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Strawmen in Trade Protectionism: The Case of Citrus Import Quotas

Greg Baker and Hiroshi Mori

The hypothesis that shipments of oranges into Japan have displaced, and will continue to displace, domestic Mandarin orange shipments in Japan was tested using annual and monthly data and by estimating an econometric model. It was found that the marketing seasons of Mandarin and imported oranges are substantially different. This result, along with econometric estimates, indicated that Mandarin and imported oranges do not directly compete with each other, and supported rejection of the hypothesis that imported oranges have displaced Mandarin orange shipments. It was projected that, under full trade liberalization, orange imports would increase by 115 percent. However, most of this increase would occur during the April to September period when few Mandarin oranges are shipped.

Trade protectionism is often based on arguments that are hard to support. The problem for trade negotiators, however, is that these arguments are usually equally difficult to refute. One such case concerns agricultural trade negotiations between the United States and Japan, of which one of the main topics has been Japanese imports of oranges. Japan's arguments for protection have been based on the fact that production of domestic Mandarin oranges has declined over the past decade while orange imports have risen. Current tariffs range from between 20 to 40 percent of the wholesale price depending on the time of year. It is argued that further removal of trade barriers will cause Mandarin orange production to decline even more. This research examines the plausibility of these claims.

The orange market in Japan is made up

of three distinctly different types of oranges. The most popular is the domestically produced Mandarin orange, harvested primarily between October and March. There are several other varieties of domestic oranges—Hassaku, Iyo, Summer and Sweet Summer oranges, commonly called late season oranges—which are primarily harvested from January to June. Late season oranges have similar characteristics and are more like the oranges produced in the United States than Mandarin oranges. Navel and Valencia oranges comprise the bulk of the oranges imported into Japan, coming mostly from the United States, and are imported year-round, with slightly more than 50 percent imported during June and July. Wholesale shipments¹ of oranges by type are summarized in Table 1.

Hypothesis

Japanese economists have argued that much of the decline in Mandarin orange shipments can be attributed to import increases, and that limiting orange imports

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¹ Shipments is defined as the total quantity of oranges shipped out of wholesale markets in Japan, as reported by the Ministry of Agriculture, Forestry and Fisheries.

TABLE 1. Wholesale Shipments of Oranges in Japan, 1975-82.

| Year | Japanese Mandarin Oranges | Japanese Late Season Oranges | Imported Oranges | Imported Oranges as a Percent of Japanese Domestic Shipments |
|---------------------------------|---------------------------|------------------------------|------------------|--|
| ----- (1,000 metric tons) ----- | | | | |
| 1975 | 2,887 | 1,078 | 16 | 0.4 |
| 1976 | 2,643 | 990 | 18 | 0.5 |
| 1977 | 2,634 | 674 | 15 | 0.5 |
| 1978 | 2,556 | 1,009 | 44 | 1.2 |
| 1979 | 2,650 | 988 | 48 | 1.3 |
| 1980 | 2,357 | 1,002 | 65 | 1.9 |
| 1981 | 2,110 | 772 | 69 | 2.4 |
| 1982 | 2,062 | 896 | 78 | 2.6 |

Source: Ministry of Agriculture, Forestry, and Fisheries of the Japanese Government.

is necessary to stop the further decline in Mandarin orange shipments [Fujitani and Takebe]. This study tested the hypothesis that orange imports into Japan have displaced, and will continue to displace, shipments of domestic Mandarin oranges in Japan. This hypothesis was tested by 1) analyzing the annual domestic and imported orange shipments, 2) analyzing the monthly domestic and imported orange shipments, and 3) estimating an econometric model of the demand for imported oranges. Of interest was the substitutional relationship between domestic and imported oranges and the impact on imports of removing trade barriers.

Analysis with Annual Data

The controversy over importing oranges into Japan has been stimulated by the large decline in shipments of Mandarin oranges during the 1970s. Shipments of Mandarin oranges declined by 825 thousand metric tons (tmt) during the period 1975 to 1982, a decrease of 37 percent. Orange imports increased by almost 400 percent during the same period,

largely as a result of the 1977-78 bilateral trade negotiations between the United States and Japan. Orange imports tripled between 1977 and 1978 and have since expanded at an annual rate of approximately 20 percent. The current tariff is 20 percent of the wholesale price from June to November and 40 percent of the wholesale price from December to May.

The use of annual data to support the hypothesis that imported oranges have displaced domestic Mandarin oranges is subject to two flaws. The first is that arguments based on a simple examination of trends are not adequate to support a causal relationship. Although imports increased by 388 percent from 1975 to 1982, the increase of 62 tmt in imported orange shipments could hardly have caused a decrease of 825 tmt in Mandarin orange shipments. Further, the decline in Mandarin orange shipments began in the early 1970s but the increase in imported orange shipments began in the late 1970s.

The second problem is that analyzing aggregate annual data may mask important information. Citrus production is highly seasonal and oranges are typically stored only long enough to facilitate orderly marketing. Thus, the seasonal nature of shipments must be considered because an analysis of annual data could give quite different results than an analysis that incorporates the citrus market seasonal nature. Although the examination of the annual data does not refute the hypothesis that imported oranges have displaced, and will continue to displace, Mandarin orange shipments, it clearly shows the need for examining seasonal data.

Two major studies concerning liberalization of the orange trade have been conducted in Japan, both using annual data. These studies showed that if trade were completely liberalized, imports would be increased substantially. Yuize conducted an econometric analysis of annual data and predicted that under full trade liberalization, the wholesale price of imported or-

anges would fall to 168 yen per kilo.² At that price, he predicted orange imports would increase to 160 tmt in 1987, an increase of about 100 tmt, and the consumption of Mandarin oranges would fall by 300 tmt. Fujitani and Takebe conducted an econometric analysis of annual data and modeled the optimal decisions of Japanese citrus producers using a linear programming model. They estimated that, at a wholesale price of 250 yen per kilo, the quantity of imported oranges would increase to 400 tmt and, at a wholesale price of 180 yen per kilo, imports would be 550 tmt. They also noted that increasing orange imports by 200 tmt would reduce domestic citrus consumption by more than 1,000 tmt.

Predictions of imports under trade liberalization are quite different in the two studies—160 tmt at a price of 168 yen per kilo in the Yuize study versus 550 tmt at a price of 180 yen per kilo in the Fujitani and Takebe study. The most interesting point, however, is the predicted effect on shipments of Mandarin oranges. Yuize predicted 100 tmt of imported oranges would replace 300 tmt of Mandarin oranges. Fujitani and Takebe predicted that 200 tmt of imported oranges would replace 1,000 tmt of Mandarin oranges. It is puzzling that each ton of imported oranges could replace between three to five tons of Mandarin oranges. An analysis which accounted for the seasonal nature of citrus shipments, as discussed in the next section, may yield substantially different and more believable results.

Seasonality of the Citrus Market

Data on the shipments of Mandarin, late season, and imported oranges are available on a monthly basis. Table 2 indicates that shipments of Mandarin and imported oranges vary greatly, depending on the season. The bulk of Mandarin oranges (al-

TABLE 2. Monthly Shipments of Mandarin and Imported Oranges as a Percentage of the Annual Total Average for 1981 to 1983.

| Month | Monthly Shipments of Mandarin Oranges as a Percent of the Annual Total | Monthly Shipments of Imported Oranges as a Percent of the Annual Total |
|-----------|--|--|
| January | 13.5 | 3.0 |
| February | 9.1 | 3.2 |
| March | 3.6 | 5.0 |
| April | 0.3 | 6.9 |
| May | 0.0 | 8.6 |
| June | 0.0 | 29.1 |
| July | 0.2 | 22.9 |
| August | 0.4 | 10.5 |
| September | 2.2 | 3.6 |
| October | 15.6 | 2.3 |
| November | 22.6 | 1.3 |
| December | 32.4 | 3.8 |
| Total | 100.0* | 100.0* |

* Totals do not balance due to rounding.

most 97 percent over the past three years) are shipped during October to March, when less than 19 percent of imported oranges are shipped. Over half (52 percent) of all imported oranges are imported during June and July, when less than one percent of Mandarin oranges are shipped. An examination of monthly shipments of Mandarin and imported oranges suggests that, for the most part, imported oranges are not a threat to Mandarin oranges because they are marketed at different times during the year and, therefore, do not directly compete with each other. This makes it difficult to support the hypothesis that imported oranges could have displaced Mandarin oranges, or that they could displace Mandarin oranges, if the present pattern of shipments continues.

An Econometric Model

A demand equation for imported oranges was estimated to examine the substitutional relationship between Mandarin oranges and imported oranges, and to estimate the effect of removing trade bar-

² All prices noted in this paper were deflated by the Japanese CPI to represent 1980 yen.

riers on the monthly shipments of imported oranges. A log-linear monthly demand equation was estimated using ordinary least squares (OLS). Because Japan's imports of oranges, which are almost entirely of U.S. origin, are relatively small in comparison to overall U.S. production, Japan's influence on the supply price of U.S. oranges is insignificant. Although the relationship between imported oranges and the price of Mandarin oranges is likely simultaneous, the seasonal nature of Mandarin and imported orange shipments reduces the importance of this relationship and a single equation was estimated. No inventory equation was needed because oranges are stored only for short periods of time. Because Japanese buyers can buy essentially all the U.S. oranges they want at the going price, a quantity-dependent equation with monthly intercept shifters was chosen. The estimated demand equation for oranges imported into Japan was (standard errors in parentheses):

$$\begin{aligned}
 LQORI = & 0.02 - 1.22LPORI^* \\
 & (3.83) \quad (0.36) \\
 & + 0.84LPORIO^{***} + 0.80 LPLSo^{**} \\
 & (0.47) \quad (0.30) \\
 & - 0.98LPLSOO^* + 0.40LPMO \\
 & (0.37) \quad (0.37) \\
 & - 0.47LPMOO + 1.70LT^* \\
 & (0.39) \quad (0.25) \\
 & + 0.42FE^{**} + 0.60MA^* \\
 & (0.20) \quad (0.21) \\
 & + 0.27AP^{***} + 0.63MY^{***} \\
 & (1.88) \quad (1.97) \\
 & + 4.50JU^{**} + 4.23JY \\
 & (2.03) \quad (3.75) \\
 & - 3.66AU - 2.64SE \\
 & (3.74) \quad (3.81) \\
 & - 0.32OC - 0.03NO - 0.50DE \\
 & (3.37) \quad (3.32) \quad (3.30)
 \end{aligned}$$

* Significant at 1% probability level

** Significant at 5% probability level

*** Significant at 10% probability level

$R^2 = 0.84$, $MSE = 4.25$, $n = 97$, $DW = 1.57$

where:

LQORI = the log of the monthly quantity of oranges, in metric tons, imported into Japan;

- LPORI = the log of the wholesale deflated price, in 1980 yen per kilo, of oranges imported into Japan;
- LPORIO = the log of the wholesale deflated price, in 1980 yen per kilo, of oranges imported into Japan during the months of July to December;
- LPLSO = the log of the weighted average wholesale deflated price, in 1980 yen per kilo, of late season oranges;
- LPMOO = the log of the wholesale deflated price, in 1980 yen per kilo, of Mandarin oranges during the months of October to March;
- LPMO = the log of the wholesale deflated price in 1980 yen per kilo, of Mandarin oranges;
- LT = the log of T which represented the months, and was incremented by one each month starting from 75;³ and
- FE ... DE = monthly dummy variables.

The R^2 for the model was 0.84, indicating the model explained much of the monthly variation in orange imports. The variable T representing the month was used as a proxy for income, because income in Japan has increased smoothly over time.⁴ The time trend variable indicated a strong relationship between time and the consumption of imported oranges. The monthly intercept shifters accounted for the seasonal pattern in shipments of imported oranges. The price elasticities were not sensitive to the removal of insignificant monthly intercept shifters. Dummy variables allowed the own-price and cross-price elasticities to vary by season. Thus, the own-price elasticity was -1.12 from January to June and -0.38 (-1.22 + 0.84) from July to December.⁵ The estimated

³ Seventy-five was used as a base so that the percentage change would be fairly representative of trends in Japanese income.

⁴ People in Japan are paid sizable bonuses twice a year, one much larger than the other. Thus, monthly Japanese income statistics reflect this large increase in income during the two months. This would make the use of income on a monthly basis highly questionable and, thus, no attempt to collect income data was made.

⁵ Coyle assumed that imported oranges had an own-price elasticity of -1.0 to -3.0.

cross-price elasticities for Mandarin oranges were statistically insignificant. This further supports the conclusion that Mandarin and imported oranges effectively do not compete because their marketing seasons do not overlap, and supports rejection of the hypothesis that imported oranges have displaced Mandarin oranges.

The cross-price elasticity for late season oranges, considered to be a good substitute for imported oranges, was significant and positive for the January to June period when most late season oranges are marketed. The elasticity was close to zero ($-0.18 = 0.80 - 0.98$) for the July to December period.

The model was estimated without the Mandarin variables, and used to predict the impact of removing the import quota and tariffs on orange imports. The price used to make the prediction was determined by estimating the cost of production⁶ and adding shipping, insurance, and importers' and wholesalers' fees. It was estimated that 182 tmt would be imported with the removal of the quota and all tariffs at a weighted average annual price of 161 yen per kilo. This represented an increase of 97 tmt or 115 percent over the 1983 reported shipments. Notice that these numbers are close to those estimated by Yuize, who used annual data. The important difference with his results lies in the suggestion of the present research that there would be little impact on the market for Mandarin oranges. This is because 74 percent (72 out of 97 tmt) of the increase in imports would occur during the April to September period when only three percent of all Mandarin oranges are shipped. Although the increase in imported oranges would be substantial in percentage terms, it is small in comparison to Mandarin orange shipments. Both the size and the timing of the

projected orange shipments support rejection of the hypothesis that orange imports will continue to displace Mandarin orange shipments, even in the case of full trade liberalization.

Conclusion

The hypothesis that imported oranges have displaced and would displace Japanese Mandarin oranges with the removal of trade barriers was tested. The first test of the hypothesis was conducted through examination of annual data. Although trends cannot be used to infer causality, it is unlikely that an increase of 62 tmt in imported oranges could have displaced 825 tmt of Mandarin oranges. Further, the use of annual data masks important information. The seasonal analysis revealed that 97 percent of all Mandarin orange shipments occur between October and March, when only 19 percent of all imports occur, indicating the two products never directly compete. The econometric analysis, which indicated that the price of Mandarin oranges did not influence the quantity of imported oranges, also supported the conclusion that Mandarin and imported oranges do not compete effectively. This is strong evidence that imported oranges have not displaced Mandarin orange shipments. With the removal of all quotas and tariffs, imported orange shipments would be expected to increase by 97 tmt. However, only 26 tmt or 27 percent of the increase will be imported during October to March when most Mandarin oranges are shipped. Thus, imported oranges are unlikely to displace a substantial amount of Mandarin oranges, even if trade is liberalized.

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⁶ The cost of production was determined by averaging the estimated cost of production from California shippers.

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