Pass-through of exchange rates and tariffs in Greek–US tobacco trade

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Abstract

The paper examines the extent to which exchange rate and unit tariff changes are passed-through in US import prices of unmanufactured Greek oriental tobacco. The results indicate partial pass-through of exchange rates and tariffs. Exchange rate pass-through is about 0.272 and tariff pass-through about 0.185. One possible reason for the partial pass-through is oligopoly in tobacco exporting. Oligopoly would imply that depreciation of the drachma relative to the US dollar benefits tobacco exporters operating in Greece. A second possible reason is a possible correlation between exchange rates premiums paid to tobacco exporters in previous agricultural policies. An important implication of this possible correlation is that Greek tobacco prices may be more sensitive to exchange rate changes under the current agricultural policy. ©1999 Elsevier Science B.V. All rights reserved.

1. Introduction

The United States is an important market for Greek oriental tobacco. Greek exports of oriental tobacco into the US averaged about 20% of the total Greek oriental tobacco exports for the period 1990–1995. Currently, Greek oriental exports into the US are about 24% of total the Greek oriental tobacco exports [1]. Oriental tobacco leaves are used by US cigarette manufacturers to blend with US and foreign non-oriental (flue-cured and burley) leaves and improve the flavor and aroma of the final product. Total oriental tobacco imports into the US averaged about 37.5% of total

tobacco imports for the period 1990–1995. During the same time period, total oriental tobacco use (or disappearance) averaged about 13.5% of total tobacco use by US cigarette manufacturers.

Although much attention has been given in the trade of flue-cured and burley tobacco products, oriental tobacco trade has been overlooked. In addition, much of the research in tobacco trade is focused on trade barriers and government intervention (Johnson and Norton, 1983; Sumner and Wohlgenant, 1985; Beghin and Chang, 1992; Zanias, 1993; Brown, 1995). There has been little research investigating the use of strategic trade policies and the relationship between exchange rate and tariff changes and the price of the imported tobaccos (Pompelli and Pick, 1990).

The purpose of this paper is to examine the extent to which permanent changes in exchange rates and tariffs are passed-through in US import prices of unmanufactured Greek oriental tobacco. Recent evidence from various studies suggests that the 'law of one price' (LOP) does not hold in many traded goods (Isard, 1977; Dun, 1978; Richardson, 1978;

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[1] For the period 1990–1995 average total Greek oriental exports to the world accounted for about 89,829 MT while Greek average exports of Oriental tobacco to the US accounted for about 17,970 MT. For the year 1995, Greek oriental exports to the US were 21,422 MT while total Greek exports of oriental tobacco to the world were about 90,000 MT.

Dornbusch, 1987; Jabara and Schwartz, 1987; Giovannini, 1988; Feenstra, 1989; Pompelli and Pick, 1990; Sexton et al., 1991). That is, exchange rate and tariff changes are less than fully passed-through in import prices. If this is the case, supply and demand shifts depicted in response to an exchange rate change may be different from those occurring under the LOP. As a result, conclusions about trade outcomes may be misleading if the LOP is assumed (Jabara and Schwartz, 1987). Since the US is an important market for Greek oriental tobacco, this information is particularly important to Greek tobacco grower organizations as well as to EU agricultural policy makers who must set quotas for Greek tobacco. Information on the effect of exchange rates on US prices for Greek tobacco would also be important to US cigarette manufacturers and to the international leaf merchants that trade in Greek oriental tobacco.

The LOP suggests that, in the absence of trade impediments, and under conditions of perfect competition, efficient arbitrage would ensure that homogeneous products when expressed in a common currency, would be uniformly priced, allowing for the existence of transportation cost. In other words, if two markets have separate currencies and the exchange rate varies, at least one of the two prices of any traded goods will have to shift to maintain the equality. The percentage change in the relationship between the two prices should equal the percentage change of the exchange rate. For example, when the LOP holds, a 10% change in the exchange rate can translate into 10% change in the importing country's price, all other things held constant (i.e., complete pass-through).

Significant departures from the LOP can be attributed to one or more of the following reasons (Sexton et al., 1991). First, the regions are not linked by arbitrage (i.e., they represent autarkic markets). Second, there is imperfect competition in one or more of the markets. Third, there are impediments to efficient arbitrage (i.e., government intervention, imperfect information, risk aversion). While the first of these reasons does not seem to apply to the case of Greek–US tobacco trade, the other two reasons, as discussed later, may apply.

This paper first discusses current and past government tobacco programs and reviews the literature concerning the LOP and then presents a model for examining the extent to which changes in exchange rates

and tariffs are passed through in US import prices of unmanufactured Greek oriental tobacco. Data, estimation of model coefficients, and results are presented. The results are presented with a discussion of possible sources and implications of any departure from the LOP.

2. Tobacco program

The tobacco program in Greece has undergone a series of changes. The first change occurred in 1981, when Greece joined the European Union (EU). The national tobacco program was abolished and the tobacco program of the common agricultural policy (CAP) was implemented. In 1992, there was a change of the CAP with a new set of policy measures regarding tobacco production and sales in the EU. With implementation of the CAP, the policy rules of the common market organization (CMO) were placed in effect for Greek tobacco. The principal support measure of the CMO was a system of premiums for purchasers, paid to buyers of EU-produced raw tobacco, designed to bring its price down to world levels and hence to provide an incentive to take all the Community's production. The premiums are calculated as the difference between 'norm prices' (equivalent to target prices) and the price of tobacco in a competing country. The 'norm prices' had to be paid to EU growers. In addition to the above price support system, a supply control system (i.e., the maximum guaranteed quantity, MGQ) was set in effect in 1988. One problem with the system was that same subsidy was set for all tobacco grades regardless of quality differences. This resulted in overprotection of low quality tobacco.

In 1992, new policy measures concerning tobacco production and sales in the EU were placed in effect. The European Council set a premium based on grade and variety of tobacco. This premium is paid directly to growers in addition to the market price. In order to receive the premiums, growers have to (a) grow tobacco in specific areas of production, specified by law for each type, (b) tobacco must meet certain specification for quality, and (c) growers must sign a cultivation contract with processing companies. The last condition is mandatory since it is the means to restrict total tobacco production to MGQ. No premium is available for any production over MGQ. In 1993,

the MGQ for Greece were 133,950 MT and they re-
duced to 126,700 MT for the period from 1994–1997.
In 1994, the market price of Greek tobacco was be-
tween 3.4 and 26.3% of the total price received by
growers (Papageorgiou, 1997).

Since this paper investigates the period from 1968
until 1995, a discussion of the national tobacco pro-
gram before Greece joined the EU is useful. The Greek
tobacco program had some similarities to the CAP
program, especially to the one in effect from 1970
until 1992. The national program was characterized
by supply control and intervention prices. Producers
were required to own permits to produce tobacco. To-
bacco had to be grown in specific areas of production,
specified by law for each type. Each year, before the
beginning of the marketing period, intervention prices
were known. Intervention prices differed by produc-
ing area, tobacco type and quality. Finally, domestic
cigarette manufacturing companies were required to
buy certain tobacco types for cigarettes produced for
domestic consumption. These tobacco types had low
demand in the foreign markets. However, they enjoyed
high market prices due to the artificially high domes-
tic demand.

3. Literature

There is a growing body of literature examining
the pass-through effects of exchange rates to import
prices. Dun, 1978 tested the pass-through effect of ex-
change rates on import prices of six Canadian markets
for traded goods and found that there was not any close
relationship between changes in the exchange rate and
changes in either relative prices or in Canadian prices.
He concluded that firms allow export profits to ab-
sorb the effects of exchange rate variations and that
such behavior can be explained by imperfect market
patterns. Isard, 1977 argued that many US manufac-
tured goods do not have near-perfect substitutes on the
lists of products manufactured abroad and for these
goods the LOP does not hold. Richardson, 1978 draws
conclusions from a regression study of disaggregated
commodity arbitrage between the US and Canada and
concluded that commodity arbitrage is never perfect.
Dornbusch, 1987 indicated that the extent of price ad-
justment to exchange rates depends on product substi-
tutability, the relative number of domestic and foreign

firms and market structure. Giovannini, 1988 studied
the Japanese and US markets and found that devia-
tions from the LOP are due to exchange rate surprises
but also to price staggering and price discrimination.

Jabara and Schwartz, 1987 examined commodity
price adjustments on exchange rate changes for five
agricultural commodities exported from the US to
Japan. The results support the 'ratchet' hypothesis.
In other words, an exchange rate increase was com-
pletely passed-through but not an exchange rate de-
cline. The present study does not examine the 'ratchet'
hypothesis because during the period under study
(1968–1995) the drachmas/dollar exchange rate ap-
preciated, on an annual basis, only five times. Zanias,
1993 investigated the degree of spatial market integra-
tion in EC agricultural product markets. The results
of his study showed that market integration has not
been achieved in a number of cases.

A series of recent studies by Goodwin, 1990 and
Goodwin et al., 1990a,b; Grennes and Wohlgenant
(1 and 2) provides support for a rational expecta-
tions view of the LOP. These argue that typical anal-
yses of the LOP, which assumes that parity holds
contemporaneously, overlooks temporal elements of
trade. They concluded that empirical results using an
expectations-augmented model produce greater sup-
port for the LOP than the same model using contem-
poraneous prices.

Feenstra, 1989 tested the effect of tariffs and ex-
change rates on US prices of Japanese cars, trucks
and motorcycles, under the assumption of imperfect
competition. The pass-through relation obtained in the
study varied across products, ranging from about 0.6
for trucks to unity for motorcycles. Pompelli and Pick,
1990 applied Feenstra's approach to the Brazilian–US
tobacco trade and examined the extent to which ex-
change rate and tariff changes are passed-through in
US import prices of unmanufactured tobacco from
Brazil. The results showed that exchange rate changes
do not appear to be passed through and tariff changes
only partially are passed through in import prices. This
is the only study in international tobacco trade con-
sidering the possibility of market imperfections and
testing the LOP.

The Brazilian–US tobacco trade modeled by Pom-
pelli and Pick, 1990 is predominately flue-cured
tobacco with some burley, but no oriental. The present
study complements the work of Pompelli and Pick,

1990 by modeling the Greek–US oriental tobacco trade to provide information on a different type of tobacco. In short, the model used in this paper considers the possibility of market imperfections and the statistical results present evidence that exchange rate and tariff changes are partially passed through in US import prices of unmanufactured Greek oriental tobacco.

4. The model

Consider a foreign or multinational firm operating in an imperfectly competitive industry (in Greece) that exports Greek oriental tobacco to the US The firm faces an import demand function $X(\text{Pm}, \text{Pd}, \text{Ps}, Y)$ where X represents quantity of Greek oriental tobacco; Pm is the import price of the Greek oriental tobacco and is denominated in US currency (i.e., US$/kg); Pd is price of the US grown tobacco in US currency (i.e., US$/lb); Ps is the import price of the substitute tobacco (Turkish oriental) imported into the US and is denominated in US currency (i.e., cents/kg); and Y represents US expenditures for tobacco products. The tobacco firm in Greece (foreign firm) exhibits a cost function $C(X, W)$, where W represents a vector of Greek input prices to the firm. Because of data constraints, W represents the price paid by the firm for oriental tobacco in Greece and it is denominated in Greek currency (i.e., drachmas/kg).

Assuming that the firm is operating in an imperfectly competitive industry, then it maximizes profit with respect to Pm as follows:

$$\text{Max}\left[q(\text{Pm} - T)X(\text{Pm}, \text{Pd}, \text{Ps}, Y) - C(X, W)\right] \quad (1)$$

where q is the drachmas/US$ exchange rate and T is the US unit tariff for the oriental tobacco in US currency (i.e., cents/lb). In the above specification it is assumed that the firm uses the US currency in announcing prices and in receiving payments. This is realistic because in the case of tobacco, international prices are denominated in US dollars.Assuming the cost function is homogeneous of degree one [i.e., $C(X, W) = f(X)W$], Eq. (1) can be written as follows:

$$q\,\text{Max}\left[(\text{Pm} - T)X(\text{Pm}, \text{Pd}, \text{Ps}, Y) - f(X)\frac{W}{q}\right] \quad (2)$$

The first order condition for Eq. (2) can be written as:

$$f'(X)\left(\frac{W}{q}\right) + T = \frac{\text{Pm}\,[1 - 1/\eta]}{R\,(\text{Pm}, \text{Pd}, \text{Ps}, Y)} \quad (3)$$

where $\eta = (-\partial X/\partial\text{Pm})(\text{Pm}/X)$ denotes the elasticity of demand, and $R\,(\text{Pm}, \text{Pd}, \text{Ps}, Y)$ represents marginal revenue. Eq. (3) implies that the marginal revenue of exporting one unit of Greek oriental tobacco to the US is equal to the marginal cost plus the unit tariff. Assuming that $f'(X)(\partial X/\partial\text{Pm})(W/q) - (\partial R/\partial\text{Pm}) \neq 0$, then Eq. (3) can be solved for the import price net from the unit tariff (i.e., $\text{Pmg} = \text{Pm} - T$). As a result, a general functional form for the Greek oriental import pricing equation can be obtained and is given below:

$$\text{Pmg} = g\left(\frac{W}{q}, \text{Pd}, \text{Ps}, Y, T\right). \quad (4)$$

Eq. (4) is homogeneous of degree one in its right-hand side arguments. That is, increasing all these arguments by the same proportion would increase the optimal import price (Pmg) by that proportion. Using a loglinear specification, Eq. (4) can be written as:

$$\text{Pmg}_t = \alpha + \beta_1 \ln\left(\frac{W_t}{q_t}\right) + \beta_2 \ln(Pd_t) + \beta_3 \ln(Ps_t)$$
$$+ \beta_4 \ln(Y_t) + \beta_5 \ln(T_t) + e_t \quad (5)$$

In contrast to Feenstra, 1989, who uses quarterly data, this study employs annual data. Consequently, all exchange rate adjustments are assumed to occur in the current period[2]. The error e_t in Eq. (5) reflects

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[2] In estimating Eq. (5) we also considered the effect of 'expected' exchange rate on the import price of Greek tobacco (Pmg). In specifying how the expected rate is determined, we supposed that the expected exchange rate is a log-linear function of the current and past rates (Feenstra, 1989). As a result the following general version of Eq. (5) was estimated (Feenstra, 1989):

$$\text{Pmg}_t = \alpha + \sum_{i=0}^{k}\beta_i \ln\left(\frac{W_t}{q_{t-1}}\right) + \beta_2 \ln(Pd_t) + \beta_3 \ln(Ps_t)$$
$$+ \beta_4 \ln(Y_t) + \beta_5 \ln(T_t) + e_t \quad (6)$$

where $\beta_i = \lambda_i\beta_i$ and $\sum_{i=0}^{k}\lambda_i = 1$ is assumed. Initially Eq. (6) was estimated with $k = 5$ and by performing a backwards elimination of the statistically insignificant lags the model given by Eq. (5) was supported by the statistical results. Consequently, it can be assumed that current exchange rate (i.e., $k = 0$) is the best predictor for expected exchange rate. In other words, all exchange rate adjustments occur in the current period (i.e., within the year).

the measurement error in the import price (Pmg). The error term is assumed lognormally distributed with an expected value of 0. In addition, e_t should be uncorrelated over time. The import price Eq. (5) could be tested for homogeneity of degree one by testing if $\beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 = 1$. Note that the homogeneity test is a check for the overall specification of the pricing equation, and is analogous to testing that a conventional demand system is homogeneous of degree zero in prices and income (Feenstra, 1989).

The coefficient β_1 in Eq. (5) is the 'pass-through' elasticity and gives the change in the import price due to a change in the foreign factor price (W) or the exchange rate (q). As shown in Feenstra, 1989, for a firm in an imperfectly competitive industry, β_1 is expected to be positive and less than 1. This is the 'normal' case where a change in the exchange rate (or foreign factor price) is less than fully pass-through in the import price. The 'unusual' case, however, of $\beta_1 > 1$ cannot be ruled out theoretically. Finally, the pass-through effect could be negative in the case where exporters' marginal costs decline as imports rise (Pompelli and Pick, 1990).

The domestic price coefficient β_2 is expected to be positive but not greater than 1. The substitute price coefficient β_3 is expected to be positive. The tobacco expenditure coefficient β_4, could be negative or positive (Deardorff and Stern, 1978; Feenstra, 1989; Pompelli and Pick, 1990). The unit tariff pass-through coefficient β_5 is expected to be positive and less than 1 and to follow the exchange rate pass-through effect, but is not restricted to equal the exchange rate coefficient (Pompelli and Pick, 1990). Feenstra's model restricts the tariff pass-through coefficient to equal the exchange rate coefficient but that model examines the effect of an ad valorem tariff on import prices.

5. Data

The data used in estimating the model are annual observations, covering the period from 1968 until 1995. The US import prices, in US$/kg, of unmanufactured Greek (Pgm) and Turkish (Ps) oriental tobaccos, were calculated using the quantity and value figures obtained by request from the US Department of Agriculture, Economic Research Service (USDA-ERS), 1995. The US import price of Turkish oriental tobacco is used as the representative substitute price because its quality is close to the Greek oriental tobacco. Note that the calculated import prices do not include the unit tariff on oriental tobacco imports.

The US tobacco price data series (Pd), in cents/lb, were calculated using the average prices and quantities of domestically produced flue-cured and burley tobaccos. Quantities were used as weights in obtaining an average price for domestic tobacco. All data related to domestic tobaccos (i.e., flue-cured and burley) were obtained from the US Department of Agriculture, Economic Research Service (USDA-ERS), 1995 issue of the Tobacco Situation and Outlook Report, (TBS-233).

Expenditures for tobacco products (Y), in million dollars, were obtained from the annual issues of US Department of Agriculture, Economic Research Service (USDA-ERS), 1995. The United States tariff rates (T) for oriental tobacco, in cents/lb, were obtained from the US International Trade Commission, 1968, US International Trade Commission, 1988. The Greek exchange rate (q, in drachmas/US$) was obtained from various issues of the International Financial Statistics, 1999 (various issues) (IMF). Finally, the input price (W), in drachmas/kg, represents the average price paid by buyers for oriental Greek tobacco and was obtained by request from the Greek Ministry of Agriculture, Department of Agricultural Policy and Documentation, Division of Agricultural Statistics.

6. Results and discussion

The tobacco import price Eq. (5) is estimated and is tested for homogeneity of degree one in import prices by performing the Wald, likelihood ratio (LR) and lagrange multiplier (LM) tests. All tests show that the homogeneity restriction cannot be rejected (Wald = 0.14 with P-value = 0.709; LR = 0.14 with P-value = 0.71; and LM = 0.14 with P-value = 0.7104). The results of the initial estimation indicated the presence of autocorrelation in the residuals. The Durbin–Watson statistic was 1.357, falling into the inconclusive range of first-order autocorrelation of the error term e_t. The Ljung-Box Q statistic, however, indicated that the null hypothesis of a white noise error term (e_t), could be rejected at any conventional level of significance. The P-value of the Ljung-Box

Table 1
Tobacco import price equation results with AR(2)

Variables	Parameter estimates	Standard error	P-values
Intercept	1.653	0.880	0.0743
pass-through (W/q)	0.272	0.103	0.0152
US tobacco price (Pd)	2.227	0.134	0.1054
Turkish price (Ps)	0.604	0.101	0.0001
Domestic expenditures (Y)	−2.290	0.080	0.0016
Tariff (T)	0.185	0.049	0.0012
ϕ_1	0.416	0.220	0.0732
ϕ_2	−0.319	0.222	0.1660
Durbin–Watson statistic	2.205		
Lung-box Q statistic (6 df)	10.72		0.098
Observations	28		
R^2	0.977		
Adjusted	0.971		

Q statistic was 0.001. With autocorrelated residuals the estimated coefficients still can be unbiased but not efficient. Furthermore, the standard errors of the initial estimation were biased and hypothesis tests based on these results would be invalid.

Other specifications with additional explanatory variables were examined to insure that the autocorrelation was not due to missing variables. However, none of the specifications improved the results. Visual inspection of the autocorrelation and partial autocorrelation functions of the residuals indicated that the series followed an AR(2) process. In other words, $e_t = \phi_1 e_{t-1} + \phi_2 e_{t-2} + u_t$.

Eq. (5) was re-estimated assuming an AR(2) process for the error term e_t. The estimated results of the restricted import price equation are presented in Table 1. The Durbin–Watson statistic at 2.2 indicates that there is not any evidence of first order autocorrelation in the error term, u_t. The Ljung-Box Q statistic shows that the null hypothesis of a white noise error term, u_t, cannot be rejected at the 5% level of significance. As indicated by the adjusted R^2 value of 0.97, the overall fit of the restricted import price equation (Table 1) is high. In addition, statistical tests show that the homogeneity restriction cannot be rejected (Wald = 0.35 with P-value = 0.55; LR = 0.37 with P-value = 0.54; and LM = 0.39 with P-value = 0.53). As a result, the statistical tests and especially the acceptance of the homogeneity constraint support the specification of the pricing Eq. (5) with an AR(2) process of the error term, e_t.

From Table 1, it can be seen that the exchange rate pass-through coefficient at 0.272 is significant at the 5% level. This result suggests that import prices of Greek oriental tobacco, only partially reflect changes in exchange rates or factor prices. The first possible reason that the pass-through coefficient is less than one is that tobacco companies exporting Greek tobacco may be oligopolistic. There is a relatively small number of tobacco processing companies which operate in Greece. The main business of these companies is to buy and process tobacco leaves from Greek farmers. There are less than 10 big and well-organized companies exporting tobacco leaves abroad. These companies buy tobacco either directly from the farmers or from the smaller tobacco processing companies. The most important companies are: Michailidis A. Kapnikiae, Seke AE, A.T.I.C AE, E.X.E.L.K.A, Gleoudis N. 'Kabex' AE, Dimon Hellas Kapniki, Missiran AE. It is worth noting that the three biggest multinational tobacco processing companies, Universal, Dimon and Standard Commercial either cooperate or own some of the above companies. Especially Universal is closely cooperating with Missiran AE and A.T.I.C AE (ICAP) while Dimon owns Dimon Hellas Kapniki and Standard Commercial controls Exelka via its subsidiary Swiss company Spierer Freres and CO SA. Finally, the most important buyers of Greek tobacco are Philip Morris Incorporated, Rothmans Manufacturing B.V, Reemtsma, R.J. Reynolds, House of Prince A/S, Orlik Tobacco Company A/S, British American Tobacco Com. Ltd.

If an oligopoly does exist then exporters of Greek tobacco may not fully pass savings from depreciation of the drachma (the case for most of the data series) or additional costs from appreciation of the drachma to their customers. For example, if the Greek drachma depreciates by 10% (or Greek input prices decrease by 10%) relative to the US dollar then the US dollar price of the Greek oriental tobacco will drop by 2.7%, all other things held constant. Firms operating in Greece will experience an increase in revenues once converted into drachmas. In addition, these firms may gain market share in the oriental tobacco market because of lower US dollar price of the Greek oriental. In the case of an appreciation of the Greek currency relative to the US dollar (or an increase in the Greek input price) the model predicts less than a proportional increase of the US dollar price of the Greek oriental. This result may be perceived as an attempt by the firm to forestall any decline in sales or market share. The share of Greek tobacco in the oriental tobacco market in the US during the period 1975–1980 averaged 11% while the average exchange rate of the period averaged about 37 drachmas/US$. During the period 1990–1995 the Greek share of oriental tobacco in the US market averaged about 19% while the average exchange rate was about 205 drachmas/US$. These circumstances are consistent with a situation of imperfect competition and with the findings of other studies of the world leaf tobacco trade (Feenstra, 1989; Pompelli and Pick, 1990; Sexton et al., 1991).

The second plausible reason for the partial pass-through of the exchange rate may be government intervention via the price support program in effect in Greece before 1992. From the discussion of tobacco program remember that tobacco companies were required to pay growers (in drachmas) a preset 'norm price' (equivalent to a target price). The price support mechanism for EU-produced tobacco paid the buyer of raw tobacco a premium (in drachmas) designed to reduce the effective purchase price of Greek tobacco to the world price. The premiums were calculated as the difference (in drachmas) between 'norm prices' and the prices of oriental tobacco in some competing country to the EU. If prices in the competing country were not correlated to the Greek–US exchange rate (q), then a change in q did not affect the premium the buyer was paid by the government. Consequently, the net price (target price less than the premium) that

buyers paid for Greek tobacco (in drachmas) was not affected by a change in q.

However, if the third country prices were correlated to q (e.g., the competing country tobacco prices rose in response to a strengthening of the US currency against both the Greek and competing country currencies [3]), then the pass-through of the changes in q may only be partial. In the case of third country prices and q increasing simultaneously, the premium paid to tobacco companies would have decreased, at least partially offsetting any savings to the tobacco company from a strengthening of the dollar. In the case of depreciation of the dollar, a positive correlation between q and third country prices would have increased the premium and possibly prevented the dollar price of Greek tobacco from falling as much as in the absence of the CAP. Thus, even if perfect competition existed among tobacco companies, a positive correlation between q and the premium could have partially or fully offset the effects of a change in q, preventing full, or possibly even partial, pass-through of exchange rate changes. With a positive correlation between the third country tobacco prices and q, Greek tobacco prices to US manufacturers would have been less volatile with respect to changes in the value of the dollar than in the absence of the CAP.

The situation is different for the period after 1992. Under new policy measures the 'norm price' was abolished. The European Council sets a premium that is paid directly to the growers in addition to the market price. Consequently, the Greek tobacco price could be more sensitive to exchange rate fluctuations after the 1992 policy than before because of the elimination of the 'norm prices'. This implies that Greek tobacco prices to US cigarette manufacturers may be more volatile now than in the past. However, the extent of pass-through of exchange rate changes still depends on the degree of competition in the tobacco marketing industry. Even so, the pass-through of exchange rates could be higher now than for the period before 1993. This is an empirical question that currently cannot be

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[3] A rise in the price of oriental tobacco in the competing country in response to appreciation of the US dollar is possible if the country's tobacco prices are free to respond to an increase in demand. Note that if the target price for Greek oriental tobacco was above the competitive equilibrium price (as was always the case), then the price paid to Greek tobacco farmers would not respond to changes in demand for Greek tobacco.

examined due to data limitations. An important consideration for EU policy makers when setting quotas is the potential increased pass-through and volatility of Greek tobacco prices.

The tariff pass-through coefficient at 0.185 is significant and suggests a partial pass-through effect of the US tariff on the import price of the Greek oriental tobacco. This result indicates that the 9.1% reduction of the oriental tariff in 1995 resulted in a 1.68% drop of the US$ price of the Greek oriental, all other things held constant. The small pass-through coefficient implies that greater part of the tariff is born by Greek firms than by US buyers. As discussed by Feenstra, 1989 a tariff pass-through effect that is less than 1 suggests that the importing country achieves a rise of the terms of trade from import protection.

The coefficient of US domestic tobacco price at 0.227 is not significant at the 5% level of significance. However, the *P*-value at 0.105 indicates that there may be a weak impact of the US domestic tobacco price on the import price. The reason for the weak cross price effect may be the limited substitutability between the oriental and US domestic tobaccos in the production process of cigarettes. Another reason may be the result of the tobacco program that maintains US domestic tobacco prices above world prices.

The coefficient of the Turkish tobacco import price, at 0.604 is significant and its magnitude indicates that the Greek oriental tobacco price is sensitive to the price changes of the Turkish tobacco. The reason may be the high degree of substitutability between Greek and Turkish tobaccos in the production process. Both tobaccos are used as flavoring agents.

The coefficient of US domestic tobacco expenditures is −0.29 and significant. The negative coefficient may suggest a demand shift from Greek oriental toward non-oriental foreign or US tobacco. As shown in Feenstra, 1989 and discussed in Deardorff and Stern, 1978 the relationship between import prices and US expenditures may be positive or negative.

The results of this work can be compared with those obtained by Pompelli and Pick, 1990 for Brazil–US tobacco trade. In their study, the exchange rate pass-through effect equals 0.145 and is statistically insignificant. The tariff pass-through effect equals 0.549 and is statistically significant. In addition, the coefficient of the US domestic tobacco price at −0.985 is statistically insignificant and the effect

of the substitute tobacco price (Italian tobacco) equals 0.208 and is statistically significant. Finally, the coefficient of the US tobacco expenditures equals 1.082 and is statistically significant. These findings support the results obtained in this study indicating a partial pass-through effect of exchange rates and tariffs. The finding of a smaller tariff pass-through coefficient and a larger exchange pass-through coefficient for Greek oriental tobacco may be due to differences between the Brazilian and Greek tobacco industries. First, there may be substantial differences between the flue-cured and oriental tobacco trades. Second, in contrast with Greece, the Brazilian government does not intervene in tobacco production and marketing at the farm level. A third possible reason is differences in trade policies. For example, Brazil levies substantial export taxes on tobacco. Differences in the market structure of tobacco exporting companies could also contribute to differences in pass-through coefficients.

7. Conclusions

This paper examines the extent to which exchange rate and unit tariff changes are passed-through in US import prices of unmanufactured Greek oriental tobacco. The results indicate that the exchange rate pass-through equals 0.272 and the tariff rate pass-through equals 0.185. The small tariff rate pass-through coefficient indicates that more of the tariff is born by Greek firms than by US buyers.

The results of this paper correspond with the findings provided by other studies showing partial pass-through of exchange rates and tariffs for agricultural goods (Jabara and Schwartz, 1987; Pompelli and Pick, 1990). Regarding the model, the acceptance of the homogeneity restriction supports the econometric specification used in this study and the magnitude of the R^2 statistic shows that the explanatory power of the model is high.

At least two plausible reasons are suggested for the partial pass-through of exchange rates and tariffs. First, tobacco companies that purchase and export Greek tobacco may be oligopolistic in their behavior. If this is the case, then continued depreciation of the drachma relative to the dollar will benefit tobacco exporters operating in Greece since savings due to exchange rate changes are not fully passed through.

Second, the previous agricultural policy of setting target prices at the farm level for Greek tobacco and then paying tobacco companies premiums to reduce their net price paid for Greek tobacco to the world price may also have prevented full pass-through of exchange rates. The policy effect will only have been a factor if the premiums were based on competing country prices that were correlated with Greek exchange rates for US currency.

If this correlation exists, then under the CAP changes in premiums would have partially offset gains from oligopolistic Greek tobacco exporters due to depreciation of the drachma. With the new EU agricultural policy, this may not be the case. Further, the Greek tobacco price could be more sensitive to exchange rate changes under the current EU agricultural policy than it was under the agricultural policy in effect prior to 1992. The possibility of increased sensitivity of Greek tobacco prices to the exchange rate for drachmas and US dollars is a factor that EU policy makers should consider when setting quotas and premiums for Greek tobacco. An important contribution to EU agricultural policy would be to further examine this issue once sufficient data is available.

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