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# The Effects of Sectoral and Economy-Wide Policies on Tobacco Production in the Dominican Republic

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## *Abstract*

This study analyses the effects of specific agricultural and exchange rate policies on tobacco production in the Dominican Republic. Direct protection resulting from output and input subsidies and taxes was positive on average from 1966 to 1988, but total protection was negative when exchange rate policies are considered. Tobacco policies were quite volatile and resulted in increasing production in the 1970s but decreasing production in the 1980s. Overall, tobacco production was 4.8 percent less than it would have been had there been no policy interventions. Several reasons are provided for the policies.

**Key Words:** Dominican Republic, Nominal Rate of Protection, tobacco policies

Many governments in developing countries suppress producer prices of agricultural commodities through agricultural marketing boards, export taxes, export grants, overvalued exchange rates, and other policies. At the same time, these governments often attempt to partly offset the resulting producer disincentives by input subsidies (Krueger et al). The combined effect of policies influencing agriculture in developing countries is often to discriminate against producers (Ballenger et al). The result is reduced production, income, and welfare due to inefficient use of resources.

Tobacco in the Dominican Republic is an example of a commodity that has experienced substantial government intervention over the past several years in both input and output markets. Export taxes, overvaluation of the Dominican peso, and input subsidies have acted in a sometimes

countervailing but frequently discriminatory way against tobacco. These policies, combined with lower prices in world markets, have resulted in reduced profitability for Dominican producers and lower production.

The purpose of this study is to analyze the effects of specific agricultural and exchange rate policies on the tobacco industry in the Dominican Republic. Effects on production, foreign exchange earnings, and government revenue are considered. Drawing on methods employed by Greene and Roe, the net degree of protection or taxation resulting from both direct and indirect policies is estimated. A rationale is offered for why this particular policy mix has prevailed in the Dominican Republic. Finally, implications are drawn for agricultural policies in that country.

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## Dominican Tobacco Industry and Policies

Historically, tobacco has been one of the most important agricultural commodities in the Dominican Republic. While it is the fourth largest source of foreign exchange after sugarcane, coffee, and cocoa, generating roughly 5 percent of all foreign exchange in the country (Table 1), it is more significant in terms of employment. Tobacco planting, marketing, and processing employs more than 300,000 people (Centro Dominicano de Promocion de Exportaciones). Tobacco generates about 3 percent of the total value of crop output.

A comparison of tobacco to other major crops in the Dominican Republic is presented in Table 2. Sugar has historically been the crop that produced the largest share of agricultural income. Although its relative importance has declined over time with the expansion of food crops and non-traditional export crops, such as vegetables, sugar remains number one in economic importance. Rice is the most important food crop and production has more than doubled over the past 30 years. Beans are the second most important food crop and their importance has grown over time.

Despite input subsidies, tobacco production has declined from 18,390 metric tons in 1966 to 15,600 tons in 1990. However, substantial variation in production has occurred from year to year due to weather, pests, and price swings. For example, production reached 56,000 tons in 1978. Production and exports increased during most of the 1970s but generally decreased in the 1980s. Tobacco production in 1990 was particularly low due to a combination of drought and low prices.

Most tobacco is produced on farms of 1 hectare or less with heavy use of family labor and low levels of technology (Bautista). Less than half the farmers use chemical fertilizers or pesticides, although these are still the major purchased inputs. Dominican dark tobacco is considered one of the best in the world due to low acidic and nicotenic content and excellent combustibility. There are three major varieties. Amarillo Parado is the dominant variety, representing about 60 percent of total production. Another 21 percent is Chago Dias (fragrance tobacco) and 19 percent is Piloto Cubano (Cuban seed tobacco). Almost all of the tobacco

produced in the Dominican Republic is dark tobacco of which about two-thirds is exported. Dark tobacco is primarily used in mixtures and blends for pipe tobacco and cigars. Spain is the largest export market.

The first major government intervention in tobacco production occurred with the founding of the Tobacco Institute (INTABACO) in 1962. INTABACO is charged with improving the quality of Dominican tobacco and protecting tobacco growers. It donates part of the inputs that growers use in dark tobacco production, including all seeds and part of the fertilizers and pesticides.<sup>1</sup> Since 1978, tobacco planting has been prohibited in the southern and eastern parts of the country and tobacco growers elsewhere are only allowed to plant seeds distributed by INTABACO. The purpose is to maintain or improve the quality of Dominican tobacco.<sup>2</sup>

Other government interventions have included prohibiting imports of light tobacco (used in cigarette production) and its products since 1982, and levying taxes on cigarette sales and tobacco exports. The exporting sector has also been affected by monetary regulations. For example, in 1983 the Central Bank established a stabilization exchange fund and an export compensation fund to provide tobacco exporters with a more favorable exchange rate than the official rate, which was heavily overvalued at the time. In 1984, a monetary incentive of 48 percent was added to the official exchange rate for U.S. dollars earned from tobacco exports. Despite this incentive, tobacco exporters were still discriminated against compared to the free or parallel market rate. In 1985, the exchange rate used for tobacco exports was set equal to the parallel market rate, but a 36 percent surcharge was imposed on tobacco exports. The net effect of exchange rate manipulations and surcharges has been to tax tobacco exports in most years.

The Dominican peso (DR\$) was officially pegged at the rate of DR\$1=US\$1 from 1947 to 1985. Increasing current account deficits and high inflation rates made this more and more difficult after the mid 1960s. Transactions not only increased in the parallel foreign exchange market but became increasingly allowed until the official rate was devalued in 1985. Maintaining the separate exchange rates enabled the government to

**Table 1.** Value of Total Agricultural Exports for the Dominican Republic, 1966-1988 (Millions of 1980 US\$)

Year	Total Agric. Exports	Raw Sugar Exports	Green Coffee Exports	Cocoa Exports	Tobacco Exports
1966	713.54	338.33	92.51	49.34	44.30
1971	918.93	519.03	86.94	50.37	110.82
1976	706.02	383.07	143.39	63.87	56.61
1981	998.11	678.40	96.44	63.79	73.93
1982	789.81	471.10	156.98	96.88	30.55
1983	789.81	442.24	122.24	97.44	29.55
1984	961.85	509.34	161.12	128.86	37.69
1985	761.09	319.50	96.81	110.02	34.43
1986	659.86	213.12	168.95	98.83	37.39
1987	655.48	248.63	105.14	123.97	23.99
1988	628.80	228.46	106.43	112.06	29.45

Source: IMF, *International Financial Statistics*, Washington, D.C., various volumes.

**Table 2.** Production, Prices, and Value for Major Agricultural Commodities in the Dominican Republic (1988)

Selected Commodities	Production (1000 MT)	Price (DR\$/1000 MT)	Value (Millions DR\$)
Sugar	777	1,477	1,147
Coffee	50	5,830	291
Tobacco	29	5,707	165
Rice	275	2,750	756
Red Beans	46	7,722	355
Corn	57	1,628	93
Cassava	127	1,430	182

Source: Jesus de Los Santos, "The Impacts of Trade and Agricultural Policies in the Dominican Republic: A Sector Programming Approach." Ph.D. thesis, Virginia Polytechnic Institute and State University, 1990.

implicitly tax exports, reduce the cost of imports, and keep food prices low.

The above discussion of government policies indicates that tobacco production in the Dominican Republic has been subject to diverse forms of government intervention, particularly with respect to the exchange rate. Measures of the degree of these interventions and their effects are presented below. While tobacco is not the only commodity affected by government intervention in the Dominican Republic, it provides an excellent example of how policies can interact in a countervailing yet discriminatory fashion to reduce production incentives.

## Methods

The degree of government intervention was measured by calculating the nominal rate of protection (NRP) and effective rate of protection (ERP) for Dominican tobacco. The NRP measures the degree of direct price intervention by establishing the difference between domestic and border prices. Three types of NRP's are reported. One, the direct nominal rate of protection, measures the difference between the domestic and border price evaluated at the official exchange rate. The second, the total nominal rate of protection, measures the combined effect of price policy and exchange rate distortions. The third, the input-subsidy-adjusted NRP, nets out the effect of input subsidies on the first two NRP's. In addition, the direct and total nominal rates of protection for tobacco relative to corn are presented.

The ERP includes the effects of distortionary policies for both tradable outputs and inputs by calculating the difference between value-added at the domestic price (including market distortions) and value-added at the border price (excluding market interventions). In other words, the ERP is another method for taking into account the effects of protective measures on both traded outputs and inputs (Henneberry and Henneberry).

Several previous studies have calculated NRPs and ERPs. A summary of a World Bank study for a variety of commodities and countries is provided in Krueger, Schiff, and Valdes. Greene and Roe, as a part of the World Bank study,

calculated NRPs and ERPs for sugar, rice, and coffee in the Dominican Republic. The current study follows their procedures rather closely to permit policy makers in that country to make comparisons across commodities.

The first step in measuring the NRP of the domestic tobacco price was to convert the prices into equivalent product units at the same stage in the marketing chain. Because the study was primarily concerned with supply, the farm-gate stage was used. The NRP was calculated on a percentage basis, first at the official exchange rate, second after adjusting for the exchange rate distortion, and third after netting out input subsidies.<sup>3</sup>

The NRP evaluated at the official exchange rate is  $(PPRT-BPRT)/BPRT$ , where  $PPRT$  = the farmgate price of raw tobacco in DR\$/MT and  $BPRT$  is the estimated cost-adjusted border price of raw tobacco evaluated at the official exchange rate. Appendix 1 provides details on calculating NRP. Calculating the NRP at the undistorted equilibrium exchange rate ( $E^*$ ) involved substituting that exchange rate for the official rate in the calculations. For this study,  $E^*$  was obtained from Green and Roe for the period 1966 - 1984. The method described in their report and summarized in Appendix 1 was used to calculate  $E^*$  for 1985 - 1988.<sup>4</sup>

The ERP was calculated assuming that the fertilizer tax or subsidy was the major traded-input price distortion.<sup>5</sup> In order to calculate the ERP for raw tobacco, the distorted value added in tobacco production was determined using the producer price of raw tobacco and the domestic price of fertilizer. The undistorted value added in tobacco production was determined by using the border price of raw tobacco and the import price of fertilizer, both evaluated at the equilibrium foreign exchange rate. The difference between the distorted and the undistorted value added divided by the undistorted value added provides the measure of the ERP. (See Appendix 1 for details.)

Once the degrees of tobacco price distortions were calculated using these measures, the effects of the government interventions on tobacco production were assessed using the results of an econometrically estimated tobacco supply function.

Observed annual tobacco production was compared to the estimated output that would have prevailed had producer prices been at their equivalent non-distorted prices.

The estimated supply function is shown below and includes the quantity of raw tobacco regressed on the expected prices of tobacco and corn, fertilizer price, and a time trend. Corn is a substitute in production for tobacco in the Dominican Republic, fertilizer is the most important purchased input, and the time trend accounts for technical change.

$$\begin{aligned} QPRT_t = & 37.84 + 1.15PPRT_{t-1} - \\ & (2.78) \quad (3.87) \\ & 5.78PPC_{t-1} - 4.03PPFT_t \\ & (-2.01) \quad (-2.11) \\ & + 0.63T_t \\ & (2.08) \end{aligned}$$

$$R^2 = .49 \quad d.w. = 1.57 \quad (\text{Numbers in parentheses are t-ratios})$$

where:

$QPRT_t$	=	quantity of raw tobacco produced
$PPRT_{t-1}$	=	producer price of raw tobacco divided by a price index of non-agricultural goods, lagged one year
$PPC_{t-1}$	=	producer price of corn divided by a price index of non-agricultural goods, lagged one year
$PPFT_t$	=	producer price of fertilizer divided by the producer price index for agricultural inputs
$T_t$	=	time trend

The above equation was estimated using OLS with data from 1966 to 1990. The coefficients on the

explanatory variables have the expected signs and are statistically significant at the 5 percent level.<sup>6</sup> The coefficients of this model were used to estimate the effects of the policy distortions on production. The low  $R^2$  may reflect, in part, weather variability. It also may be due to omitted variables on prices of other inputs, for example, pesticides. These omitted prices may be biasing the fertilizer price coefficient, the implications of which are discussed below.

### Nominal and Effective Protection Rates

The direct and total nominal rates of protection and the effective rate of protection are shown in Table 3. The direct effects of output price intervention are illustrated in column 1 and indicate that tobacco production was subsidized 23.1 percent on average from 1966 to 1988. The total NRP when the exchange rate policy is considered is shown in column 2. The official exchange rate was overvalued each year and when this implicit tax is accounted for, the total NRP implies that tobacco was taxed 9.2 percent on average.

When the explicit input subsidies (donations) are considered as well, the direct NRP increases from 23.1 percent on average to 31.7 percent (column 3) and the total NRP is reduced to an average tax of 4.6 percent. Thus input subsidies by the Dominican government partly offset the net taxation resulting from the exchange rate policy.

The ERP is reported in column 7. Comparing the results in column 7 with those in column 2 indicates that the effect of the fertilizer tax or subsidy was relatively small. On average, the explicit fertilizer price was 16 percent higher than the border prices (column 5). However, when the fertilizer price was evaluated at the equilibrium exchange rate, fertilizer was subsidized an average of 8 percent (column 6). The difference between the ERP and the NRP evaluated at the equilibrium exchange rate was small because fertilizer was a relatively small component of total production costs. Because fertilizer and other input prices are likely to have been positively correlated, the omitted variable problem mentioned above implies that even this difference between ERP and NRP is likely to be overestimated.

**Table 3.** Nominal and Effective Protection Rates for Tobacco in the Dominican Republic, 1966-1988 (Percent)

Year	<i>NPRT</i> (1)	<i>NPRT*</i> (2)	<i>NPRTS</i> (3)	<i>NPRTS*</i> (4)	<i>NPRF</i> (5)	<i>NPRF*</i> (6)	<i>ERPT</i> (7)
1966	24.9	-15.9	58.3	-2.1	7.3	-21.7	-15.7
1967	-15.9	-40.6	-3.0	-34.5	6.2	-20.7	-41.4
1968	43.1	.1	64.6	10.2	18.2	-12.5	.6
1969	7.9	-24.7	17.0	-20.4	20.9	-10.4	-25.2
1970	13.8	-20.3	17.0	-16.3	39.1	3.0	-20.9
1971	13.5	-20.9	22.0	-17.9	16.2	-15.2	-21.2
1972	10.8	-14.3	20.1	-10.8	16.1	-7.1	-14.5
1973	46.2	12.3	52.5	15.9	9.9	-12.1	12.9
1974	60.3	26.2	68.4	31.2	23.8	2.4	27.1
1975	61.7	40.1	79.2	52.9	64.3	46.7	39.9
1976	49.9	21.0	55.7	24.6	-1.1	-16.9	22.2
1977	25.9	3.3	33.2	8.2	9.5	-7.2	3.5
1978	-6.1	-31.6	.1	-28.3	18.8	-7.9	-32.0
1979	33.2	-4.5	35.8	-3.1	14.9	-11.6	-4.3
1980	13.9	-19.7	16.6	-18.4	22.4	-8.7	-20.1
1981	9.3	-20.1	15.7	-16.7	34.6	4.4	-20.7
1982	40.5	-15.2	41.6	-14.8	44.8	-3.4	-15.9
1983	34.9	-28.8	50.3	-24.7	11.8	-33.1	-28.6
1984	38.4	-41.9	47.5	-40.4	-32.4	-35.1	-42.2
1985	-20.9	-22.1	-17.3	-18.7	-7.4	-8.6	-22.8
1986	38.7	28.8	42.2	31.8	12.4	5.8	29.8
1987	-7.8	-31.5	-5.1	-30.0	17.1	-9.4	-32.3
1988	14.6	9.1	16.4	10.8	-9.2	-12.8	9.9
Average	23.1	-9.2	31.7	-4.6	15.6	8.4	-9.2
Std. Dev.	21.2	22.9	23.4	24.2	19.4	23.3	23.4

- (1) *NPRT* = direct nominal protection rate for tobacco (reflects output tax or subsidy at the official exchange rate)
- (2) *NPRT\** = total nominal protection rate for tobacco = (1) evaluated at equilibrium exchange rate
- (3) *NPRTS* = direct nominal protection rate for tobacco when government input subsidies are included
- (4) *NPRTS\** = total nominal protection rate for tobacco when government input subsidies are included
- (5) *NPRF* = percent difference between domestic and border fertilizer price at the official exchange rate
- (6) *NPRT\** = percent difference between domestic and border fertilizer price at the equilibrium exchange rate
- (7) *ERPT* = effective rate of protection for raw tobacco

The volatility of direct and indirect support to tobacco is also evident in Table 3. There was a tendency for negative support in the late sixties and early seventies, positive support in the mid-1970s, and negative support in the 1980s. Support was particularly negative in 1967 when output price supports, input subsidies, and exchange rate effects were each negative, causing production to drop in 1968.

### **Output and Foreign Exchange Effects**

The direct and total output effects of government policy interventions on tobacco production are shown in Table 4. These effects were generated using the estimated tobacco supply function presented above. The observed annual tobacco output (column 1) is compared first with the estimated output that would have prevailed if actual producer prices for tobacco had been equal to equivalent border prices, evaluated at the official exchange rates (column 2) and at the equilibrium foreign exchange rates (column 4). The results indicate that the direct government output price subsidy for tobacco increased tobacco output an average of 16.9 percent during the time period when evaluated at the official exchange. However, the results indicate that if the equilibrium exchange rate had prevailed, tobacco output would have been 12.2 percent higher than it was, even without the direct output subsidy.

The effects of government input subsidies as well as the output interventions are illustrated in column 6 for the official exchange rate and column 8 for the equilibrium exchange rate. The results indicate that tobacco output was 29.6 percent higher with the combined output and input subsidies than it would have been without them, evaluated at the official exchange rate. However, if the equilibrium exchange rate had prevailed, tobacco output would have been 4.8 percent higher than it was, even without the direct output and input subsidies. In summary, the direct output and input subsidies increased tobacco production, but when the effects of the overvalued exchange rate are considered, tobacco output was 4.8 percent less than it would have been had there been no output or input interventions or exchange rate manipulation.

Because corn is a production substitute for tobacco, an additional set of calculations was completed to examine the implications of freeing up both the corn and tobacco markets (Table 5). The results indicated that at the official exchange rate the net effects of subsidies to both tobacco and corn reduced tobacco production by 16.6 percent because the corn subsidy was greater than the tobacco subsidy. Had the equilibrium exchange rate prevailed, tobacco production still would have been 9.3 percent less. If tobacco input subsidies are also considered, production would have been 8.6 percent less at the official exchange rate but 1.6 percent less on average at the equilibrium exchange rate. However, this average is dominated by a large increase that would have occurred in 1975. In fact, for the period 1966-1988, direct and indirect government intervention on tobacco and corn had the net effect of reducing tobacco output in 16 of those years. In summary, the tobacco output effects of removing direct and indirect government intervention were to reduce tobacco production but the effects were less if protection was removed from corn in addition to tobacco.

The net effect of all tobacco output price intervention, tobacco input subsidies, and exchange rate effects was to reduce foreign exchange earnings from tobacco exports by roughly U.S. \$600,000 per year (2.4 percent) over the time period assuming no influence of Dominican tobacco on world market price. If all explicit and implicit government subsidies and taxes were removed from tobacco production, government revenues would have been reduced an average of DR \$18 million per year in 1985 DR\$ (5.8 million US\$) (See Peña for additional details).

### **Conclusions and Implications**

Analysis of the effects of government policy interventions on tobacco production indicates that the direct effects of these policies subsidized tobacco. However, the policy of overvaluing the exchange rate resulted in a net tax on tobacco, an exported crop, and a net subsidy on corn, an imported commodity. Tobacco production and foreign exchange earnings were reduced, but government revenues were increased, by these policies.



**Table 4.** Output Effects of Government Interventions on Tobacco Production in the Dominican Republic, 1966-1988

Year	<i>QPRT</i> 1000 MT (1)	<i>QPD</i> 1000 MT (2)	<i>Q1</i> %Δ (3)	<i>QPTT</i> 1000 MT (4)	<i>Q2</i> %Δ (5)	<i>QPDTS</i> 1000 MT (6)	<i>Q3</i> %Δ (7)	<i>QPTTS</i> 1000 MT (8)	<i>Q4</i> %Δ (9)
1966	18.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1967	18.8	12.6	33.0	22.4	-19.1	7.2	61.7	17.4	7.4
1968	14.9	20.7	-38.9	32.7	-119.5	15.7	-5.4	28.0	-87.9
1969	24.9	9.2	63.1	21.1	15.3	4.6	81.5	16.8	32.5
1970	26.1	23.5	10.0	35.1	-34.5	20.8	20.3	32.7	-16.9
1971	30.2	25.3	16.2	37.3	-23.5	22.9	24.2	35.1	-16.2
1972	34.1	28.3	17.0	43.1	-26.4	26.0	23.8	41.0	-20.2
1973	43.9	39.0	11.2	44.7	-1.8	36.7	16.4	42.7	2.7
1974	40.6	31.3	22.9	32.2	20.7	22.2	45.3	30.8	24.1
1975	18.7	3.9	79.1	8.7	53.5	2.8	85.0	7.6	59.4
1976	45.4	28.5	37.2	31.5	30.6	25.8	43.2	28.9	36.3
1977	38.1	25.0	34.4	28.8	24.4	22.7	40.4	27.8	27.0
1978	56.1	46.9	16.4	52.5	6.4	44.9	20.0	50.7	9.6
1979	45.4	47.0	-3.5	54.2	-19.3	45.4	0.0	52.7	-16.1
1980	45.6	38.2	16.2	45.1	1.1	37.8	17.1	44.7	2.0
1981	39.2	35.1	10.5	44.1	-12.5	34.6	11.7	42.5	-11.0
1982	29.4	27.0	8.2	34.1	-16.0	25.1	14.6	32.7	-11.2
1983	29.1	20.0	31.3	32.0	-10.0	20.0	31.3	31.8	-9.3
1984	21.4	14.2	33.6	29.9	-39.7	12.1	78.8	27.9	-30.4
1985	26.6	19.3	27.4	42.8	-60.9	18.1	32.0	42.6	-60.2
1986	21.2	27.2	-28.3	27.5	-29.7	25.9	-22.2	26.4	-24.5
1987	28.5	20.2	29.1	18.3	35.8	17.7	37.9	17.7	37.9
1988	28.9	44.5	-54.0	41.3	-42.9	30.5	-5.5	40.4	-39.8
Average	32.4	26.7	16.9	34.5	-12.2	23.6	29.6	32.7	-4.8

(1) *QPRT* = quantity of raw tobacco actually produced(2) *QPD* = quantity that would have been produced without direct output price intervention at the official exchange rate(3) *Q1* = percentage change in output resulting from direct price effects at the official exchange rate(4) *QPTT* = quantity that would have been produced without output price intervention at the equilibrium exchange rate(5) *Q2* = percentage change in output resulting from output price and exchange rate interventions(6) *QPDTS* = quantity that would have been produced without direct output price intervention or input subsidies at the official exchange rate(7) *Q3* = percentage change resulting from total policy effects at the official exchange rate(8) *QPTTS* = quantity that would have been produced without direct output price interventions or input subsidies at the equilibrium exchange rate(9) *Q4* = percentage change resulting from total policy effects at the equilibrium exchange rate

**Table 5.** Tobacco Output Effects of Government Interventions on Tobacco and Corn in the Republic, 1966-1988

Year	<i>QPRT</i> 1000MT (1)	<i>QPDC</i> 1000MT (2)	<i>Q5</i> %Δ (3)	<i>QPTC</i> 1000 MT (4)	<i>Q6</i> %Δ (5)	<i>QPDCS</i> 1000 MT (6)	<i>Q7</i> %Δ (7)	<i>QPTCS</i> 1000 MT (8)	<i>Q8</i> %Δ (9)
1966	18.40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1967	18.80	23.66	-20.54	19.61	-4.13	18.28	2.84	14.59	28.85
1968	14.90	37.56	-60.33	35.39	-57.89	32.55	-54.22	30.83	-51.67
1969	24.80	31.66	-21.35	31.04	-20.10	27.04	-7.91	27.07	-8.38
1970	26.10	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1971	30.20	43.48	-30.54	42.97	-29.71	41.10	-26.52	-40.71	-25.81
1972	34.10	43.74	-22.03	48.02	-28.98	41.40	-17.63	45.84	-25.61
1973	43.90	68.69	-36.08	67.08	-34.55	66.40	-33.88	65.09	32.55
1974	40.60	57.14	-28.94	48.53	-16.34	48.06	-15.52	47.10	13.80
1975	18.70	8.68	115.43	6.14	204.56	7.51	149.00	5.04	271.30
1976	45.40	41.77	8.69	38.50	17.92	39.09	16.14	35.92	26.39
1977	38.10	29.80	27.85	27.57	38.19	27.56	38.24	26.57	43.39
1978	56.10	67.17	-16.48	64.80	-13.42	65.24	-14.00	62.95	10.88
1979	45.40	62.34	-27.17	59.89	-24.19	60.73	-25.24	58.40	-22.26
1980	45.60	58.00	-21.37	54.73	-16.68	57.58	-20.80	54.32	-16.05
1981	39.20	54.60	-28.20	54.25	-28.09	54.07	-27.50	53.91	-27.28
1982	29.40	39.25	-32.73	34.34	-14.38	37.85	-22.32	33.01	-10.93
1983	29.10	41.13	-29.24	37.37	-22.13	40.94	-28.92	37.19	-21.75
1984	21.40	27.33	-21.69	32.73	-34.61	25.24	-15.21	30.78	-30.47
1985	26.60	26.12	1.83	48.04	-44.21	24.96	6.57	47.93	-44.50
1986	21.20	43.93	-51.74	42.83	-50.50	42.65	-50.29	41.66	-49.11
1987	28.50	29.05	-1.89	21.64	31.70	26.52	7.46	21.02	35.63
1988	28.90	60.01	-52.34	56.93	-49.23	48.22	40.06	55.94	-48.33
Average	32.4	42.62	-16.62	41.54	-9.37	39.67	-8.56	39.80	-1.62

(1) *QPRT* = quantity of raw tobacco actually produced(2) *QPDC* = quantity that would have been produced without direct output price intervention at the official exchange rate(3) *Q5* = percentage change in output resulting from direct price effects at the official exchange rate(4) *QPTC* = quantity that would have been produced without output price intervention at the equilibrium exchange rate(5) *Q6* = percentage change in output resulting from output price and exchange rate interventions(6) *QPDCS* = quantity that would have been produced without direct output price intervention or input subsidies at the official exchange rate(7) *Q7* = percentage change resulting from total policy effects at the official exchange rate(8) *QPTCS* = quantity that would have been produced without direct output price interventions or input subsidies at the equilibrium exchange rate(9) *Q8* = percentage change resulting from total policy effects at the equilibrium exchange rate

Why did these policies prevail? Several reasons are likely. First, a tobacco export tax is one of the easiest taxes to administer. Second, overvaluation of the exchange rate may provide a short-term means of placing downward pressure on inflation because it discourages exports and encourages imports. Third, it is difficult for tobacco producers to judge if implicit economy-wide policies such as exchange rate manipulations more than offset the visible output price and input subsidy policies.

Fourth, and perhaps most important, the urban-industrial pressures for low-food price policies and for policies that give breaks to manufacturing industries were undoubtedly stronger than the pressures generated by the tobacco industry. There are likely to be several reasons for this. First, urban unrest resulting from high rice and corn prices can potentially bring down a government. Second, urban-industrial groups may have lower costs of gathering information and undertaking collective action than the agricultural community. Industrialists see overvalued exchange rates as a means of importing cheaper capital. Third, the tobacco industry itself is heterogeneous. Tobacco producers favor higher tobacco prices, while processors, and particularly exporters, prefer lower (farm-gate) tobacco prices.

Bates has argued that government interventions in markets facilitate the allocation of political rents. Resources can be transferred to supporters who control the marketing functions. Unfortunately, efforts to reduce these interventions therefore must overcome pressures from groups who benefit from the existing policies.

The effects of output and input price interventions in tobacco markets is to reduce

economic efficiency and growth.<sup>7</sup> Because tobacco is produced predominantly on small farms, the net taxation of tobacco farms also is likely to have had a regressive effect on income distribution.

U.S. tobacco producers have been affected relatively little by the price interventions influencing Dominican tobacco production. While Dominican tobacco exports to the United States have declined and Dominican tobacco competition in the European market has been reduced as well, the United States produces relatively little dark tobacco and Spain, the largest foreign market for Dominican dark tobacco, imports little dark tobacco from the United States.

The results of this study illustrate the effects of direct and indirect government policies on tobacco in the Dominican Republic. They add a chapter to the growing literature on effects of government intervention on the agricultural sector in that and in other developing countries. The results are consistent with those found by Greene and Roe for coffee, sugar, and rice. Both our studies illustrate that unless indirect policies such as exchange rates are considered, the policy conclusions that follow from an analysis of direct policy interventions alone can be grossly misleading.

A set of analyses such as those in this paper can be used by policy makers assessing economic and political tradeoffs. When combined with analyses of research policies and industrial policies, the opportunity costs of meeting societal objectives through particular policy mixes become more evident. Hence, policy decisions are more likely to reflect societal objectives, assuming that continued political power of decisionmakers depends, at least in part, on meeting those objectives.

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## Appendix 1. Methods for Calculating Nominal and Effective Rates of Protection

### The Nominal Rate of Protection (NRP)

#### Direct NRP

The following set of equations describes how the NRP is calculated at the official exchange rate:

- 1)  $QPPT = @QPRT$  or  $QPRT = QPPT/@$
- 2)  $@PPPT = PPRT + mT(d)$  or  $PPRT = @PPPT - mT(d)$
- 3)  $@MT(d) = mT(d)$
- 4)  $BPRT = @(Emto)BPPT - @MT(u)$
- 5)  $NPRT = [PPRT - BPRT]/BPRT$

where,

- |         |   |  |
|---------|---|--|
| $QPPT$  | = | Quantity of processed tobacco produced.  |
| $QPRT$  | = | Quantity of raw tobacco produced.  |
| $@$     | = | The conversion ratio of tobacco in its raw form to its export processed form.  |
| $PPPT$  | = | The domestic farm-gate price in DR\$/MT of tobacco in its export processed form (the producer price of processed tobacco).     |
| $PPRT$  | = | The domestic farm-gate price in DR\$/MT of tobacco in its farm-gate raw form (the producer price of raw tobacco).              |
| $mT(d)$ | = | The observed domestic marketing margin between farm-gate and the exporter for tobacco in DR\$/MT of the farm-gate raw tobacco. |
| $MT(d)$ | = | The observed domestic marketing margin between farm-gate and exporter for tobacco in DR\$/MT of the export processed tobacco.  |

<i>BPRT</i>	=	The estimated cost-adjusted border price (DR\$/MT) of raw tobacco evaluated at the official foreign exchange rate.
<i>BPPT</i>	=	Border price of processed tobacco (f.o.b.) in US\$/MT.
<i>E<sub>mt</sub></i>	=	The estimated official foreign exchange rate.
<i>MT(u)</i>	=	The efficient domestic margin between the farm-gate and the exporter buyer for tobacco in DR\$/MT of processed tobacco.
<i>NPRT</i>	=	The nominal producer protection rate of raw tobacco evaluated at the farm-gate and at the official foreign exchange rate.

### *Total NRP*

The following equations describe how the NRP is calculated at the equilibrium exchange rate:

$$6) \quad BPRT^* = E^*BPRT$$

$$7) \quad NPRT^* = [PPRT - BPRT^*]/BPRT^*$$

where,

*E\** = The undistorted equilibrium foreign exchange rate for tobacco in DR\$/US\$.

*BPRT\** = The estimated cost-adjusted border price (DR\$/MT) of raw tobacco evaluated at the equilibrium foreign exchange rate.

*NPRT\** = The nominal producer protection rate of raw tobacco evaluated at the farm-gate and at the equilibrium foreign exchange rate.

To use equation 7 to calculate the total nominal producer protection rate for raw tobacco, the equilibrium foreign exchange rate (*E\**) is needed. The procedure used for calculating *E\** followed Greene and Roe:

$E^* = (B/A)^{1/(e-n)}$  = estimated equilibrium foreign exchange rate,

*B* =  $QD/[E^*(1+TM)]^n$  = constant in the demand equation for foreign exchange,

*A* =  $QS/[E^*(1-TS)]^e$  = constant in the supply equation for foreign exchange,

*e* = supply elasticity for foreign exchange,

*n* = demand elasticity for foreign exchange,

*TM* = implicit import tariff rate,

*TS* = implicit export tax rate,

*QD* = demand for US\$ from the current account,

*QS* = supply of US\$ from the current account.

The effects of other factors that influence the excess supply and demand for goods and services are assumed to be captured through variables used to compute *A* and *B*. In summary, the annual equilibrium exchange rates were derived from the estimated supply and demand for U.S. dollars in the Dominican Republic as reflected by annual flows in the Dominican current account after removing the estimated value of trade restrictions.

### *Direct NRP for Tobacco Relative to Corn*

The direct nominal protection rate of tobacco relative to corn, the principal substitute in production for tobacco, is calculated as:

$$8) \quad RNPPTC = [(PPRT/PPC) - (BPPT/BPPC)]/(BPPT/BPPC) \text{ or } RNPPTC = RPPTC - RBPPTC/RBPPTC$$

where,

*RNPPTC* = Direct nominal producer protection rate for tobacco relative to corn.

$RPPTC$  = The producer price of tobacco relative to corn at the farm-gate.

$RBPTC$  = The border price of tobacco relative to corn evaluated at producer equivalent prices.

The direct nominal producer protection rate of tobacco relative to non-agricultural goods ( $RNPPT$ ), can also be calculated, according to following formula:

$$RNPPT = [RPPTPNA - RBPTPNA]/RBPTPNA$$

If  $BPPT^*$  represents the equivalent undistorted border price of tobacco evaluated at the equilibrium foreign exchange rate and  $BPNA^*$  the undistorted price of non-agricultural goods evaluated at the equilibrium foreign exchange rate, then the total nominal producer protection rate of tobacco relative to non-agricultural goods is:

$$9) \quad RNPPTPNA^* = [(PPRT/PNA) - BPPT^*/PNA^*]/(BPPT^*/PNA^*)$$

$$RNPPTPNA^* = RPPTPNA - RBPTPNA^*/RBPTPNA^*$$

where,

$PNA^*$  = Price of non-agricultural goods evaluated at the equilibrium exchange rate.

$RNPPTPNA^*$  = The total nominal producer protection rate of raw tobacco relative to PNA.

$RBPTPNA^*$  = The adjusted border price of tobacco relative to non-agricultural goods at producer prices.

The following transformation of equation 9 is used to calculate the total nominal protection rate of raw tobacco relative to corn:

$$10) \quad RNPPTC^* = [(PPRT/PPC) - (BPPT^*/BPPC^*)]/(BPPT^*/BPPC^*)$$

or

$$11) \quad RNPPTC^* = RPPTC - RBPTC^*/RBPTC^*$$

where,

$RNPPTC^*$  = Total nominal producer protection rate of tobacco relative to corn.

$BPPT^*$  = Undistorted border price of tobacco evaluated at the equilibrium foreign exchange rate.

$BPPC^*$  = Undistorted border price of corn evaluated at the equilibrium foreign exchange rate.

Data sources: INTABACO Statistics Bulletin, various years; National Budget Office; Central Bank; INTABACO Annual Report, various years.

## The Effective Rate of Protection

The effective rate of protection (ERP) is calculated from:

$$ERPT = [VaT(d) - VaT(u)]/VaT(u)$$

where,

$VaT(d)$  =  $PPRT - P_j(d)ajT$  = The prevailing or domestic value added for tobacco.

$VaT(u)$  =  $BPRT^* - P_j(u)ajT$  = The undistorted or border value added for tobacco.

$PPRT$  = Producer price of raw tobacco.

$BPRT^*$  = Border price of raw tobacco (DR\$/MT) evaluated at the equilibrium foreign exchange rate.

$P_j(.)$  = The price of fertilizer.

$ajT$  = The amount of fertilizer used to produce one unit of tobacco.

In order to calculate the effective rate of protection for raw tobacco (EPRRT\*) the distorted value added in tobacco production [VaT(d)] has to be determined, using the producer price of raw tobacco (PPRT) and the domestic price of fertilizer [Pj(d)]. To find VaT(u), the border price of raw tobacco evaluated at the equilibrium foreign exchange rate and the import price of fertilizer at the equilibrium exchange rate are used.

## Endnotes

1. Sugarcane and rice are the two crops that use chemical inputs most intensively. The input subsidy policy is not restricted to tobacco, and hence, the needs of these other commodities are likely to have influenced the decision to subsidize fertilizer and pesticides.
2. However, less than 1,000 hectares of tobacco was grown in the southern and eastern parts of the country prior to 1978, and hence, the prohibition had little effect on tobacco production.
3. A recent study by Pompelli and Pick also examined the pass-through of exchange rates and tariffs in Brazil to U.S. tobacco import prices. The Dominican Republic, however, is a smaller player than Brazil in the world tobacco market and it is likely that no pass-through of their policies occurs. Hence, that potential policy effect was not considered in this paper.
4. The literature on the primary determinants of the supply and demand for foreign currency, and hence, the equilibrium exchange rate, is quite extensive. Although there is no generally accepted consensus on the correct procedure to estimate equilibrium exchange rates, recent studies by Krueger, Shiff, and Valdes; Greene and Roe; and others have used procedures similar to ours. Krueger provides a review of exchange rate determination.
5. Data indicate that pesticides, especially fungicides, are other major subsidized inputs. However, reliable historical prices for these inputs do not exist.
6. The assumptions underlying the model (normality, homoskedasticity, linearity, and autocorrelation) were all tested. Based on the results of those tests, the supply function was judged to be statistically adequate.
7. Unfortunately, one policy affecting tobacco and other agricultural commodities in the Dominican Republic is absent from our study: research policy. Because policy decisions are made in a political economy context, public policymakers may attempt to meet their objectives through a combination of price policies, exchange rate policies, and research policies. Distortionary price and exchange rate interventions may make sense to a particular county if they are more cost effective instruments than research for meeting non-efficiency objectives. Hence, future policy research should focus on incorporating research policies as well as price and exchange rate policies in the analysis.