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International Agricultural Trade
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DECLINING U.S. TOBACCO EXPORTS
TO AUSTRALIA: A DERIVED DEMAND
APPROACH TO COMPETITIVENESS

by

Fan Hu & John Beghin*

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*Beghin is at the OECD Development Centre and Hu at North Carolina State University.

Correspondence or requests for additional copies of this paper should be addressed to:

Dr. John Beghin
OECD Development Centre
94 Rue Chardon-Lagache
75016 Paris
FRANCE

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DECLINING U.S. TOBACCO EXPORTS TO AUSTRALIA
A DERIVED DEMAND APPROACH TO COMPETITIVENESS

John Beghin*
North Carolina State University
OECD Development Centre

Fan Hu
North Carolina State University

April 1994

Abstract: We investigate the loss of competitiveness of U.S. tobacco leaf exports in Australian cigarette manufacturing using industry-level time-series data. We account for relative prices, distorting policies, maturation of the cigarette market and scale, changing cigarette characteristics and market structure. We provide a decomposition analysis that reveals the relative impact of these factors over time on U.S. tobacco exports to Australia.

Key words: U.S. tobacco, export, competitiveness, Australia.

* The views expressed in the paper do not necessarily reflect the views of the OECD.

Declining U.S. Tobacco Exports to Australia.

A Derived Demand Approach to Competitiveness.

Tobacco has been an important export crop in the United States since colonial days and U.S. tobacco has been dominant on world markets since then. At the end of World War II the U.S. share of world exports of flue-cured tobacco was over 60 percent. Australia was the third largest export market for U.S. tobacco, which represented over three fourths of the annual leaf usage in the late 1950's (USDA-FAS). While the U.S. continues to play an important role in the world tobacco economy and remains the major exporter to Australia, its role has been changing. The Australian average share of imports originating in the United States declined from 63 percent of total imports in 1960-69 to 34 percent in 1987-1991. The actual average level of Australian imports of U.S. tobacco has fallen from 7,915 metric ton to 3,592 metric ton over the same period.

One popular explanation of this loss of competitiveness¹ of U.S. tobacco in the export market, not only in Australia but worldwide, is that this is due to the difference in leaf prices between the U.S. and other supplying countries (USDA-FAS), such as Malawi, and Brazil. These countries, of which some have export subsidy programs, export their tobacco at prices significantly below the price of U.S. leaf (Barford). Since World War II, the U.S price support program for tobacco has consistently kept the price of US tobacco above the price. of competing tobaccos (Johnson, Johnson and Norton) and has eroded the competitive advantage of American growers. Some studies argue that even though the U.S. produces a premium-quality leaf, the prices of U.S. leaf are still above the price of its competitors after adjusting for the quality

¹ Competitiveness is defined as the ability to profitably maintain market share in either domestic or export market (Agriculture Canada).

difference (Hicks et al.).

As pointed out by Abbott and Bredahl additional factors to prices determine the competitiveness of U.S. agricultural products. The decline of U.S. tobacco exports may have to do with some policies of importing countries and non-price effects (scale, changing product characteristics, technical change). In Australia, domestic cigarette manufacturers must meet a domestic physical content requirement on their leaf use. The minimum domestic leaf content required by law is 50 percent of the total leaf use while cigarette manufacturers have agreed "voluntarily" to use 57 percent². Compliance is achieved via a substantial tariff penalty on imported tobacco in case of violation. A lower concessionary tariff is imposed on all imported tobacco independently of the content requirement being satisfied or not. The government also sponsors and mediates annual marketing negotiations between leaf growers organized in a state-sponsored cartel and the association of the three Australian cigarette manufacturers. Details of Australian government restrictions can be found in Industries Assistance Commission (1982, 1987). A recent investigation of these policies found evidence of trade flows being altered by the domestic content requirement but not by the tobacco market structure (Beghin and Lovell).

Non-price factors may also explain declining agricultural exports. Changes in cigarette characteristics may be one of such factors. Consumption has evolved away from non-filtered cigarettes with high nicotine content towards filtered cigarettes containing much less tobacco than thirty years ago. In the case of U.S. tobacco use is the decrease just induced by prices or is this global trend towards lighter cigarettes affecting the derived demand for U.S. tobacco beyond price

² It is not clear which one of the two requirements is enforced by Australian customs which monitor compliance of tobacco imports with the domestic content ratio (see Industries Assistance Commission).

effects ?

Scale effects represent another potential source of additional changes in U.S. tobacco exports to Australia. Australian cigarette production almost doubled between 1960 and 1980, but has been on a slightly downward trend since the early 1980's indicating the maturation of that cigarette market. To know the effect of that maturation on tobacco derived demand information on the scale elasticity is necessary. In sum, what are the implications of these additional factors for U.S. tobacco use in Australian cigarette manufacturing?

This paper investigates U.S. tobacco competitiveness in Australian cigarette manufacturing from a derived demand perspective with two objectives. The first one is to further investigate the derived demand structure for U.S. tobacco in Australia accounting for potential scale effects and changes in cigarette characteristics not considered by Beghin and Lovell. We test their maintained assumption of constant return to scale and incorporate variables directly measuring product characteristics into their specification. The second and main objective is to use the estimated demand parameters to analyze the decline in U.S. exports to Australia due to effects of relative prices (tobacco and others), policies, scale, and final product characteristics. The relative importance of different factors affecting the decline in exports is estimated through a decomposition analysis following the approach of Heien and Wessells. The latter authors show how demand structure varies over time due to changes in underlying determinants.

There has been some reticence among agricultural economists to tackle competitiveness issues because of a perceived conceptual weakness of the case-study approach often used or invoked with competitiveness, and to some extent by concern that the profession is ill-equipped to analyze these issues. Contrary to this notion we argue that the usual tools and concepts available to the applied economist namely derived demand analysis and econometric estimation

based on industry-level time series data, can be used successfully to derive intelligible and important implications about competitiveness. This paper is certainly not the ultimate approach to competitiveness issues but it unambiguously heralds the useful contribution of "traditional" applied economic analysis.

The paper is organized as follows: The second section reviews previous research on tobacco demand in Australia. The third one describes the model of U.S. tobacco exports to Australia and the decomposition analysis. Estimation and decomposition results follow. Concluding remarks end the paper.

2. Previous Studies of Australian Tobacco Demand

The Australian Industries Assistance Commission (1987) analyzed the effect of the domestic content requirement assuming that the Australian grower association, a state-sponsored cartel with mandatory production quotas, maximized monopoly profit. The monopoly power originates in the domestic content requirement policy which increases the willingness to pay for the domestic tobacco to avoid the tariff penalty on competing imported tobaccos. Trade and welfare effects are derived assuming a nested CES composite tobacco in cigarette technology and consensus estimates for the elasticity of substitution. That study posits without testing that the industry is monopolistic and ignores the market power of Australian cigarette manufacturers.

By contrast, Beghin and Lovell tested econometrically the market structure and found evidence of an efficient bilateral monopoly between the growers' cartel and the cigarette producers' association. Their findings show that the domestic content requirement influences the U.S./Australian tobacco mix penalizing U.S. tobacco use in Australian cigarette manufacturing. In that context they also found evidence of an efficient marketing contract between Australian

cigarette manufacturers and leaf growers i.e., it maximizes aggregate joint surplus possibilities given policy constraints, as opposed to a monopoly or monopsony situation. The principal manifestation of such efficient contract is that the tobacco derived demand system depends on the marginal cost of supplying the domestic tobacco (the marginal opportunity cost to the two agents) and the price of the competing tobacco inputs, but not on the marketing contract price (Brown and Ashenfelter; Beghin and Sumner). However their investigation maintains the assumption of constant return to scale and does not consider non-price effects except for a time trend which was found not significant.

3. The Demand Model and Decomposition Analysis for U.S. Tobacco Exports

Building on the efficient bilateral monopoly model we posit that U.S. tobacco export demand to Australia (I_{US}) is influenced by its own price (P_{US}), a price vector of imported tobacco from other countries (P_I), the content variable (κ), the marginal cost of producing domestic leaf (C'_D), prices of two other inputs, equipment and labor in cigarette manufacturing (R and W), cigarette output (Q), and a trend variable capturing characteristics changes such as increasing use of filters and decreasing tobacco weight of cigarettes (charact). The vector P_I captures the substitution effects among competing foreign tobacco. Higher marginal cost of producing Australian leaf shifts the demand for U.S. tobacco, a substitute, outward. Cost minimization in manufacturing motivates the inclusion of the other input prices.

The content requirement ratio shows the trade-distorting effect of that policy on U.S. tobacco use. Incorporating the cigarette characteristic variable is important because of radical changes that have occurred in the hedonics of cigarettes (essentially lower effective nicotine content with filters and less tobacco). Ideally the argument of changing technology or taste should

be backed by nonparametric tests of cost minimization which were not feasible in this case due to incomplete data on input unit cost and quantities.

The U.S. tobacco export demand emanating from Australian cigarette manufacturing is expressed as:

$$I_{US} = F(C_D, P_{US}, \mathbf{P}_I, W, R, \kappa, \text{character}, Q) \quad . \quad (1)$$

When the tobacco demand is defined in per unit of output as in Beghin and Lovell the hypothesis of constant return to scale is that $\partial I_{US} / \partial Q = 0$. The hypothesis of changing characteristics is expressed as $\partial I_{US} / \partial \text{character} \neq 0$. Both output and characteristics may be endogenous to the tobacco use, because they are function of input prices as well, and because we use industry-level data. We consider that possibility in the empirical section.

Heien and Wessells introduced a decomposition analysis method to quantify structural change in consumption brought about by changes in its determinants over time. They used a Cobb-Douglas form to derive the percentage change in the dependent variable (consumption) as the elasticity-weighted sum of the percentage changes in the independent variables. Noting that this result holds locally for any functional form we differentiate equation (1) to obtain:

$$d(I_{US}) = \sum_i ((\partial I_{US} / \partial X_i) dX_i) \quad , \quad (2)$$

where $X_i = P_{US}, \mathbf{P}_I, C_D, W, R, \kappa, \text{character}, \text{ and } Q$. Expressing equation (2) in proportional changes (log-differentials) yields:

$$dI_{US} / I_{US} = \sum_i ((\partial I_{US} / \partial X_i) X_i / I_{US}] dX_i / X_i) \quad , \quad (3)$$

or in a more compact form:

$$d\ln I_{US} = \sum_i (\eta_i d\ln X_i) , \quad (4)$$

with η_i being the elasticity of I_{US} with respect to X_i . We are interested in evaluating small changes over time expressed annually; hence for a total time span of T periods we consider changes between time t and $t-T$ and take the average change for I_{US} and all its determinants X_i 's. Equation (4) then becomes:

$$1/T (\ln I_{US,t} - \ln I_{US,t-T}) \approx 1/T (\sum_i \eta_i (\ln X_{i,t} - \ln X_{i,t-T})) . \quad (5)$$

4. Variable Specification and Empirical Results

4.1. Variable Specification

Equation (1) is the base of the econometric estimation and tests of constant return to scale and effects of changing characteristics. Since we use the Beghin-Lovell data set we keep their formulation of U.S. tobacco use per unit of output. The vector $\mathbf{P}_I$ is represented by the prices paid for Malawi (P_{MA}), Korean (P_{KO}), and Brazilian (P_{BR}) tobacco leafs, all inclusive of the concessionary tariff and transportation cost. These tobaccos represent the lion's share of tobacco exports to Australia. The price paid for U.S. tobacco is also inclusive of tariff and transportation cost. All tobacco data are expressed in dry-weight equivalent. Shifts in the marginal cost of producing domestic leaf is measured by an index of prices paid by farmers. The Australian manufacturing wage and manufacturing capital deflator are used to approximate W and R in the cigarette industry. The content requirement policy effect is captured by the response of U.S. tobacco use to the legal minimum domestic content ratio κ . For the characteristic variable we originally had two candidates: the proportion of filtered cigarettes in total cigarette production,

and the average tobacco weight per cigarette. Both variables exhibit a clear trend but we only retained the latter measure because the former did not contribute to the explanatory power of the regression.

All variables are annual values over the time period 1960/1-1988/9 and refer to the Australian fiscal years (July of that year to July of following year). All prices are deflated by the Australian CPI. The data sources are mostly from Australian publications, USDA-FAS, OECD, and IMF documents and are described precisely in the data appendix.

4.2. Econometric Estimation of U.S. Export Demand

Because of the potential endogeneity of several variables (charact and Q) with U.S. tobacco derived demand we resort to three stage least square estimation³ with Shazam. Regression results are reported in Table 1. The Table's first column shows the results for the estimation of equation (1). Column (2) presents the estimation of equation (1) with the maintained hypothesis of constant return to scale.

We first test the latter hypothesis. The computed χ for the Wald test of the restriction $\partial I_{US} / \partial Q = 0$ is .0012 with one degree of freedom. Hence the hypothesis of constant return to scale can not be rejected, i.e, the data are consistent with U.S. tobacco use per unit of output being independent of scale. This result casts doubt on the scale argument as ground for trade management practices in Australian cigarette manufacturing (Helpman and Krugman). The presence of the output variable in the specification as a marginal effect on the magnitude of the estimated parameters and associated elasticities but tends to decrease the significance of several

³ The instruments used for the first stage estimation of were the tobacco prices, the marginal cost C'_D , a time counter, the excise tax on cigarette, the content ratio, the concessionary tariff, the share of filtered cigarettes in total manufacturing, the green leaf/dry tobacco conversion ratio, and the CPI.

variables compared to the results obtained with the second specification. We choose to maintain the constant return to scale hypothesis since it cannot be rejected and focus the discussion of results with the latter specification.

The characteristic variable coefficient indicates that other things being equal U.S. tobacco has not escaped from the trend towards lighter cigarettes and actually has been relatively much affected by this trend (elasticity value above 2.4 for most regression trials). The computed χ for the Wald test of the restriction $\partial I_{US} / \partial \text{charact} = 0$ is equal to 5.866 and we reject the null hypothesis for $\alpha = 2.5\%$.

The estimated price response of U.S. tobacco demand in Australian cigarette manufacturing follows conventional wisdom and is consistent with the Beghin-Lovell estimates. Own-price response is negative and large (elasticity estimated at the mean above 1.5); positive cross-price responses are inelastic for the price of Malawian tobacco but elastic for the marginal cost of Australian tobacco. The three tobaccos are considered substitutes in cigarette production. The two other tobacco prices have no significant impact on U.S. tobacco use, neither does the manufacturing wage. The manufacturing capital deflator has a marginally significant and negative impact on U.S. tobacco leaf demand. The content ratio, κ , has negative and significant effect on U.S. tobacco use.

Finally we retested the efficient contract hypothesis ($\partial I_{US} / \partial P_D = 0$) with P_D being the domestic tobacco price by estimating equation (1) inclusive of P_D . This result continues to hold for these specifications when they were re-estimated including P_D among the regressors. Wald tests not reported here indicated that P_D has no significant effect on U.S. tobacco leaf use. The high t-statistics obtained in the second column of Table 1. for C'_D , P_{US} , and P_{MA} provide further evidence in favor of the efficient contract of the bilateral monopoly. Maximizing joint surpluses

implies changing U.S. tobacco use due to shifts (cross-price) and movements along (own-price) the derived demand for U.S. tobacco and also because of shift induced by changes in the marginal cost of producing Australian leafs (the opportunity cost of a substitute). This result suggests that U.S. tobacco use in Australian manufacturing would remain the same if the Australian tobacco market became perfectly competitive. Hence the organization of the industry does not further distort resource flows. However it was important to investigate this aspect to be able to confirm the previously established result of an efficient contract between growers and manufacturers.

4.3 Decomposition Results

Using results of column (2) of Table 1 we compute the elasticities η_i 's evaluated at the mean of the data set. Constant return to scale implies a unitary scale elasticity. We also calculate the average annual rate of change in the determinants X_i 's evaluated at the mean⁴ to estimate equation (5) and to decompose the decline in U.S. tobacco exports to Australia by source (tobacco prices, other inputs, policies, cigarette characteristics, and scale). These results are presented in Table 2; the columns respectively show elasticities, percent change in determinants, and estimated contribution to exports change.

Row (1) of Table 2 shows that the change in the U.S. export price has actually benefited U.S. exports, the real price has been declining over the period. However the price of Malawian tobacco has declined at a faster rate and has substantially offset the own-price effect. Nevertheless the inelastic cross-price response to the Malawian price mitigates this offsetting effect. Hence the popular argument that U.S. tobacco prices have contributed to the decline of U.S. tobacco exports

4 The annual average rate of a given determinant X is $(X_{1989} - X_{1961}) / \sum_t X_t$, for $t = 1961, \dots, 1989$.

has to be narrowly qualified since it is restricted to a relative tobacco price and because it abstracts from elasticities weighing these price changes. Changes in other imported prices were quite small, so were their effects. Row (5) gives the subtotal of the total tobacco price impact on U.S. export to Australia: it is small relative to other factors (1.95 percent of export change).

This result has to be qualified as well since we do not include prices for all other foreign tobacco competing with U.S. leafs for the Australian market. Row (6) shows that although the response to shifts in marginal cost of Australian tobacco is elastic, the impact on exports is small because of little change in the index of price paid by farmers relative to the CPI. The limited increase in manufacturing equipment and labor cost contributes to total average U.S. export decline per year for nearly 2.82% (sum of Row (7) and (8)).

Row (10) gives the scale effect on U.S. tobacco export demand. The impact of the changes in Australian cigarette output was nearly 1.94% per year. This change reflects the output expansion that prevailed before 1980. The maturity of the current market suggests that changes of that magnitude are unlikely in the future. Row (11) indicates that the domestic content requirement does play an important role in reducing the demand for U.S. tobacco which respond elastically to this policy variable and because the content requirement has been substantially increased during the period considered. Domestic content requirement impacts have caused an annual rate of decline of 2.54%.

The characteristic variable (Row (12)) contributes to -3.33 percent of the exports decline which suggests that the worldwide trend towards lighter cigarettes induced by growing health concern and standards is likely to affect U.S. tobacco exports to other countries as well. The sum of Row (1) to Row (12) (minus Row (5) and (9)) shows that the estimated overall average decline predicted by the decomposition analysis is 3.86 percent per year whereas the actual one was 3.15

percent. Driving that aggregate estimate is the important negative effect of the cigarette characteristic trend and the domestic content variable but partly offset by scale and price effects.

5. Conclusion

This paper investigated the decline in U.S. tobacco exports to Australian manufacturers by considering a wide range of factors: tobacco prices, other input prices, scale effects, the distortions present in Australian tobacco markets, changing characteristics of the final product, as well as market structure. This study built upon a previous study that focused on the efficiency aspects of the market structure and the content policy but that abstracted from scale and final product characteristics. We first estimated econometrically the effect of these neglected factors on U.S. tobacco use in Australian cigarette manufacturing and then we addressed the competitiveness issue carrying a decomposition analysis that encompassed all determinants and their individual contribution to the decline of U.S. tobacco exports to Australia.

We found evidence of a constant-return-to-scale industry that meant that the maturation of the cigarette market has a one-to-one effect on tobacco inputs. Incidentally this constant return to scale finding invalidated the scale/trade management link in cigarette manufacturing. The other new econometric evidence was the downward shift in U.S. tobacco use induced by lighter cigarettes, i.e., a change in output characteristics. These new findings did not alter the evidence of the efficient bilateral monopoly and its implications for trade flows, i.e. exports towards Australia would not benefit from a more competitive domestic tobacco industry.

The decomposition analysis revealed several offsetting effects among and within price and non-price determinants. The major negative contributions came from the lighter-cigarette effect and the domestic content policy. Price differences between U.S. tobacco and its competitors

alone cannot explain the decline in U.S. tobacco exports to Australia and this implication substantiates Abbott and Bredahl's contention with the exclusive and narrow focus of "traditional" trade theory on prices. We conjecture that these results (multiple offsetting effects, importance of non-price factors) may well extend to other export markets given they represent prevalent tendencies not only common to most tobacco markets (Barford; Grise) but also to derived demand for other agricultural commodities (Shui et al.).

Finally this paper argued convincingly that derived demand analysis combined with industry-level data can be used to draw competitiveness implications for agricultural commodities. The trend towards lighter cigarette production seems progressively irreversible given increasing health concerns and regulations worldwide (Roemer 1982 and forthcoming). By contrast the content requirement protection is supposed to be phased out starting 1995 and to be replaced by import tariffs. Our estimates could be used to predict the impact of this policy change on U.S. tobacco exports once its precise modalities are known.

Table 1. 3SLS Estimation of Equation (1)

Variable	Unrestricted specification	CRS specification
	coefficient (t-stat)	coefficient (t-stat)
C'_D	0.0056 (2.03)	0.0054 (2.29)
κ	-0.0085 (-3.39)	-0.0086 (-4.02)
P_{MA}	0.0004 (1.92)	0.0004 (2.15)
P_{KO}	0.0001 (0.32)	0.0001 (0.37)
P_{BR}	0.0002 (-0.63)	0.0002 (-0.66)
R	-0.0066 (-1.58)	-0.0071 (-1.97)
P_{USA}	-0.0005 (-1.70)	-0.0005 (-2.15)
W	-0.0506 (-0.59)	-0.0395 (-0.82)
Q	0.0000 (0.11)	
charact	7.3904 (1.33)	6.4514 (2.27)
CONSTANT	0.5162 (0.64)	0.6751 (1.23)

Table 2. Decomposition Analysis

Determinant	Elasticity	Percent change	Effect on export
(1) P_{USA}	-1.644	-2.986	4.909
(2) P_{MA}	0.826	-4.323	-3.569
(3) P_{KO}	0.151	-2.955	-0.445
(4) P_{BR}	-0.283	-3.742	1.058
(5) subtotal (1) to (4)			1.953
(6) C'_D	2.085	0.446	0.930
(7) W	-0.751	1.118	-0.839
(8) R	-2.759	0.719	-1.983
(9) subtotal for prices (5) to (8)			0.061
(10) Q	1	1.944	1.944
(11) κ	-1.637	1.552	-2.540
(12) charact	2.754	-1.209	-3.330
(13) subtotal (nonprice (10) to (12))			-3.926
(14) total predicted (9) to (12)			-3.865
actual rate			-3.151

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Data Appendix

1. Variables Transformation

All tobacco prices are in dry weight equivalent. The data refers to Australian fiscal years.

All prices are deflated using the Australian CPI.

All prices and tariffs are in Australian cents per Kg of tobacco. The exchange rate is the average period rate of the International Financial Statistics. All import tobacco prices are multiplied by 1.12 to reflect shipping cost; then the concessionary tariff is added to this CIF price to give the import unit cost.

Although complete data was available for both the manufacturing wage and capital deflator, they were obtained from 2 different series. We regressed overlapping data points for the two series (for both the wage and the capital deflator) to minimize the base change problem. Then we predicted a complete series using the regression results and the existing value of the other series which was used as right-hand side variable in the regression.

To account for drying and aging of the domestic tobacco leafs we matched prices of domestic tobacco produced and marketed in year $t/t+1$ with the price of imported tobacco of year $t+1$. This gives an aging period of 6 to 12 months which is a standard assumption in modelling tobacco processing (Industries Assistance Commission). From 1976 to 1988 the data on U.S. tobacco imports refers to fiscal years. The data from 1960 to 1975 was originally given for calendar year. We took the average calendar year $(t + t+1)/2$ to approximate fiscal year t for the years 1960 to 1975.

We have two measures of the domestic content requirement. One is the official minimum content proportion. The second one is the actual content proportion that the cigarette industry

agreed to respect. The latter is higher than the minimum proportion.

2. Data Sources

For the domestic tobacco price: The Annual Report of the Australian Tobacco board for 1965-1988. For 1959-1965 "Tobacco in Australia", Report M 26 of USDA FAS March 1972.

For the price of U.S. tobacco: "Industry Assistance Inquiry into Tobacco Growing and Manufacturing Industries" The Tobacco Grower Council, Australia, for 1970 to 1985. For 1960 to 1970, Report M 26 of USDA-FAS op cit.; for 1986 to 1988, "World Tobacco Situation" of USDA-FAS several issues.

For the price of Malawian Tobacco: "International Financial Statistics" of IMF, series 76m. The 1970 FOB price of Malawian tobacco comes from "Industry Assistance Inquiry into Tobacco Growing and Manufacturing Industries" op cit.

For the price of Korean Tobacco: similar sources as for U.S. tobacco for 1970 to 1988. For 1960 to 1970, "World Tobacco Situation" of USDA-FAS November 1988, Table 13, provides the series of price received by Korean burley producers (1959-1987). That series is adjusted to account for Wholesale markup.

For the Brazilian tobacco price: Similar sources as for the Korean price.

For the index of price paid by farmers: "Quarterly Review of the Rural Economy", Australian Bureau of Agricultural and Resource Economics. Similar data is published by the FAO in its "production Yearbook".

For the manufacturing wage: "OECD Economic Surveys", OECD, and the IMF's "International Financial Statistics".

For the manufacturing capital deflator: "OECD Economic Surveys", op cit.

For the content requirement proportions: "Annual Report" of the Australian

Tobacco Board.

For the difference between the nonconcessionary and concessionary tariffs: "World Tobacco Situation. Import Requirement and Restrictions for Tobacco and Tobacco Products in Foreign Markets", USDA-FAS, various issues.

For the CPI index: "OECD Economic Surveys", OECD, or International Financial Statistics of IMF.

For the conversion ratio green leaf into dry weight of tobacco: "World Tobacco Situation" of USDA-FAS, various issues.

For the cigarette output: Similar sources as for the domestic tobacco price.

For U.S. tobacco imports: Similar sources as for the domestic tobacco price.

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