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# IMPACTS OF THE EUROPEAN UNION TARIFF ON THE FLORIDA PRICE FOR GRAPEFRUIT JUICE

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# Impacts of the European Union Tariff

# On the Florida Price for Grapefruit Juice

The European Union (EU) imposes a 12% ad valorem tariff on imports of grapefruit juice (GJ) from the United States and, in general, other countries. Israel, one major GJ supplier to Europe, is exempt from the duty. The U.S. is Europe's largest supplier of GJ, followed by Israel, Cuba and South Africa. The U.S. share of EU imports of GJ was 26.3% in 2009, but had been as high as 34.6% in 2003 before Florida, which accounts for most of the U.S. exports of GJ, was struck by several hurricanes and its production was significantly reduced (Table 1). Florida exports of GJ are a major part of Florida's GJ total sales, accounting for 41.5% and 36.9% of its total movement in 2008-09 and 2009-10, respectively.[1] The EU and Japan are Florida's largest export markets.[2] Volume sales in these markets are relatively sensitive to price (Brown and Guci).[3] Thus, the EU import duty, which increases the GJ price in that market, significantly deters GJ sales there. The purpose of this study is to estimate the impact of the EU GJ tariff on the Florida grower price and the value of removing this tariff for Florida grapefruit growers.

### Analysis

An ideal model for this study might be an econometric model of world GJ supply and demand that includes a relationship between the grower price and the EU tariff and fits the data well. Estimating such a model, however, is problematic, given the EU tariff has been in place for some time with relatively limited variation, and data on the various factors impacting world supply and demand for GJ are lacking. As a result, the approach taken in this study is to construct a model based on previous estimates made and simplifying assumptions. The assumptions result in a model that reflects basic market forces underlying the GJ price.

The analysis is based on a world model for GJ under competition, similar to the world OJ model developed by Spreen, Brewster and Brown; and Brown.[4] The first equation in this model is the EU demand for GJ which can be written as

(1) $q_1 = \alpha_1 + \beta_1 (p + c)(1+t)$,

where $q_1$ is the quantity demanded by processors in the EU, p is the Florida FOB price, c is the Florida cost of transporting GJ to Europe; and t is the EU tariff (.12).[5] The price (p + c) is the

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[1] See *Florida Citrus Outlook, 2010-11*, Table 16, page 34, Florida Department of Citrus, at http://www.fdocgrower.com/d/economic_and_market_research/publications_and_presentations/outlook-florida_citrus/2010-2011.pdf.

[2] See *Florida Citrus Outlook, 2010-11*, Table 17, page 35, at web site above.

[3] See Market and Economic Research Department, Florida Department of Citrus staff report 2004-2, "U.S. Grapefruit Juice Export Demand, Price and Exchange Rate Effects," by Mark Brown; and staff report 2008-2, "Exchange Rates and the Export Demand for U.S. Grapefruit Juice, by Ledia Guci.

[4] "The Free Trade Area of the Americas and the Market for Processed Orange Products," by T. Spreen, C. Brewster and M. Brown, *Journal of Agricultural and Applied Economics*, 35, 1 (April 2003): 107-126; and "Impacts on U.S. Prices of Reducing Orange Juice Tariffs in Major World Market", *Journal of Food Distribution*, 35,2 (July, 2004):26-33.

landed price in Europe and is equivalent to the cost-insurance-freight price (CIF). The price (p + c) (1+t) is the tariff-paid price in Europe. It is assumed that all suppliers face the same tariff-paid price and CIF price for the same quality product, but the cost of transporting GJ to Europe differs across suppliers, resulting in varying country specific FOB prices. That is, with p + c being the CIF price for Florida product and $p_i + c_i$ being the CIF price for some other country i, where $p_i$ and $c_i$ are that other country's FOB price and transportation cost, respectively, the condition $p + c = p_i + c_i$ is required, implying $p_i = p + c - c_i$. The costs c and $c_i$ are treated as constants and thus changes in the Florida and other country FOB prices are assumed to be the same. The terms $\alpha_1$ and $\beta_1$ are parameters to be estimated.

The total domestic supply of GJ in the EU, including product from Israel, is denoted by $Q_1$. At all prices p under consideration, it is assumed that EU demand exceeds EU supply or there is excess demand (ED) of the amount

(2) $ED = \alpha_1 + \beta_1 (p + c) (1+t) - Q_1$.

On the other hand, the U.S. and the rest of the world (ROW) are assumed to have excess supply (ES), i.e.,

(3) $ES = Q_2 – (\alpha_2 + \beta_2 p)$,

where $Q_2$ and $(\alpha_2 + \beta_2 p)$ are U.S.-ROW supply and demand for GJ, respectively, and, as in the case of ED, the Florida price p is used as a world price (again, differences in prices across the world are constant and changes in these prices follow changes in the Florida price p). The terms $\alpha_2$ and $\beta_2$ are additional parameters to be estimated.

In equilibrium, ED =ES or

(4) $\alpha_1 + \beta_1 (p + c)(1+t) - Q_1 = Q_2 – (\alpha_2 + \beta_2 p)$,

or, rearranging,

(5) $p = (Q_1 + Q_2 – (\alpha_1 + \alpha_2) - \beta_1 c (1+t)) / (\beta_1 (1+t) + \beta_2)$.

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[5] There are two product forms, not from concentrate GJ (NFC) and frozen concentrated GJ (FCGJ). It is assumed that the grower price for each product is the same and the FOB, NFC price is equal to the FOB, FCGJ price plus a fixed margin representing additional costs. EU demand for product k from country i can be written as $q_{ik} = \alpha_{ik} + \beta_{ik1} (p_i + c_{i1}) (1+t) + \beta_{ik2} (p_i + c_{i2}) (1+t)$, where k=1 for FCGJ and k=2 for NFC (the two price terms are for the own- and cross-price effects; although not considered here the c's may also change, perhaps due to promotions resulting in cross-price effects between product forms). The cost $c_{i2}$ for NFC includes additional processor costs above those for FCGJ plus product specific transportation costs. Summing across k results in $q_i = \alpha_i + \beta_i (p_i + c_i) (1+t)$, where $q_i = q_{i1} + q_{i2}$, $\alpha_i = \alpha_{i1} + \alpha_{i2}$, $\beta_i = \beta_{i11} + \beta_{i12} + \beta_{i21} + \beta_{i22}$, and $c_i = w_{i2}c_{i1} + w_{i2}c_{i2}$, where $w_{i1} = (\beta_{i11} + \beta_{i21}) / \beta_i$ and $w_{i2} = (\beta_{i12} + \beta_{i22}) / \beta_i$. Again, assuming the CIF price $p_i + c_i$ is the same across countries results in $q_i = \alpha_i + \beta_i (p + c) (1+t)$ and summing over i results in equation (1) where $q_1 = \sum q_i$, $\alpha_1 = \sum \alpha_i$ , and $\beta_1 = \sum \beta_i$.

Equation (5) shows the equilibrium Florida FOB price for a given world supply ($Q_1 + Q_2$), world demand parameters ($\alpha_1$, $\alpha_2$, $\beta_1$, and $\beta_2$), the cost parameter c and the tariff parameter t. To determine the impact of the tariff on the Florida FOB price, equation (5) can be evaluated with the tariff parameter t at .12 and without the tariff (zero). The benefits to Florida growers can then be estimated as the difference in the with- and without-tariff prices times Florida GJ production.

When the tariff is removed, all else constant, the EU price declines by $(p + c)t$, creating excess demand of the amount $\beta_1 (p + c)t$. The excess demand then sets in motion changes across world markets, forcing price p to increase until it reaches a new equilibrium level as indicated by equation (5) with $t = 0$.

## Results

Equation (5) was evaluated with and without the EU tariff based on the price elasticities and market volumes in Table 2. Given the lack of demand parameters by product form and that FCGJ accounts for roughly 70% to 80% of Florida's total GJ exports, the FOB, FCGJ price and transportation cost for FCGJ were used in evaluating equation (5). The FOB price for FCGJ was constructed as the three year average (2006-07 through 2008-09) Florida delivered-in grower price,[6] plus an estimated \$.35 per pound solids (PS) processing cost. The transportation cost from Florida to Europe was set at \$.14/PS, based on the difference between the estimated FOB, FCGJ price and the corresponding average CIF in Table 1. Results are shown in Table 3. The estimates suggest that removal of the EU tariff could result in an increase in the FOB price of \$.05 to \$.07 per single-strength-equivalent (SSE) gallon, depending on the price elasticities used. Given constant processing costs, the Florida grower price would increase by the same amount as the FOB price increase. Florida production of GJ was 57.1 million SSE gallons in 2009-10. Assuming the grower price increases by the average of the two estimates (\$.063 per SSE), the value of GJ produced would increase by \$3.6 million (\$.063 per SSE gallon times 57.1 million SSE gallons).

Although not the focus of this study, the tariff paid price in Europe would decline by an estimated \$.06 per SSE gallon which would expand sales there by an estimated 3.1 million SSE gallons, benefitting EU consumers.

An alternative approach supports the foregoing analysis. Previous unpublished analysis of the Florida GJ situation by the Florida Department of Citrus suggests that as the Florida GJ inventory in weeks (inventory divided by average weekly movement) declines by one week, the Florida grower price tends to increase by \$.02 to \$.03 per SSE gallon. Being the largest GJ producer in the world, Florida may be able to capture much of the estimated increase in EU GJ demand noted above. Assuming Florida alternatively captures 1/3, 1/2 and 2/3 of the estimated marginal imports of 3.1 million SSE gallons, the Florida grower price would increase by \$.04,

[6] *Florida Citrus Outlook*; see footnote 1.

$.05 and $.07 per SSE gallon, respectively, assuming a one-week decline in ending inventory increases the price by $.025 per SSE gallon.

## Conclusions

GJ exports account for a major part of Florida as well as U.S. GJ sales, accounting for 41.5% and 36.9% of total Florida GJ sales in 2008-09 and 2009-10. The largest export market in many of the recent years has been the EU. The EU imposes a 12% ad valorem tariff on GJ imports, resulting in a higher price for GJ there and a lower volume demanded than would be expected otherwise. Based on the analysis of this study, it is estimated that removal of the EU tariff would result in increased sales of GJ in the EU, benefitting consumers in Europe, and a higher price for Florida growers. The Florida grower price and annual revenue were estimated to increase by $.06 per SSE gallon and $3.6 million, respectively, if the EU tariff were removed.

Table 1. E.U. (15) GJ Imports.

| | NFC/Other GJ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | From World | | | | From U.S. | | | | | |
| Season | mil $ | mt | mil ps[a] | $/ps | mil $ | mt | mil ps[a] | $/ps | $ share | mt share |
| 2002 | 35.097 | 65,427 | 14.4 | 2.43 | 12.898 | 25,991 | 5.7 | 2.25 | 36.7% | 39.7% |
| 2003 | 37.278 | 68,507 | 15.1 | 2.47 | 16.383 | 30,565 | 6.7 | 2.43 | 43.9% | 44.6% |
| 2004 | 35.217 | 66,613 | 14.7 | 2.40 | 14.160 | 28,655 | 6.3 | 2.24 | 40.2% | 43.0% |
| 2005 | 45.095 | 69,924 | 15.4 | 2.93 | 10.210 | 15,868 | 3.5 | 2.92 | 22.6% | 22.7% |
| 2006 | 49.232 | 67,224 | 14.8 | 3.32 | 12.771 | 14,914 | 3.3 | 3.88 | 25.9% | 22.2% |
| 2007 | 49.696 | 73,491 | 16.2 | 3.07 | 13.552 | 21,548 | 4.8 | 2.85 | 27.3% | 29.3% |
| 2008 | 52.556 | 83,166 | 18.3 | 2.87 | 11.652 | 21,314 | 4.7 | 2.48 | 22.2% | 25.6% |
| 2009 | 42.615 | 68,187 | 15.0 | 2.83 | 13.298 | 23,928 | 5.3 | 2.52 | 31.2% | 35.1% |

Table 1. E.U. (15) GJ Imports, continued.

| | FCGJ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | From World | | | | From U.S. | | | | | |
| Season | mil $ | mt | mil ps[b] | $/ps | mil $ | mt | mil ps[b] | $/ps | $ share | mt share |
| 2002 | 64.136 | 50,278 | 64.3 | 1.00 | 20.064 | 15,734 | 20.1 | 1.00 | 31.3% | 31.3% |
| 2003 | 53.913 | 43,876 | 56.1 | 0.96 | 17.862 | 13,994 | 17.9 | 1.00 | 33.1% | 31.9% |
| 2004 | 60.999 | 56,308 | 72.0 | 0.85 | 18.181 | 15,575 | 19.9 | 0.91 | 29.8% | 27.7% |
| 2005 | 56.749 | 36,383 | 46.5 | 1.22 | 10.896 | 5,459 | 7.0 | 1.56 | 19.2% | 15.0% |
| 2006 | 76.281 | 37,817 | 48.4 | 1.58 | 14.345 | 5,960 | 7.6 | 1.88 | 18.8% | 15.8% |
| 2007 | 65.358 | 37,383 | 47.8 | 1.37 | 18.888 | 9,840 | 12.6 | 1.50 | 28.9% | 26.3% |
| 2008 | 50.215 | 38,258 | 48.9 | 1.03 | 14.672 | 10,809 | 13.8 | 1.06 | 29.2% | 28.3% |
| 2009 | 47.071 | 36,467 | 46.6 | 1.01 | 11.877 | 8,575 | 11.0 | 1.08 | 25.2% | 23.5% |

Table 1. E.U. (15) GJ Imports, continued.

| | Total GJ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | From World | | | From U.S. | | | | |
| Season | mil $ | mil ps | $/ps | mil $ | mil ps | $/ps | $ share | ps share |
| 2002 | 99.2 | 78.7 | 1.26 | 33.0 | 25.8 | 1.28 | 32.8% | 32.8% |
| 2003 | 91.2 | 71.2 | 1.28 | 34.2 | 24.6 | 1.39 | 34.6% | 34.6% |
| 2004 | 96.2 | 86.7 | 1.11 | 32.3 | 26.2 | 1.23 | 30.3% | 30.3% |
| 2005 | 101.8 | 61.9 | 1.64 | 21.1 | 10.5 | 2.01 | 16.9% | 16.9% |
| 2006 | 125.5 | 63.2 | 1.99 | 27.1 | 10.9 | 2.49 | 17.3% | 17.3% |
| 2007 | 115.1 | 64.0 | 1.80 | 32.4 | 17.3 | 1.87 | 27.1% | 27.1% |
| 2008 | 102.8 | 67.3 | 1.53 | 26.3 | 18.5 | 1.42 | 27.5% | 27.5% |
| 2009 | 89.7 | 61.7 | 1.45 | 25.2 | 16.2 | 1.55 | 26.3% | 26.3% |

[a]Assumes a metric ton is $10^0$ Brix.

[b]Assumes a metric ton is $58^0$ Brix.

Source: Global Trade Information Services, Inc (World Trade Atlas).

Table 2. World Market Sizes and Price Elasticities.

| County | 2007-09 Avg. Vol. | Price Elasticity[a] | |
|---|---|---|---|
| | mil sse ga | Guci | Brown |
| US[b] | 59.1 | -0.43 | -0.43 |
| EU[c] | 54.3 | -0.96 | -1.13 |
| Japan[c] | 18.2 | -1.59 | -0.64 |
| Canada[d] | 6.4 | -0.48 | -0.37 |
| Other[e] | 6.2 | -0.97 | -1.21 |
| Total[e] | 144.2 | | |
| U.S. & ROW Total | 89.9 | | |
| Wt Avg Excl EU | | -0.70 | -0.52 |

[a] See Footnote 3 in text; the price elasticity for the U.S. is based on an estimate of the retail price elasticity times the ratio of the FOB-retail price.

[b] Volume based on U.S. consumption reported in "Florida Citrus Outlook, 2010-11", Table 18, page 36.

[c] Volume based on Global Trade Information Services, Inc (World Trade Atlas), net imports or GJ import minus GJ exports.

[d] Volume assumes Canada has same per capita GJ consumption as the U.S.: Canada population times U.S. per capita GJ consumption.

[e] Based on total processed grapefruit utilization reported by the USDA, Foreign Agricultural Service, "Grapefruit Fresh: Production, Supply and Distribution in Selected Countries," at web site http://www.fas.usda.gov/psdonline/psdHome.aspx. From 2007-08 through 2009-10, the annual average processed (fresh) grapefruit was 1.13 million metric tons. Converting to pounds, assuming half the resulting weight is juice with $10^0$ brix and letting a single strength gallon be $10^0$ brix results in the U.S.-ROW total shown.

Table 3. Demand Parameter Estimates.[a]

| | Demand Equation | FOB Price Elast. | q1 | p | $\beta_1$[b] | $\alpha_1$ | c | t |
|---|---|---|---|---|---|---|---|---|
| EU | $\alpha1 + \beta1 (p + c)(1+t)$ | -0.96 | 54.3 | 0.93 | -49.8 | 113.0 | 0.12 | 0.12 |
| | | FOB Price Elast. | q2 | p | $\beta_2$[c] | $\alpha_2$ | | |
| U.S. & ROW | $\alpha_2 + \beta_2 p$ | -0.70 | 89.9 | 0.93 | -67.6 | 153.1 | | |

| | Price Equation | Q1 + Q2 | $\alpha_1+\alpha_2$ | $\beta_1 c (1+t)$ | $\beta_1(1+t)+\beta_2$ | p[d] | p[e] |
|---|---|---|---|---|---|---|---|
| p with tariff (t=.12) | $p = (Q_1 + Q_2 - (\alpha_1 + \alpha_2) - \beta_1 c (1+t)) / (\beta_1 (1+t) + \beta_2)$ | 144.2 | 266.1 | -6.53 | -123.4 | 0.93 | 0.93 |
| p w/o tariff (t=0) | | 144.2 | 266.1 | -5.83 | -117.4 | 0.99 | 1.01 |

[a] Quantities in SSE gallons ($10^0$); prices in dollars per SSE gallon.

[b] FOB Price elasticity times market quantity divided by price p divided by (1+t).

[c] FOB Price elasticity times market quantity divided by price p.

[d] Based on Guic estimate of price elasticities.

[e] Based on Brown estimate of price elasticities.

Table 4. Alternative Florida Movement Scenarios based on 2009-10 Season.

| | | Share of Margin Imports[a] | | |
|---|---|---|---|---|
| | 2009-10 | 0.33 | 0.50 | 0.67 |
| | million SSE gallons | | | |
| Beginning Inventory | 45.7 | 45.7 | 45.7 | 45.7 |
| Production | 58.0 | 58.0 | 58.0 | 58.0 |
| Availability | 103.7 | 103.7 | 103.7 | 103.7 |
| Movement | 61.6 | 62.6 | 63.1 | 63.6 |
| Ending Inventory | 42.1 | 41.0 | 40.5 | 40.0 |
| | weeks | | | |
| Carry Over | 35.5 | 34.1 | 33.4 | 32.7 |
| | | $/SSE gallon | | |
| Price Impact[b] | | 0.04 | 0.05 | 0.07 |

[a] Share of EU marginal imports of 3.1 million SSE gallons captured by Florida.

[b] Change in weeks from 2009-10 season times $.025/SSE gallon.