A Note on the Value of the Right Data

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Author's note· From time to time, we forget that the data we use are at least as important as the methods we employ True, agricultural economists have devoted considerable effort to assessing and understanding the appropriate application of theory, underlying assumptions, models, and methodologies for estimating elasticities And, this has led to real progress in the analysis of international commodity markets But, data are what we seek Methodology and procedures lead us nowhere without the right results

Over the years, a number of observers, including Orcutt, Parniczky, and Griliches, have cautioned that inconsistencies are often present in trade data (5, 1, 6, 4) [1] We have joined Hueth in believing that traded quantities reported by agricultural exporters consistently exceeded quantities reported by importers (2) We wanted to find the possible causes of these observed inconsistencies and the implications, in terms of elasticity estimates, of using exporter versus importer trade data

Causes and Consequences of Data Inconsistencies

There are, of course, several explanations for inconsistencies in international trade data When trade is evaluated in value terms, differences in exchange rates, trade terms (FOB—free on board, CIF—cost insurance freight), timing of discharge and receipt, and discounts or rebates may all contribute to inconsistencies among trade levels reported by exporters and importers

Inconsistencies are more difficult to explain for trade volumes One or both of the trading partners may simply have collection and reporting processes or procedures which perform poorly In some instances, certain countries may underreport imports, overstating self-sufficiency for political reasons Ely and Parniczky say the exporter is frequently unaware of the final destination of the merchandise, and the importer has several choices in identifying the country of origin

Japan, for example, is notorious as a re-exporter in agricultural trade While exporters may be aware of this, they may be unable to correct the data to fully reflect re-export activities Using Japan as an example, we hypothesize that import demand for certain commodities is

$$MJ^et = MJ^ct + MJ^rt,$$

where

MJ^et is the total quantity exported to Japan from, say, the United States in period t,

MJ^ct is the quantity actually consumed in Japan in period t (or possibly t + 1),

MJ^rt is the quantity purchased and re-exported by the Japanese in period t (or t + 1)

In this case, MJ^ct is a function of all the standard import demand variables, such as real price, real income, prices of related goods, population, and exchange rates However, MJ^rt is likely to be a function of an entirely different and possibly unrelated set of variables

If an exporter country, say the United States, reports sales to Japan as MJ^et, as though $MJ^et = MJ^ct$, then elasticities estimated using these data will be incorrect To obtain true elasticities, MJ^ct, as reported by Japan, should be utilized It can easily be shown that, in general, the larger the share of resale related to total traded quantity (MJ^rt/MJ^et), the more the own-price elasticity (estimated using inaccurate exporter data) will be biased toward underestimation of the true elasticity That is, estimates using exporter data will yield elasticities more price inelastic than the "true" elasticity To obtain "true" elasticities, MJ^ct, as reported by Japan, is the correct data source A simple example assume the importer, Japan, re-exports a consistent percentage, γ, of their imports (0<γ<1) The exporter, the United States, does not account for this re-export Thus, its data assume all sales, $Q^*_M = Q_M + γQ_M$, where Q_M is the true quantity consumed in Japan Now, assume demand in Japan can be defined as

$$Q_M = α - βP,$$ then the "true" price elasticity of demand, in absolute terms, is

$$\epsilon = β \ \frac{P}{Q_M}$$

However, a model using U S data is specified as

$$Q^*_M = α - βP,$$

or $$Q_M + γQ_M = α - βP,$$

or $$Q_M = \frac{α}{1+γ} - \frac{β}{1+γ}P$$

The elasticity (in absolute terms) estimated here is

$$\frac{P}{Q_M} > \frac{P}{Q^*_M}$$

We know $\beta > \frac{\beta}{1+\gamma}$ and $\epsilon^* = \frac{\beta}{1+\gamma} \; \frac{P}{Q^*}$ Clearly, therefore, $\epsilon^* < \epsilon$ (in absolute terms)

A Specific Case

As an illustration of the effect of data inconsistencies or inaccuracies on estimates of demand and demand elasticities, we carried out a simple exercise. We selected a published demand model that used exporter data for the dependent variable We then re-estimated the model using importer data for the dependent variable with original independent variable data More specifically, we re-estimated the demand for U.S wheat in the Japanese market, choosing the Gallagher, Lancaster, Bredahl, and Ryan model because (a) it has been widely cited, establishing credibility, (b) its research was sponsored by USDA, (c) it is an easily replicated, single-equation OLS estimate, and (d) its entire data set is under one cover (3)

The model is [2]

$$\frac{WXCJ}{POPJ} = \text{Constant} - b \frac{(\overset{-}{RPWJ})}{(CPIJ)} - c(YCPJ) - d(QWSJ)$$

$$-f(DSTRIKE),$$

where

    WXCJ = Commercial exports of U S wheat and flour to Japan (million bushels),

    POPJ = Japanese population (millions),

    RPWJ = Japanese Food Agencies (JFA) wheat resale price (yen/kg),

    CPIJ = Japanese consumer price index (1970 = 1 0),

    YCPJ = Per capita consumption expenditures (real) in Japan (1970 = 1.0),

    QWSJ = Wheat production and beginning stocks in Japan (million metric tons), and

DSTRIKE = Dummy variable for West Coast dock strike

For the purpose of this example, we simply substitute variable WMCJ for WXCJ, where

    WMCJ = Commercial imports of U S wheat and flour by Japan as reported by the JFA

[2]According to (3), this is the "best of several alternative equations "

Table 1—Comparison of OLS demand coefficients for U.S. wheat in Japan, based on different sources for dependent variable data, 1960-74

Variable	WXCJ	WMCJ
Constant	2 0751	1 8349
RPWJ/CPIJ	– 0018	– 0022
(t-stat)	(2 87)	(2 01)
VCPJ	–23 5319	–11 0262
(t-stat)	(77)	(20)
QWSJ	–17 2810	– 0315
(t-stat)	(2 53)	(29)
DSTRIKE	– 0749	0112
(t-stat)	(3 88)	(38)
R²	930	842

Table 2—Comparison of estimated demand elasticities for U.S. wheat in Japan, based on different sources of dependent variable data, 1960-74

Elasticity	WXCJ	WMCJ
Price	–0 97[1]	–1 31[1]
Income	– 33	– 13
Japanese production	– 43[1]	– 08

[1]Statistically significant at the 95-percent level

During the model's analysis (1960-74), the volume of U S wheat exported to Japan exceeded JFA-reported volumes of U S wheat imports by an average of 4 percent per year [3] As suggested earlier, there are several possible explanations for this difference It seems reasonable to conclude, however, that at least a share of this discrepancy can be attributed to Japanese re-exports of wheat

The WXCJ demand estimate assigned responses to Japanese consumers, which were, in fact, partly responses by consumers in other (re-export) markets The discrepancy in the data led to a misspecification of the model The "true" Japanese demand coefficients could have been more accurately captured in the alternative WMCJ model

Table 1 compares the estimated coefficients from the two models Table 2 compares the estimated elasticities computed at the mean The results are revealing but not surprising As expected, demand estimates using JFA data were more price elastic The other variables in the WMJC model were not statistically significant

If the WMCJ model had been more appropriate, we could conclude the following

    • Japanese consumers were more sensitive to U S wheat price than reported by the model, and

[3]Clearly, these are old data However, comparisons of USDA and JFA reports reveal that these discrepancies in reported trade volumes still exist in the data

- Much of the variation in U S exports attributed to Japanese income growth and changes in Japanese wheat production, in fact, resulted from Japan's wheat re-export activities

We do not seek to find fault with the model in (3) The choice of data was probably correct and the model accurate Our intention is to demonstrate that inconsistencies in data can lead to substantial differences in analytical outcomes and policy recommendations

Conclusion

Fully understanding the data is important, essential to conducting international agricultural demand analysis Although this may seem obvious, the data trail may be lost in the rigors of econometric estimation

References

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