COMMENT: A THEORETICAL FRAMEWORK FOR ANALYZING SOCIAL COSTS OF THE TOBACCO PROGRAM

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We commend Johnson and McManus on their article, which presents a theoretical framework for analyzing social costs of the tobacco program and an application of that framework to current policy issues.[1] However, while we basically agree with their approach in quantification of "net reduction in social costs" (given their assumptions), we perceive related matters that deserve further discussion.

Johnson and McManus apparently recognize that, except under circumstances in which markups are a fixed percentage of raw product prices, farm-level elasticity will be more inelastic than retail elasticity. However, they do not appear to recognize that the magnitude of the difference will be mainly a function of marketing spreads, and that a derived demand approach can be utilized to reach empirically derived estimates of elasticity of demand for tobacco at the farm level. Their assumed value for farm-level demand elasticity (−.6) was presumably based upon their reported range of demand elasticity estimates for cigarettes of −.3 (Sackrin, p. 86) to −1.5 (Maier, p. 703). Marketing spreads for tobacco are substantial and largely fixed (Tobacco Tax Council, p. viii; USDA, p. 98). This would necessarily imply a farm-level demand elasticity much more inelastic than assumed by Johnson and McManus. Their assumed elasticity was also notably less inelastic than that reported by Sutton.[2]

In order to demonstrate the impact that an alternative farm-level elasticity might have on Johnson and McManus' analysis, we assumed a farm-level demand elasticity of −.05. Given this value, if tobacco prices dropped 25 percent (to the postulated competitive market equilibrium), the calculated point on *D would be $*P_1 = .8445$, $*Q_1 = 2{,}160{,}861.30$.[3] With the same assumptions, the calculated point on *D would be $*P_2 = 1.4638$, $*Q_2 = 2{,}102{,}171.24$ when price is increased to the full cost equilibrium. Given the estimate of supply elasticity (.45) and the assumption that *S and *S′ have the same slopes, these equilibrium points were used to calculate second points on *S and *S′.[4] From the two points on each curve and the assumption of linear equations in the relevant range, equations for *D, *S, and *S′ were derived.[5] With the use of these equations and quantities for $*Q_0$, $*Q_1$, and $*Q_2$, the social cost areas in Johnson and McManus' Figure 1 were estimated by integrating the functions over the relevant intervals. The integral equations and values (rounded to nearest thousand) were as follows:

Public Costs

$$(1)\quad AFHC = \int_{*Q_2}^{*Q_1} *S'dQ - \int_{*Q_2}^{*Q_1} *SdQ$$

$$= \$39{,}240{,}000$$

Reduction in Public Costs

$$(2)\quad BGHC = \int_{*Q_0}^{*Q_1} *S'dQ - \int_{*Q_0}^{*Q_1} *SdQ$$

$$= \$17{,}836{,}000$$

Producer-Consumer Surplus Loss

$$(3)\quad BCE = \int_{*Q_0}^{*Q_1} *DdQ - \int_{*Q_0}^{*Q_1} *SdQ$$

$$= \$4{,}057{,}000$$

Net Reduction in Social Costs

$$(4)\quad CEGH = \int_{*Q_0}^{*Q_1} *S'dQ - \int_{*Q_0}^{*Q_1} *DdQ$$

$$= \$13{,}779{,}000$$

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[1] It should be noted that the numerical data included in Johnson and McManus' paper do not permit the reproduction of some of their findings. The authors have inadvertently coded the production data in thousands (U.S.D.A.). The public costs, social costs, and producer-minus-consumer surplus yielded by their reported output figures are their reported values divided by one thousand. Only by using corrected output (or properly decoding) can one reproduce their findings.

[2] An unpublished dissertation by Russel W. Sutton reports a farm-level elasticity of -.031.

[3] Johnson and McManus' procedures were used for all calculations, with only the assumption for demand elasticity varied. Similarly, their coding convention for quantity was retained. All values associated with the alternative analysis are noted with an asterisk (*).

[4] The calculated points were: on *S (P = .7952, Q = 2,102,171.24) and on *S′ (P = 1.5131, Q = 2,160,861.30).

[5] The supply equations were: *S ($P = -.9715 + 8.404 \times 10^{-7}$ Q), and *S′ ($P = -.3029 + 8.404 \times 10^{-7}$ Q), where P = dollar price per pound and Q = thousand pounds. The demand equation *D was $P = 23.646 - 1.0552 \times 10^{-5}$ Q.

As we have demonstrated in a farm-level analysis, a farm-level demand elasticity that is "too" elastic will inflate the types of costs evaluated in Johnson and McManus' article. Given the −.05 farm-level elasticity assumed in this comment, "public costs" would be reduced $676.8 million from the $716 million reported in their article. Proportional decreases in their other values were found, with "reduction in public costs" declining from $325 to $17.8 million; "producer-consumer surplus loss" declining from $74 to $4.1 million; and "net reduction in social costs" declining from $251 to $13.8 million.

If their article were intended only to present a theoretical framework, perhaps any criticism of their assumed elasticity values would be unmerited. However, while elasticity values have no impact on the mathematical operations performed, the quantitative results are extremely sensitive to the values assumed for elasticities, and, thus, the results of their application have no meaning. Researchers who wish to employ Johnson and McManus' technique should recognize this fact and exercise extreme care in selecting the elasticity values to be used.

While supply elasticity does not appear to be a problem in this analysis, one should also recognize that its accuracy is as critical as the demand elasticity. A supply elasticity that is "too" elastic will deflate the types of costs evaluated by Johnson and McManus; conversely, if "too" inelastic, costs will be inflated.

In summary, Johnson and McManus have presented a theoretical framework that can prove useful in analyzing a wide range of policy issues involving social costs. However, anyone wishing to employ their technique should recognize that the results of the analysis will be very much dependent upon the elasticities assumed, and that the validity of the findings will necessarily be limited by the accuracy of their elasticities.

Finally, we would suggest that any evaluation of social costs should also consider the tax burden on the commodity or product involved.[6] In cases where punitive taxation is involved, as is the case with tobacco, the social costs still exist, but they may be indemnified by taxes on the product—in some cases there may even be a net gain to non-consumers of the product. Thus, questions of equity should be examined along with social cost considerations.

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[6] According to the Tobacco Tax Council, in 1979, the total tax directly imposed on one pound of tobacco totaled approximately $5.00 at the retail level (Tobacco Tax Council, pp. 5, 6).