF. OF PROTECTION (%) (15)	IMPLICIT X.TAX RATE (1-tx) (16)	EST. CONSTANT A (17)	EST. CONSTANT B (18)	E* EST.NOM. EQ.X.RATE (DR$/US$) (19)	E*/Ewo RATIO (20)	CPI D.R. (1965=100) (21)
1966	0.711	0.960	181.03	461.11	1.37	1.36	98.69
1967	0.711	0.960	200.17	481.28	1.34	1.33	100.08
1968	0.711	0.960	216.33	529.89	1.35	1.34	100.11
1969	0.711	0.960	244.30	594.61	1.35	1.33	101.24
1970	0.709	0.958	298.79	733.78	1.35	1.33	104.92
1971	0.697	0.947	323.13	826.34	1.37	1.35	109.43
1972	0.698	0.943	466.21	909.27	1.25	1.24	118.20
1973	0.707	0.931	580.56	1143.31	1.25	1.24	136.02
1974	0.721	0.898	908.37	1602.73	1.21	1.20	155.25
1975	0.672	0.828	1255.49	1759.14	1.12	1.10	176.17
1976	0.727	0.905	1061.31	1781.21	1.19	1.17	189.75
1977	0.712	0.884	1187.45	1969.84	1.18	1.15	214.35
1978	0.757	0.942	1020.02	2194.02	1.29	1.24	221.99
1979	0.725	0.938	1401.76	3109.17	1.30	1.25	242.34
1980	0.751	0.938	1530.21	3702.73	1.34	1.28	282.78
1981	0.755	0.926	1728.37	3673.83	1.29	1.20	304.00
1982	0.797	0.987	1148.86	3908.02	1.50	1.26	327.46
1983	0.774	0.992	1129.79	5284.25	1.67	1.28	350.08
1984	0.741	0.978	675.82	18703.97	3.02	1.27	435.77
	n.a.	n.a.	n.a.	n.a.	3.15	1.00	599.18

(15) Estimated coefficient of protection for the D.R. Based on the terms of trade data of the Central Bank.
(16) Estimated implicit export tax rate (column 14*15).
(17) Calculated value of the constant in the supply equation for foreign exchange (column 9/(11*16)^12).
(18) Calculated value of the constant in the demand equation for foreign exchange (column 10/(11*14)^13).
(19) Estimated nominal equilibrium exchange rate (column (18/17)^(1.0/column 12-13)).
(20) Ratio of the estimated nominal equilibrium exchange rate to the average weighted nominal rate (Column 19/11).
(21) D.R. Consumer Price Index. Central Bank data.