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COUNTRY MARKET POWER IN EU OLIVE OIL TRADE

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Abstract
This study investigates market power in olive oil exports in the European Union (EU) market for the major olive oil producers (Italy, Spain and Greece). The study employs the Goldberg and Knetter method to measure the exporter's market power. On the one side the exchange rates of competitor countries were used as an ideal cost shifter, while on the other side the producer price of olive oil was utilized as another cost shifter. Results show that olive oil exports are imperfectly competitive in the EU market, and Italy has higher market power compared to Spain and Greece.

JEL Classification: Q17, Q13
Keywords: Olive Oil Exports, Market Power, Exporter's Power, Partial Pass Through, Pricing to Market, the Elasticity of Residual Demand.

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1. Introduction

International agricultural markets are characterized by the existence of firms large enough to exercise market power (Sampson and Snape, 1980; Kolstad and Burris, 1986; Karp and Perloff, 1989; Pick and Park, 1991; Love and Murninigtyas, 1992; Carter et al., 1999). However, firms are not the only actors who are in a position to exert market power. "Large" countries that are able to use trade policies to enhance their own welfare (Anania, 2001), such as the EU, are in a similar position.

Two popular methods have been extensively used, the Partial Passing-Through (PPT) and Pricing-to-Market (PTM) behavior of exporting countries (Goldberg and Knetter, 1999), in order to examine competitiveness in the international market. Most studies of competition in agricultural commodities have largely focused on the USA market, which means that, within a European context, some features of the EU market, potentially different from the USA market (MacCarriston, 2002) are likely to be ignored. Thus, this study examines competition in international trade with a particular focus on the EU market.

The EU accounts for about 75% of the world production of olive oil, while Spain, Italy and Greece are the most important producers. The consumption of olive oil is almost entirely concentrated in the producing regions as well (Harwood and Aparicio, 2000). The main producing countries (Spain, Italy and Greece) are also the main exporting countries (Spyridakis, 1998).

The purpose of this study is to measure market power in the EU olive oil market. Section two presents the estimates of market power applying the Partial Pass-Through (PPT) and Pricing to Market Power (PTM) methods. Section three refers to the elasticity of residual demand as a measurement of market power by the application of the Golberg and Knetter (1999) model. Section four presents the estimation of residual demand elasticity used to measure market power for olive oil exports in EU market. Conclusions and policy implications are presented in the final section.

2. Measuring of Market Power

In the industrial organization theory, the Lerner index has been used to measure market power (Lerner, 1934), though the use of this index involves several problems. First, the estimation of the required cross elasticities for the destination market is an awkward task. Second, considerable effort is needed to measure the marginal cost using the available accounting data, as accounting data provide unreliable measures of economic marginal costs. Third, available data are usually aggregated and disaggregating them is costly and time consuming. Finally, in most cases, data are confidential, since they are critically important to competitors and related to taxation (Yang and Lee, 2001).

As a result of the aforementioned limitations, two methods for measuring market power have been extensively used. The PPT method - that has often been called "incomplete" or "partial" exchange rate pass-through in the literature. When the exchange rate changes, a firm may choose to pass the cost shock fully into its selling prices (incomplete pass-through), or to absorb the cost shock to keep its selling price unchanged (no pass-through), or some combination of the two (partial pass-through; Cho, *et al.*, 2002).

Another popular way to examine competitiveness in international trade is to consider the Pricing-to-Market (PTM) behavior of exporters. PTM occurs when an exporter holds his domestic currency export price constant or raises it for an importer who has realized a domestic currency appreciation. This has the effect of allowing the importer's domestic currency price either to fall (by proportionally less than the exchange rate change) or to remain stable (Pick and Park, 1991).

However, the PPT or PTM behavior of exporters as a proper indicator of market conditions may not be accepted for certain reasons. First, the adjustments of the markups to the marginal cost shocks, which determine the PPT and PTM, depend on the convexity of demand schedule exporters face. Second, evidence of discriminatory pricing behavior may be due to product differences across destination markets rather than strategic firm behavior (Abbott *et al.*, 1993). Finally, data limitation impedes the use of the methods, since for both methods specific firm-level data on marginal costs, prices, product differentiation of exporters must be collected. To cope with these problems, Sumner (1981) and Sullivan (1985) used data on excise taxes, which means no direct measurement of cost is required.

In order to draw more specific inferences about market power, more attention must be paid to the quantity adjustments associated with price changes. Carter and Maclaren (1997) characterized market power in terms of price or quantity competition and product differentiation. This study employed both price and quantity data to estimate the elasticity of the residual demand curve for each exporter group (Baker and Bresnahan, 1988; Goldberg and Knetter, 1999) as a measure of competition.

3. The Elasticity of Residual Demand as a Measurement of Market power

The purpose of the Goldberg and Knetter (1999) model is to estimate the elasticity of the residual curve, faced by a group of exporters. Equation (1) dictates the variables to be included in the estimation of residual demand, like the quantity exported by the export group (Q^{ex}), the demand shifters for the destination market (Z), and the cost shifters for competitor countries (W^n). Theory provides guidance for the variables to be included in the empirical specification, but does not suggest a particular functional form for the residual demand. When Equation (1) is estimated in log form, the coefficients have a direct interpretation as elasticities so that the estimating equation takes the following general form:

$$\ln P_{mt}^{ex} = \lambda_m + \eta_m \ln Q_{mt}^{ex} + \alpha_m^{'} \ln Z_{mt} + \beta_m^{'} \ln W_{mt}^{cn} + \varepsilon_{mt} \quad (1)$$

where ε_{mt} is an error term. Besides the parameters defined before, the subscript *m* indexes a specific market, defined as a destination product pair. The vector Z_{mt} denotes demand shifters for destination *m*, while the vector W_{mt}^{cn} consists of the cost shifters for *n* competitors the export group faces in the particular destination market (or in the case of α' and β' vectors of parameters). It is important to note that the vector W_{mt}^{cn} does not include any cost shifters for the export group itself. The above specification implies that separate equations should be specified for each product and destination; the prices charged by the export group P_{mt}^{ex} and the demand shifters are expressed in destination currency units.

The parameter of interest is η_m, which, given the logarithmic specification, can be directly interpreted as the residual demand elasticity. An estimate of zero indicates perfect competition. In this case, the export group faces a perfectly elastic curve; the export price does not depend on the quantity exported, but is completely determined by the costs of other competitors. The larger the absolute η value, the larger the deviation from marginal cost pricing and the more the export power the export group exercises.

The demand shifters Z_{mt} typically consist of various combinations of a time trend, real income, and price level for each destination market. The cost shifters for the *n* competitors should include measures of input prices (such as wages, prices of raw materials, energy prices). These cost shifters can be broken down into two parts; a part expressed in the competitors' currency that is not destination specific and a part that varies by destination, namely the exchange rate of the competitor country vis-à-vis the destination market. As pointed out earlier, exchange rate movements offer ideal cost shifters in the international setting, because they move the relative costs of exporting countries.

4. Empirical Application

This study employs the Goldberg and Knetter (1999) model to measure exporter power in the EU market for olive oil. In the model, Italy, Spain, and Greece are considered as the main competitive countries in the market. Thus, the empirical model consists of two countries as competitors against exporter one and the inverse demand equation is written as follows:

$$\begin{aligned} \ln P^{ex} = \lambda_{eu} + \eta \ln Q^{ex} + \beta_{1eu} \ln RGDP^{eu} + \beta_{2eu} \ln EXC_{eu}^{c1} + \beta_{3eu} \ln PP_{eu}^{c1} \\ + \beta_{4eu} \ln EXC_{eu}^{c2} + \beta_{5eu} \ln PP_{eu}^{c2} + \varepsilon_{eu} \end{aligned} \tag{2}$$

where $\ln P^{ex}$ represents the logarithm of the exporters' olive oil prices and is denominated by the US dollar. $\ln Q^{ex}$ denotes the logarithm of exporters' quantity of olive oil. $\ln RGDP^{eu}$ stands for the logarithm of real GDP of the EU, which includes fifteen countries and is denominated by the US dollar. $\ln EXC_{eu}^{c1}$ represents the logarithm of the real exchange rate of one of the competitor countries. $\ln PP_{eu}^{ci}$ denotes the logarithm of one of the competitors' producer price of olive in US dollars. $\ln EXC_{eu}^{c2}$ stands for the logarithm of the real exchange rate of the other competitors. $\ln PP_{eu}^{c2}$ represents the logarithm of the other competitor producer prices of olive in US dollars.

The quantity Q^{ex} is determined under the assumption of imperfect competition and has to be instrumented if the statistical test indicates potential simultaneity between Q^{ex} and P^{ex}. EXC_{eu}^{c1} and EXC_{eu}^{c2} are used as cost shifters of competitor one and competitor two in the EU market, respectively, and the rest of the variables are the cost shifters PP_{eu}^{c1} and PP_{eu}^{c2}.

The data used to calculate unit value of export prices in this study consist of the values and quantities of annual olive oil exports. Quantity, Value, and Producer Price of olive data were obtained from the Organization of Food and Agriculture (FAO). The real exchange rates were obtained from the USDA web site. The real GDP data were taken from International Financial Statistics, and represent annual average. The series were already deflated using 1990 as base year.

4.1. Simultaneity

If the fundamental assumption of regression analysis that the right-side variables are uncorrelated with the disturbance term is violated, then the OLS estimates are biased and inconsistent. In the model, quantity Q^{ex} is potentially endogenous because of the presence of a simultaneous relationship with own price P^{ex}. Thus, in the first step of the empirical estimation, the following reduced form equation is estimated to obtain an instrument variable for destination market equation.

$$\ln Q^{ex} = \beta_{eu}^{'} \ln IV_{eu} + \xi_{eu} \tag{3}$$

where IV denotes instrument variables - a vector of exogenous or predicted variables - which are strongly correlated with Q^{ex} and uncorrelated with the disturbances. This means that these instruments are used to eliminate the correlation between right-hand side variables and the disturbances. $\beta_{eu}^{'}$ represents vectors of coefficients to be estimated, and ξ_{eu} is an error term.

After choosing instrument variables, a simultaneity test is implemented by Spencer and Berk (1981). This is a modified version of the Hausman (1978) specification test that tests the specification of a single equation in a system of simultaneous equations using limited information techniques. However, the Hausman test needs to estimate the entire system of equations. The results of the simultaneity test are provided in Table 1.

Table 1.

Competitor Countries	Test Statistics	Simultaneity
Italy	5.976922***	Yes
Spain	-2.409439***	Yes
Greece	-2.826856***	Yes

The null hypothesis of the Spender and Berk test is no simultaneity between P_{ex} and Q_{ex}.
**** denotes that the null hypothesis is rejected at the 1% significance level.*

According to results of the simultaneity test, in all equations of exporter countries the estimated residual ξ_{eu}, is significant at 1% level. This means that there is simultaneity between their own prices P_{ex} and their own quantities Q_{ex}. In this case, OLS is not an appropriate estimation due to simultaneity so the two-stage least squares (TSLS) must be applied to estimate the equations.

Table 2.

Variables	**Italy**	**Spain**	**Greece**
Constant	-7.896962***	-16.31520***	7.783090**
$\ln Q^{ex}$	**-0.360164_{it}*****	**-0.157012_{sp}*****	**-0.079495_{gr}****
$\ln RGDP^{eu}$	0.896299***	1.612069***	0.834256***
$\ln PP^{c1}$	$0.233715_{sp(-1)}$**	0.254380_{it}**	0.443781_{it}***
$\ln PP^{c2}$	-	-0.365762_{gr}**	-
$\ln EXC^{c1}$	-	0.473361_{it}***	-
$\ln EXC^{c2}$	0.477677_{gr}***	-	-
$\ln P^{e}(-1)$	0.396278_{it}***	0.331784_{sp}***	0.258382_{gr}**
Dummy	-0.273740***	-	-
R^2	0.95	0.95	0.90
Adjusted R^2	0.93	0.93	0.88
F	37.70***	61.23***	37.70***
DW	1.54***	1.97**	1.54***

Note: ** *and* *** *denote that the null hypothesis is rejected at the 5% and 1% significance level, respectively.*

As can be seen in Table 2, the coefficient estimator of export quantity denotes the elasticity of residual demand in the EU market. All quantity coefficients (*lnQ^{ex}*), perceived as the residual demand elasticity, display negative signs and all of them are statistically significant at 1% level. The corresponding residual demand elasticities in the EU market for Italy, Spain and Greece are -0.36, -0.15, and -0.07, respectively. The results imply that Italy has the highest market power, and Spain has higher market power than Greece. In addition, the Real GDP of the EU (*lnRGDP*) exhibits positive signs in all equations, as was expected, and is statistically significant at 1% level.

In the model, producer prices and real exchange rates of the competitor countries are used as a cost shifter. The coefficient of the lagged (t-1) producer prices of Spain ($lnP^{e}(-1)$) has a positive sign, and is statistically significant at 1% level, which means that producer prices of Spain in t-1 year exhibit a positive relationship with the export price of Italy. In other words, when the producer prices in Spain (a country that competes with Italy) increase, the exporter prices of Italy increase too. In the same equation, the coefficient of the real exchange rates of Greece ($lnEXC^{c2}$) has a positive sign and is significant at 1% level. This means that as a competitor's currency is appreciated, the competitor's cost in exports increases and sequentially Italian exporters can charge a higher price. Nonetheless, the coefficients of the producer prices of Greece ($lnPP^{c2}$) and the real exchange rates of Spain ($lnEXC^{c1}$) are statistically insignificant, so they are eliminated from the equation for Italy.

The results of the equation for Spain demonstrate that the coefficient of Italy's producer prices ($lnPP^{c1}$) displays a positive sign and is significant at 5% level. The coefficient of the exchange rates for Italy ($lnEXC^{c1}$) exhibits a positive sign and is significant at 1% level. In the same equation, the coefficient of the producer prices of Greece ($lnPP^{c2}$) has a negative sign, and is statistically significant at 5% level. However, the coefficient of the exchange rates of Greece is insignificant, thus the variable $lnEXC^{c2}$ is eliminated from the equation. In the equation for Greece, the coefficient of Italy's producer prices ($lnPP^{c1}$) displays a positive sign and is significant at 1% level. However, the coefficients of Spain's producer prices and Italy's and Spain's exchange rates are insignificant, so the variables $lnPP^{c2}$, $lnEXC^{c1}$ and $lnEXC^{c2}$ are dropped from the equation.

In all models, R-squared and adjusted R-squared indicate that independent variables explain the dependent variable adequately. In addition, results of the F statistic tests are statistically significant at 1% level. The results of the Durbin Watson statistic test for all equations are significant, meaning that there is no autocorrelation.

5. Conclusions

In this study, the elasticity of the residual demand model was used to measure market power in the EU olive oil market. The model is based on Goldberg and Knetter's (1999) method. The main advantage of the method is that exchange rates are used as an ideal cost shifter and market power can be estimated without depending on detailed cost shifters of competitors. In this study, real exchange rates are used as more appropriate cost shifters as the monetary authority of each country describes money supply independently. Nevertheless, the exchange rate alone cannot fully explain exporter costs. Producer prices of olive oil were used as another explanatory variable of cost shifter in the model.

The results of this study support the proposition that the EU exports market for olive oil is imperfectly competitive. In particular, the results indicate that Italy dominates the price and that Spain and Greece form a competitive relationship. Italy has a higher market power compared to its competitors.

Such results indicating the relationship between competitors' costs and exporters' prices are very important for competition strategies. For instance, there is a positive relationship between Greek exchange rates and Italian exporters' prices. This relationship can be attributed to the fact that the buyers of Greek olive oil are Italian firms (Baourakis *et al.*, 2001). This means that as the Greek currency appreciates, Italian exporters charge higher prices, due to the increase in their costs from importing olive oil in bulk from Greece. In addition, there is a positive relationship between Italian producer prices and exporters' prices. It can be inferred that as Italian exporters' costs increase, Greek exporters can charge higher prices. Results for Spain indicate that Spanish exporters' prices have a negative relation with Greek producer prices. The equation for Greece shows that as Italian producer prices increase, Greek exporters' prices increase due to Greek olive oil exports to Italy.

Another important result of this study concerns Spanish exports. Data from 1970 to 2001 show that although Spain's export quantities are larger than those of Italy, Italy has higher market power than Spain. Thus, although a decline in a country's market share indicates a relative decline in its exports, this does not imply a decline in the competitiveness of its products in the international market (Mattas and Galanopoulos, 1996).

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