AN ANALYSIS OF POLICY ALTERNATIVES FOR THE U.S. BURLEY TOBACCO MARKET

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The U.S. burley tobacco industry faces an important crossroad in this decade. It appears that domestic disappearance of burley tobacco will continue to decrease and U.S. burley tobacco will continue to have stiff competition in foreign markets. The government can influence the U.S. tobacco market in the coming decade through its tobacco program. The alternatives available to government policy makers must be analyzed to help guide policy formulation.

The U.S. has been the leading exporter of burley tobacco since World War II, but in recent years the U.S. share of total world exports has been declining. For instance, the U.S. accounted for 42 percent of total world burley exports in 1965 and 28 percent in 1977 (USDA, *Foreign Agriculture*). Previous studies of the market for U.S. tobacco have focused on the U.S. domestic market and little attention has been paid to foreign markets (Mann; Sutton; Vernon, Rives, and Naylor). Price competition between U.S. and foreign tobaccos has not been considered in these studies. However, the low price of foreign tobaccos is the most commonly cited problem in the expansion of U.S. tobacco exports.[1]

The aim of this study is to analyze the structure of the U.S. burley tobacco market and assess some policy options available to the government. An econometric model is specified which explains domestic disappearance, exports, farm-level price, stocks, and net government purchases of burley tobacco. Policy options analyzed are (1) a 5 percent decrease in the burley quota, (2) a 5 percent increase in the burley quota along with a 5 percent decrease in the support price, and (3) a complete abandonment of the price support system.

THE BURLEY TOBACCO PROGRAM

The current burley tobacco program has two main features: the support system and the poundage quota. The tobacco program's objective is to stabilize producer prices and income while promoting a more orderly tobacco market. The government supports the price of burley tobacco through a nonrecourse loan program. Money for the price support system comes from the Commodity Credit Corporation. The price supports are based on an index of prices paid by producers.

The poundage quota is the major stabilizing force in the U.S. tobacco market. The poundage quota puts a ceiling on the quantity of burley tobacco a producer can market without penalty during a given year.[2] Therefore, at the quota, the supply curve of an individual farm is perfectly inelastic. The national quota for burley is determined by the U.S. Secretary of Agriculture after examination of stock levels, expected foreign demand, and expected domestic disappearance. Apportionment to individual farms is related directly to the announced national quota.

MODEL SPECIFICATION AND DATA

The model constructed for the study involves four behavioral equations and two identities. The four behavioral equations explain domestic disappearance, farm-level demand, export demand, and government purchases of burley tobacco. The two identities are a stock-flow identity and a farm-level marketing identity. The farm-level marketing identity states that all burley tobacco produced is marketed through manufacturers or through the government. Virtually no burley tobacco is stored on farms between marketing years. The structural relationships follow.

$$(1)\quad DIS = f(USPC, USPOP)$$

$$(2)\quad USP = f(DIS, BSTK, USX, RQN)$$

$$(3)\quad RQN = QN - GP$$

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[1]The price of most foreign burley tobaccos is one third to one half the price of U.S. burley. However, U.S. burley tobacco is of much higher quality than foreign burley tobaccos.

[2]In 1971 the burley tobacco program was changed from an acreage quota to a poundage quota. The acreage quota put a ceiling on the number of acres that could be planted in a given year.

(4) USX = f(USP, Y, POP, PGR, PIT)

(5) STK = BSTK + QN − USX − DIS

(6) GP = f(USP, PS, BSTK, QN)

where

DIS = domestic disappearance of burley (million pounds)
USPC = U.S. price of cigarettes (index 1967 = 100)
USPOP = U.S. population over 15 years of age (millions)
USP = U.S. price of burley (cents per pound)
BSTK = beginning stocks of burley (million pounds)
USX = U.S. exports of burley (million pounds)
RQN = quantity of burley sold to manufacturers (million pounds)
QN = quantity of burley produced in the U.S. (million pounds)
GP = net government purchases of burley (million pounds)
Y = world income (excluding the U.S., index 1969 = 100)
POP = foreign population (millions)
PGR = price of Greek burley (cents per pound)
PIT = price of Italian burley (cents per pound)
STK = end of period stocks of burley (million pounds)
PS = support price of burley (cents per pound).

Equation 1 explains domestic disappearance of burley tobacco. Disappearance is a function of the U.S. price of cigarettes and the population of the U.S. over 15 years of age. The price of cigarettes is important because essentially all burley tobacco is processed into cigarettes.

Equation 2 is a farm-level demand for burley tobacco with price as the dependent variable. This equation allows exports of U.S. burley to affect structurally the farm-level price. Because previous work (Rudd and Shuffett) has shown that there is no substitution effect between different types of tobacco, no other tobacco prices are included in equation 2. The quantity of burley sold to manufacturers can be viewed as the quantity of burley demanded in a free market. Equation 3 is an identity which assures that all burley tobacco not purchased by manufacturers goes into the support program.

The model endogenizes U.S. exports of burley tobacco through equation 4. Exports are a function of the U.S. price, world income, world population, and the price of Italian and Greek burley tobacco. Italy and Greece are the primary competitors of the U.S. in overseas markets for burley tobacco. Italy and Greece were, respectively, the second and fourth leading exporters of burley tobacco for the 1965-1977 period (USDA, *Foreign Agriculture*). Mexico was the third leading exporter during the 1965-1977 period, but most of Mexico's exports went to the U.S.

Equation 5 is a typical inventory identity. Equation 6 specifies net government purchases of burley as a function of the U.S. price of burley, the price support, beginning stocks, and the quantity produced. As the price support increases the government will have to buy more burley. If the price of burley is very high, little burley tobacco will be purchased by the government. The quantity of burley produced is included in the government purchase equation because regardless of the U.S. price or price support level, some burley will still be purchased by the government.

The six equations form a block-recursive system. Equations 2 through 6 form a simultaneous block which determine the U.S. price of burley, the quantity of burley sold to manufacturers, U.S. exports of burley, end of period stocks of burley, and net government purchases of burley. Equation 1, the recursive part of the system, explains domestic disappearance of burley. The price of burley tobacco is determined at the farm level in this model. The market for cigarettes is assumed exogenous to the burley market; the structure does not allow the price of burley to influence the price of cigarettes.

All burley price data were average grower prices in the respective country's currency. To capture the European Economic Community's Common Agricultural Policy the buyer's premium was subtracted from the Italian burley price. The Italian and Greek burley prices were transformed into dollars by using the respective exchange rates. World income (excluding the U.S.) was measured by an index of real per capita gross domestic product (GDP). This world income data series was calculated by transforming GDP figures of all countries into dollars and summing over countries.

Data on the U.S. price support for burley and the price of cigarettes were published in the USDA *Tobacco Situation.* World income and population figures came from the *Statistical Yearbook* of the United Nations. All foreign burley tobacco prices and the Italian buyer's premium were obtained from the USDA *Foreign Agricultural Circular.* Exchange rates came from the IMF *International Financial Statistics.* All other data were obtained from *Tobacco Stocks Report.* Observations were on an annual basis.

RESULTS

Ordinary least squares was used to estimate equation 1 and three-stage least squares was used to estimate the other three behavioral equations. All functional forms were linear. The observation period was from 1959 through 1976. The parameter estimates and their standard errors follow.

(7) DIS = −205 − 4.10 USPC +
(123) (0.69)
8.44 USPOP
(1.141)

(8) USP = 104 + 0.01 DIS − 0.04 BSTK +
(46) (0.10) (0.02)
0.72 USX − 0.04 RQN
(0.10) (0.01)

(9) USX = −210 − 1.23 USP − 4.46 Y +
(45) (0.47) (1.22)
0.23 POP + .62 PGR + .17 PIT
(0.05) (.26) (.21)

(10) GP = −382 − 4.80 USP + 3.04 PS +
(98) (0.96) (0.94)
0.07 BSTK + 0.74 QN
(0.05) (0.07)

Most coefficients are large in relation to their standard errors. All signs are consistent with economic theory with the exception of the coefficient for Y in equation 9. This unexpected sign could result from the data series used to measure world income. Both the price of U.S. burley tobacco and the price of Greek burley tobacco are found to explain a substantial amount of the variation in U.S. burley exports (equation 9). Table 1 shows actual and predicted values of all endogenous variables for the study period (1958-1976). Also included in Table 1 is the inequality coefficient developed by Theil (p. 32). This statistic was calculated by using changes in actual and predicted values. A value of 0.0 for the inequality coefficient indicates perfect forecasting and a value of 1.0 indicates perfect inequality between actual and predicted values.

The tobacco policy simulations were performed on the six-equation system for the study period. The first policy simulation, scenario 1, was a 5 percent decrease in the burley quota.[3] The second policy simulation, scenario 2, was a 5 percent increase in burley quota and a 5 percent decrease in the price support of burley tobacco. These two simulations were obtained by solving the block-recursive system for the derived reduced forms and

TABLE 1. ACTUAL AND PREDICTED VALUES OF THE ENDOGENOUS VARIABLES FOR THE MARKET FOR U.S. BURLEY TOBACCO, 1958-1976

Year	DIS		USP		RQN		USX		STK		GP	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
	million lbs.		¢/lbs.		million lbs.		million lbs.		million lbs.		million lbs.	
1958	483	499	66	65	513	529	35	33	1224	1211	- 47	- 63
1959	499	495	61	66	643	554	36	38	1191	1176	-141	- 52
1960	508	506	64	72	486	574	41	41	1127	1131	- 1	- 89
1961	525	518	67	70	635	594	45	50	1128	1145	- 55	- 14
1962	531	522	59	68	614	604	53	52	1228	1234	61	71
1963	514	527	58	62	584	603	57	54	1412	1397	171	152
1964	561	542	60	61	569	562	56	56	1416	1428	51	58
1965	550	535	67	65	641	560	57	51	1395	1402	- 55	26
1966	544	533	67	66	602	576	56	50	1381	1387	- 15	11
1967	545	535	72	68	496	570	53	50	1324	1332	45	- 29
1968	516	540	74	70	544	581	55	59	1317	1311	19	- 18
1969	507	528	70	68	477	544	58	61	1343	1336	114	47
1970	503	523	72	67	552	582	54	61	1346	1336	9	- 21
1971	515	526	80	75	609	565	55	72	1249	1236	-136	- 92
1972	534	525	79	86	641	597	76	64	1229	1240	- 51	- 7
1973	533	525	93	105	599	600	87	87	1071	1086	-138	-139
1974	519	520	114	90	741	708	68	84	1094	1093	-127	- 95
1975	510	500	106	102	606	645	92	93	1131	1126	33	- 7
1976	493	489	114	116	669	669	117	97	1200	1199	10	10
Theil's U		.57		.68		.58		.59		.09		.45

[3]Changes in the burley quota are assumed to change the quantity of burley produced in the U.S. by the same percentage. Therefore if the quota is decreased by 5 percent, QN decreases by 5 percent.

substituting the values of predetermined variables for each year along with the appropriate change in the quantity produced and price support. These simulations have a dynamic aspect because predicted ending stocks of burley are substituted into the next period as beginning stocks.

The third policy simulation was a complete abandonment of the price support system. The quota system was left intact. This policy simulation, scenario 3, was obtained by eliminating equations 3 and 6 from the system, thus dropping the price support of burley as a predetermined variable. The remaining four equations were then solved for the reduced form equations for each year. This policy simulation has the same type of dynamic element as in scenarios 1 and 2. The simulations for scenario 3 do not allow the support price to influence production of burley tobacco. Because the price support gives stability to the market, elimination of this program could influence all endogenous variables through the quantity of burley produced.

Table 2 shows the simulation results for the price of U.S. burley. Decreasing the burley quota by 5 percent, scenario 1, would cause a 4.9¢ per pound increase in the average price of U.S. burley for the 1958-1976 period. By the end of 1961, the government would have completely depleted its stocks because of the relatively high burley price. Therefore, equations 3 and 6 were eliminated for the 1962-1976 period for scenario 1. Scenario 2, increasing the burley quota by 5 percent and decreasing the price support by 5 percent would cause the average price of U.S. burley to decrease 4.9¢ per pound for the study period. This change translates into an 6.5 percent drop in the price. Producer revenue under scenario 1 would have been 1.4 percent higher during the observation period. Scenario 2 would have resulted in a decrease in revenue of 1.8 percent. The simulation results suggest that abandoning the price support system during the study period would have had no effect on the average price (scenario 3), but would have caused price variability to increase. The standard error of burley prices from scenario 3 is 3 percent larger than the standard error of the model's burley prices. For some years burley prices under scenario 3 differ as much as 10 percent from prices under the support system.

The results of the policy scenarios on U.S. burley exports are shown in Table 3. Because

TABLE 2. ESTIMATED EFFECTS OF THE THREE POLICY SCENARIOS ON THE U.S. PRICE OF BURLEY TOBACCO, 1958-76

Year	Actual	Predicted	Scenario 1	Scenario 2	Scenario 3
			- - - ¢/lb. - - -		
1958	66	65	58	57	59
1959	61	66	62	61	63
1960	64	72	67	65	68
1961	67	70	71	67	70
1962	59	68	69	65	66
1963	58	62	65	62	62
1964	60	61	67	61	63
1965	67	65	67	59	62
1966	67	66	69	61	65
1967	72	68	72	62	67
1968	74	70	77	65	71
1969	70	68	76	64	69
1970	72	67	83	70	76
1971	80	75	91	76	83
1972	79	86	88	74	80
1973	93	105	105	88	97
1974	114	90	115	96	106
1975	106	102	115	96	106
1976	114	116	119	100	110
Mean	75.9	75.9	80.8	71.0	75.9
Standard Error	17.4	15.6	18.8	13.4	16.1

TABLE 3. ESTIMATED EFFECTS OF THE THREE POLICY SCENARIOS ON U.S. BURLEY EXPORTS, 1958-76

Year	Actual	Predicted	Scenario 1	Scenario 2	Scenario 3
			- - - million lbs. - - -		
1958	35	33	33	34	32
1959	36	38	37	38	36
1960	41	41	41	44	41
1961	45	50	43	47	44
1962	53	52	42	47	46
1963	57	54	45	50	50
1964	56	56	50	58	55
1965	57	51	47	57	53
1966	56	50	50	61	56
1967	53	50	49	62	56
1968	55	59	53	67	60
1969	58	61	49	64	57
1970	54	61	57	73	65
1971	55	72	60	78	69
1972	76	64	54	72	64
1973	87	87	70	91	80
1974	68	84	82	104	92
1975	92	93	83	106	94
1976	117	97	92	116	104
Mean	60.6	60.7	54.6	66.8	60.7
Standard Error	19.7	17.8	15.8	22.8	19.2

U.S. burley exports are inversely related to U.S. price changes, scenario 1 would have decreased average U.S. exports by 6.1 million pounds per year or 10 percent over the 1958-1976 period. Scenario 2 would have increased U.S. burley exports by 6.1 million pounds per year. Eliminating the price support system would not have changed average burley exports, but the variability of exports would have increased by 8 percent.

Table 4 shows that U.S. burley stocks appear to be very sensitive to changes in tobacco policy. Yearly stocks would average 232 million pounds less under scenario 1 and 253 million pounds more under scenario 2. The ratio of stocks to production was 2.2 for 1958-1976 period. This ratio would fall to 1.9 under scenario 1 and would increase to 2.5 under scenario 2. Scenario 3 has no effect on U.S. burley stocks and consequently has no effect on the stocks-to-production ratio.

The government would have been completely out of the burley tobacco market by 1962 under scenario 1 (Table 5). Its entire inventory of burley would have been sold because of the high U.S. burley price. Under scenario 2 the government would have become much more involved in the U.S. burley market. Instead of being a net seller of 251 million pounds of burley tobacco over the study period, the government would have been a net purchaser of 855 million pounds.

IMPLICATIONS AND CONCLUSIONS

The study findings give policy makers information concerning the impacts of their policy decisions. The results suggest that the export market is not the panacea for the U.S. burley industry. Burley exports are responsive to the price of U.S. burley; however, if burley production is increased, exports will expand but not enough to offset revenue lost by the price decline. In fact, decreasing burley production will hurt U.S. exports but increase producer revenue.

The government should not increase the burley tobacco quota unless it is willing to store substantially more tobacco or drastically reduce the support price for burley. The government would have held more than 1 billion

TABLE 4. ESTIMATED EFFECTS ON THE THREE POLICY SCENARIOS ON U.S. BURLEY STOCKS, 1958-76

Year	Actual	Predicted	Scenario 1	Scenario 2	Scenario 3
			- - - million lbs. - - -		
1958	1224	1211	1190	1235	1213
1959	1191	1176	1140	1232	1187
1960	1127	1131	1056	1192	1127
1961	1128	1145	1046	1236	1144
1962	1228	1234	1123	1374	1250
1963	1412	1397	1268	1588	1426
1964	1416	1428	1263	1636	1446
1965	1395	1402	1236	1656	1441
1966	1381	1387	1209	1675	1436
1967	1324	1332	1137	1643	1383
1968	1317	1311	1076	1653	1341
1969	1343	1336	1059	1647	1344
1970	1346	1336	1012	1547	1315
1971	1249	1236	874	1560	1191
1972	1229	1240	854	1444	1190
1973	1071	1086	696	1469	1044
1974	1094	1093	677	1515	1044
1975	1131	1126	705	1624	1091
1976	1200	1199	773	1697	1180
Mean	1253	1253	1021	1506	1252
Standard Error	2.2	2.2	1.9	2.5	2.2

TABLE 5. ESTIMATED EFFECTS OF THE THREE POLICY SCENARIOS ON NET PURCHASES OF BURLEY TOBACCO BY THE U.S. GOVERNMENT, 1958-76

Year	Actual	Predicted	Scenario[a] 1	Scenario 2
		- - - million lbs. - - -		
1958	- 47	- 63	- 66	- 40
1959	-141	- 52	- 70	- 33
1960	- 1	- 89	-108	- 64
1961	- 55	- 14	- 62	- 4
1962	61	71	0	85
1963	171	152	0	176
1964	51	58	0	93
1965	- 55	26	0	83
1966	- 15	11	0	79
1967	45	- 29	0	46
1968	19	- 18	0	71
1969	114	47	0	64
1970	9	- 21	0	- 26
1971	-136	- 92	0	39
1972	- 51	- 7	0	37
1973	-138	-139	0	22
1974	-127	- 95	0	35
1975	33	- 7	0	107
1976	10	10	0	93

[a]Net purchases of burley tobacco by the U.S. government is zero for 1962-1976 because government stocks are depleted. For the years 1962-1976 the price support system is not used because of the high price for U.S. burley tobacco.

pounds of burley tobacco at the end of 1976 under scenario 2. This action would certainly be contrary to the government's policy of providing "orderly markets." With burley stocks at that level the government probably would never eliminate the inventory, even after several poor burley crops.

Only a small change in the burley tobacco quota enables the U.S. government to end its direct involvement in the burley tobacco market. It would have taken only four years in 1958 if the burley quota had been decreased by 5 percent.

The results suggest that the government must settle for increased price variability if the price support system is abandoned. However, the destabilizing price effects may not be as severe as one might initially think, because of the fact that stocks have such an important role in the burley market. One year's production usually accounts for less than one third of total supply (beginning stocks plus production). Therefore the large stocks tempered the effects of abnormally good (or poor) burley crops for the study period. However, never during the 1958-1976 period were there two or more consecutive good (or poor) crops. Burley stocks may temper the price effects of a single abnormal crop, but the price effects of consecutive good (or poor) years could be much more pronounced. These conclusions must also be qualified because of possible structural changes resulting from the abolition of the support system. Burley producers may tend to produce less if there is no support price guaranteed for their tobacco. These destabilizing price effects, which are not measured in this study, could be sustantial.

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