Significant Determinants of Price for EU Product Denomination of Origin Cheeses

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Abstract

There has been a great deal of theoretical literature published on geographic indications. The objective of this paper is to analyze one particular food product category, cheese, that has been widely registered in the EU for GI protection and analyze the impact on price of supply control variables such as quantity, cheese hedonic quality attributes such as country of origin, type of milk, and age, and the price of substitutes such as US artesian and farmstead cheeses on the price of imported cheeses. Our empirical results indicate that the economic magnitude of an additional unit of land for the cheese PDO results in a very small incremental increase in price. Trade disputes may occur over certain well recognized PDO cheeses such as Parmesan but, in general, the main EU PDO cheeses are not likely to be affected by US competition.

Significant Determinants of Price for EU Product Denomination of Origin Cheeses

Josling's Presidential Address on Geographical Indications (GI) discusses the differences between the United States (US) and European Union (EU) regarding the legal and economic aspects of GI's as Trade-Related Intellectual Property (TRIPs). He stated that "a quick glance at the scale of production of many GIs suggests that they are not geared toward the global market" (p.360). Furthermore, Bureau and Valceshini suggest that the "role of the EU system of voluntary labels as a significant trade barrier seems relatively limited" (p.75). However, as Josling notes, the conflict between the US and EU is due, in some part, to the perception that EU producers fear competition from US firms or that US consumers are paying a higher price for EU imports that are similar to US products. One key issue described in this literature is the ability of the producers and firms within the GI to restrict supply due to the unique inputs or processes used to create a product labeled by geography (or *terroir* as noted by Josling).

In 1992 the EU established PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) labels for all agricultural products by Regulation No. 2081/92 of the Council of the European Commission (EC). Products with PDO names have inherent characteristics resulting exclusively from the terrain (air, climate, land and native species) and the producers' know-how with regard to production practices from a specific geographical area.

The objective of this paper is to analyze one particular food product category, cheese, that has been widely registered in the EU for GI protection and analyze the impact on price of supply control variables such as quantity, cheese hedonic quality attributes such as country of origin,

type of milk, and age, and the price of substitutes such as US artesian and farmstead cheeses on the price of imported cheeses.[1]

An extensive data set of EU PDO PGI's is created that includes quality characteristics from the original application, country of origin, the quantity of the PDO / PGI within the country, and a substitute cheese produced within the US that has similar attributes as based on the quality characteristics identified in the PDO application. The regression results are quite robust and find that quantity of cheese produced, country of origin (Italy and Spain), and the price of a US domestic substitute cheese are significant in explaining the variability in US imported PDO cheese prices.

Background Information on PDO / PGIs

Lence et al. note that the stronger the level of property rights for intellectual property (such as registered GI's) leads to greater economic incentives for producers to develop PDO / PGI's. Producer associations in the EU have registered more than 800 products as PDO / PGI.[2] The welfare effects of PDO / PGI with regard to signaling quality has been shown by several authors (for example, see Moschini, Menapace, and Pick; Bonnet and Simioni; Loureiro and McCluskey) and a number of case studies have been written to study how they actually work in practice within the geographic region (for example, see Hayes, Lence, and Stoppa).

Hayes, Lence, and Stoppa described and analyzed the economics of Farmer-Owned Brand (FOB) referring to the geographical indications by the EU and marketing orders in the case of the United States. They used four case studies in order to address the success of some

[1] For the rest of the paper, we switch to using PDO/ PGI as opposed to GI because that is the terminology for cheese used within the EU.

[2] Appendix A contains a list of these products and further discussion on the process.

FOBs through supply control mechanisms and identified four ways to legally control supply: 1) restrict the production to a specific region (based on the unique attributes of the region); 2) limit the number of producers; 3) implement strong production and/or quality standards on the product; and 4) require some ingredients controlled by the producer. The authors recommend regulation to protect property rights in order to restrict imitators from entering the market.

The literature suggests that the success of a PDO/PGI is dependent upon its ability to effectively control supply and provide a product differentiated by local geographic factors such as weather, climate or production process (e.g., know-how). In other words, by limiting the amount of land that can be used to produce the PDO/PGI, it may be possible to increase the price paid to producers if consumers perceive value associated with it and demand increases for that product through the marketing of the attributes. It is relevant to assume that the available productive land is fixed as defined by the EU 1992 Quality Label legislation for each of the producer organizations. The implication of a fixed factor permits the producers to control supply in order to increase the PDO/PGI cheese prices.

Cheese as PDO / PGI's

Cheese is extensively traded between the US and EU. France, Italy and Spain are responsible for 50% of the total cheese exported to the US in 2007 (FAOSTAT 2008). The CLAL (Consultancy and Market Research Food and Dairy) of Italy reported that exports to the US of Parmigiano Reggiano and Grana Padano, Gorgonzola, Asiago (including Montasio, Caciocavallo and Ragusano), and Provolone constitute 18.04%, 2.08%, 21.66%, and 21.88% of the total exports, respectively, in 2005. The production of PDO/PGI cheeses was 196,101 tons, representing 18% of the total production of cheese in France. This required 72% of the total milk production of the country to produce these cheeses and approximately 10,000 tons were exported in 2005. Comte,

Cantal, Roquefort, Reblochon, Saint-Nectaire, Camembert de Normandie, Munster, Brie de Meaux, Blue D'Auvergne and Morbier are the premier PDO/PGI cheeses in France, representing 78% of total PDO/PGI production.

Doster discusses the EU decision to extend protection to cheeses to the Article 23 of TRIPS in Cancun, Mexico in 2003. There was no agreement on this issue because the US refused to accept the EU proposal indicating that the policy is strictly protectionism. For example the EU proposal will not allow US companies to use anglicized terms like Parmesan for cheeses because it is derived from Parmigiano Reggiano and also any of the words "style" or "imitation" before a GI name.

The argument used by the EU for this proposal is that it is crucial to protect consumers from misleading information due to the fact that cheeses are much altered from the original in the manufacturing process. The qualities are completely different from the originals. Therefore those cheeses should not be named under their original cheese. For example, Italian Mozzarella made from buffalo's milk is tender, nutty and is sold fresh packed in whey. However, the American equivalent is made from pasteurized milk, is drier and is packed and preserved in plastic bags. The EU traditional cheese producers would be replaced by more efficient standardized corporations that would process these cheeses in large quantities. Doster suggests that the US would benefit from an agreement with the EU. First the US consumers would benefit from acquired information and second the US industry would benefit by labeling their product under the GI system.

Model and Methodology

By limiting the area of production producers/processors fix the quantity of product available in the market which causes the supply curve to be vertical at that point. Any future increase in demand will have a higher price. Product differentiation makes demand more inelastic (steeper demand curve) and through product promotion the demand of these higher differentiated products increases so the combined effects of an increase in price and a fixed quantity of supply yields producers surplus. Thus, the theoretical model used in this research incorporates quality attributes, supply control and substitutes variables and is represented as the following

$$(1)\quad P = f(\text{hedonic, supply control, substitutes})$$

where P is the price of the PDO product. The hedonic variables measure the unique attributes of the terrain or producers know-how that enable the PDO to be unique to consumers and therefore create demand for the product. The supply control variables measure the ability of producers to control supply. The substitute variable measures the substitute product for the PDO.

The PDO label names were obtained from each of the producers' association website and/or the promoting organizations in the respective countries from the official EU rural development and agriculture site (http://ec.europa.eu/agriculture/foodqual/quali1_en.htm). The contact information for each group of producers/processors association was obtained from internet searches of their webpage and through some of the promotional information in various countries.[3] An electronic survey was designed to collect information on EU PDO / PGI's. In order to increase the response rate the surveys were translated to their respective languages

[3] For example, some of the websites are Asociación para la Promoción de Quesos de España (Association for the Promotion of Spanish Cheeses-http://www.asocpromocionquesos.es/index.html); PDO/PGI official government websites such as Il Portale del Formaggio in Italy (The Portal of Cheese-http://www.formaggio.it/) and Maison du Lait in France (House of Milk- http://www.maison-du-lait.com); tourism promotion websites such as Serviços Informação e Turismo S.A. in Portugal (Tourism and Information Services S.A.-http://www.lifecooler.com/) and non-profit organization such as Origin Food (www.origin-food.org).

according to the contact information data base. The languages included Dutch, English, French, German, Greek, Italian, Polish, and Spanish. A secure website was created whereby respondents could enter the information online or over the telephone if they so desired.[4]

The initial survey responses for cheese included 45 from France, 33 (Italy), 20 (Greece), 20 (Spain), 12 (Portugal), 12 (United Kingdom), 6 (Austria), 4 (Germany), 4 (The Netherlands), 2 (Denmark), 2 (Poland), and 1(Belgium, Ireland, and Sweden, respectively). However, it was not possible to construct complete data on each cheese for the theoretical model. In particular, the variable measuring production volume for the PDO (there were no PGI cheeses) could not be found for cheeses from Belgium, Denmark, Germany, Greece, Ireland, Poland, Sweden, and The Netherlands as well as some cheeses from France, Italy, Portugal, and Spain. Complete data on 34 cheeses from France, Italy (21 cheeses), Portugal (7 cheeses) and Spain (21 cheeses) were obtained from a total of 83 observations comprising 51% of all PDO cheeses in the EU but 77.4% of total PDO cheese exports to the United States in 2005.

This data set was used to construct a model using our theoretical variables and is specified as follows

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[4] The original intent of the research was to look at all EU PDO/ PGI's and use a dummy variable on each product category. Six separate surveys were made to address producers' organizations in the following categories: cereal and vegetables, cheeses, fresh meat, fruits and table olives, meat based products and olive oil. Fruit and table olives were combined in one category because the production process on both products is very similar attributed to the perennial characteristic in both products. In the same way cereal and vegetable were collected in one category because these are annual crops with similar production process. However, low response rate in the other categories coupled with a growing realization that cheese was an interesting category to analyze caused us to focus on this single category. The authors would like to thank several individuals who responded to our initial survey and helped us establish contacts with additional respondents. In particular, Michael Lough, Juan Antonio Espejo Calvo, and Emmanuelle Gallienne were especially helpful. Mr. Michael Lough is an experienced professional in the quality label system in the UK and the contact person for the Beacon Fell Lancashire Cheese. Mr. Juan Antonio Espejo Calvo from the Consejo Regulador de la Denominación Especifica del Esparrago de Huérto Tájar is an expert in the PDO legislation. He has worked on it since 1993 and he has promoted 10 PDOs in the south of Spain. Mrs. Espejo Calvo introduced and explained very well the different levels of legislation and their contents during further communications. Ms. Emmanuelle Gallienne from Service Consommateurs Société (Roquefort Society Customer Service) provided the official government website for the PDO/PGI statistics in France. The high response rate would not have been possible without their assistance.

$$(2)\ P_i = \beta_0 + \beta_1 Q_i + \beta_2 AG_i + \beta_3 PS_i + \beta_4 Italy_i + \beta_5 Portugal_i + \beta_6 Spain_i + \beta_7 Sheep_i + \beta_8 Goat_i + \beta_9 Mix_i + e_i$$

where P_i is the imported US price paid for each of the i^{th} PDO labeled product ($i = 1, \ldots, 83$), the betas are the parameters, and e_i represents the error term. The P prices were measured as the price per pound for cheese collected from eleven different US firms that sold PDO cheeses and had such cheese available in June 2008. Table 1 describes each variable in the model and its mean and standard deviation.

There is little theoretical guidance with respect to using independent variables that would capture the supply control factor. Hayes. Lence, and Stopa showed that in order to assert supply control FBO must be based on some fixed attribute. For example, specifying that a branded product can only come from a specific area justifies the restrictions due to specific attributes of the region. The authors specify that the government is legal support to FBO is basically to assign property rights for their products. Thus they can administer them in a profitable way, a fact that would most likely cause producers to limit supply as shown in the Parma Ham case study mentioned in their paper. Lence et. al emphasized that reduction in land used and reduction in productivity is clearly a producers' response in order to limit supply and achieve more profits from an price increase. The theoretical variable for supply control is quantity (Q_i) which represents the total cheese produced in the PDO.

The hedonic theoretical variables include measures of age, country-of-origin, and the source of the milk to produce the cheese. AG_i represents the ripened age at retail for each of the PDO labeled cheeses.[5] Age was obtained from the importer's specification of the products if the

[5] In general, all cheeses are organized into eight groups according to the German cheese standards, considering the content of water in the fat-free cheese mass. Those with the highest content of dry mass generally mature from three months up to a year. Hard cheese has a maximum amount of water of 56%. Sliced cheese has 54% to 64% of water content and matures quicker and slices more easily. Semi-hard sliced cheese has a water content from 61% to 69%

producers provided this data. The minimum ripeness time was taken from the book entitled *The Cheese Lover's Companion* (Tyler-Herbst and Herbst). Country of origin was obtained from the PDO section in the EU Agriculture and Rural Development webpage. Type of milk was obtained from each PDO webpage. In the event the PDO did not have a webpage, this information was obtained from the book *The Cheese Lover's Companion.*

Italy, Portugal and Spain are binary variables with value of 1 or 0 of the i^{th} observations depending on the country of origin of the cheese. France was left out for regression purposes because its cheeses are so well known and therefore France constitutes a good point of comparison.

The cheeses are produced from raw or pasteurized cow, sheep, goat, and buffalo milk made in a specific geographical area and/or from specific breed animals such as Ossau-Iraty-Pyrenees cheese that are made exclusively from Basco-Béarnaises or Manech sheep's milk. The milk is heated or pasteurized and then the curd formed with animal rennet (found in the digestive system of young calf, sheep or goat). The curd is used to produce, for example, Cabrales (sheep's rennet) or with plant enzymes used to produce, for example, Queso la Serena (from the flowers of *Cynara Cardunculus*). The curd is obtained and acidified, salted, molded or pressed depending on the type of cheese resulting in fresh cheese. The fresh cheese is salted (depending on the variety) and stored for ripening in a controlled chamber or natural environment, like the Roquefort cheese stored in the cellars in the Roquefort village. The ripeness time depends on the specification of the cheese. However some cheeses are sold fresh (non-ripe cheese) or matured

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and most of them are produced in low fat or double cream versions. Soft cheese is characterized by a water content higher than 67% and the total amount of fat is lower than harder cheeses. Pasta Filata is a type of cheese that, after the acidification process, is put into a scalding hot liquid, then kneaded and made into strings with a water content from 62% to 76%. Sour cream cheeses have water content from 60% to 73% and are low in fat and high in protein. Leftovers of different kinds of mature cheeses are ground, salted and heated up to obtain processed cheese which exists in all fat categories (Iburg). Fresh cheese usually has around 80% water content and has not matured.

(ripe cheese). Sheep, Goat and Mix are dummy variables with values of 1 or 0 depending on the type of milk used to make the cheese. Cow milk cheeses are the most consumed and therefore provides a good point of comparison.

Locally produced artesian or farmstead cheeses produced locally, made from the same type of milk, and belonging to the same type of cheese or that were derived from specific European cheeses were considered substitute products. The criteria used to select the substitute cheeses were type of milk, texture and style of cheeses. Substitute cheese is defined as an artesian or farmstead cheese produced locally that has similar characteristics in term of type of milk, style or manufacture process to the PDO cheese. The prices were obtained from gourmet or specialty food online stores for the last two weeks of June 2008. Prices are reflected in US dollars per pound and were calculated by dividing total price by the total weight of each item. PS_i represents the price of a substitute artesian or farmstead cheese produced in the United States. The states that were chosen were California, Minnesota, Texas, Vermont, Virginia, and Wisconsin which had over 80% of all US licensed artesian cheese makers in 2007.

Results

The regression model was estimated in STATA version 9. The Breusch-Pagan test was used to test for heteroskedasticity and the test result does not reject the null hypothesis of homoskedasticity so that heteroskedasticity is not a problem for this data set. Consequently, ordinary least squares estimation is used. The estimation results from equation 2 are presented in table 3. The regression R^2 is 0.4796 indicating a good degree of fit for this cross sectional data set.

Quantity Variable

The variable associated with supply control, quantity, has the expected negative sign which means that for every 1% increase in market share, the PDO cheese price decreases by $0.095 per pound, holding everything else constant. We assumed a PDO exports approximately 15% of their production (Asiago, Caciocavallo, Grana Padano, Gorgonzola, Montasio, Parmigiano Reggiano, Provolone, and Ragusano exported this amount in 2005). Therefore, the exports would increase by 2,401,080 pounds (16,007,200 average pounds multiplied by 15%). The economic impact of a one percent increase in quantity represented by an increase in 24,108 pounds in exports leads to a decrease of $2,281 of total revenue of cheese per year. This would be a small loss to producers.

The total amount of land in a PDO is described in the EU Regulation No. 2081/92 as a geographical location of each PDO (specified in communes in France, provinces in Italy, municipios in Spain and concelhos in Portugal). However, depending upon the country, there are other agricultural activities and some land is not adaptable for traditional dairy production. For example, from the 100,500 hectares registered for the production of Livarot cheese in the communes of Calvados, Eure, and Orne only approximately 50,000 are under production annually. It must be remembered that producers in a PDO have an inelastic supply curve. Furthermore there is no incentive to increase supply because the know-how or process may limit the introduction of more productive technology. Thus, it is not surprising to see small changes.

Hedonic Quality Variables

The estimated coefficient for age is statistically significant at the 90% significant level. As one might suspect, a cheese that is more mature, like wine, has a greater value. Age affects positively the PDO cheese price as expected given that most of the cheeses acquire their sensorial

characteristics (aftertaste, flavor, odor and texture) during the aging process which differentiates them and makes a particular cheese desired by the consumers. The estimated result showed that a 1 year increase in the age leads to $4.23 increase in the PDO cheese price per pound, holding everything else constant. The age variable coefficient represents a reasonable magnitude. For example, a 1 year Queso Manchego's per pound cheese price is about $2.24 dollars higher than a 3 month Queso Manchego's cheese price.

The estimated coefficients for Italy and Spain are statistically significant at the 90% significance level. The small representation of Portuguese cheeses in the data base (7 observations) might be causing its insignificance. The PDO price per pound of an Italian cheese is $7.72 less per pound compared to a French cheese, holding everything else constant. Spanish cheeses are $9.48 less expensive than French cheeses, holding everything else constant. These results are not surprising due to the fact that most of the best known cheeses in the world such as Roquefort, Brie, Banon and Camembert come from France. The economic significance of French cheeses in the international market is higher compared to the other countries. France exported 562,330 tons of cheese followed by Italy (221,240 tons), Spain (57,850 tons) and Portugal (2,620 tons) in 2005 (FAOSTAT-Agriculture 2008).

The type of milk variables (sheep, goat and mix) are statistically significant at the 85% significance level and while it may be true that consumers are more aware of the final output characteristics (odor, taste, texture, color and smell) rather than in the input type used to produced the cheeses, this significance suggests otherwise. In addition, the imported cheese market is dominated by cow milk cheeses. The US imported 174,780 tons of cheese made from cow milk. Approximately 19% and 0.05% of the cheese is made with sheep milk and goat milk, respectively, mostly from the EU in 2005 (FAOSTAT-Agriculture 2008).

Price of Substitutes Variable

The sign on the estimated coefficient on the price of substitutes (artesian or farmstead cheeses) suggests that as expected artesian or farmstead cheeses are substitutes for PDO cheeses. Given the nature and differentiation of both types of goods, the results suggest that both cheeses are substitutes. The fact these cheeses are substitutes is reflected in the fact that both cheeses are sold for about the same price in the US. Considering an average PDO cheese price of $21.92 per pound and $21.11 as an average price of a substitute US artesian cheese per pound, the results are consistent with these values.

Artesian farmstead cheese production has increased significantly in the US since 2003 to almost 900 million pounds in 2006. On per capita basis, consumption of those cheeses have increased five times faster than the total cheese consumption. A survey of 160 cheese makers by the University of Nebraska Food Processing Center in 2007 reported that there were no price leaders in the market which implied that demand is relatively inelastic. In addition, the cheese makers were not worried about imported PDO cheeses.

Implications

Cheese is a product category in the EU for PDO certification. Most cheeses are not produced in sufficient quantities for export purposes. Thus, it is not surprising that an artesian or farmstead cheese industry has developed in the United States. These cheeses have very similar characteristics to PDO cheeses produced in the EU. Our empirical results indicate that the economic magnitude of an additional unit of land for the cheese PDO results in a very small incremental increase in price. In addition, French cheeses, greater aging of the cheese, and type

of milk matters but it is not as important. Trade disputes may occur over certain well recognized PDO cheeses such as Parmesan but, in general, the main EU PDO cheeses are not likely to be affected by US competition.

References:

Bonnet, C., Simioni, M., 2001. Assessing consumer response to Protected Designation of Origin labelling: a mixed multinomial logit approach. European Review of Agricultural Economics 28(4), 433-449.

Babcock, B. A., Clemens, R., 2004. "Geographical Indications and Property Rights: Protecting Value-Added Agricultural Products," Midwest Agribusiness Trade Research and Information Center (MATRIC) Publications 04-mbp7, Midwest Agribusiness Trade Research and Information Center (MATRIC) at Iowa State University.

Bureau, J. C., Valceschini, E., 2003. European food-labeling policy: successes and limitations. Journal of Food Distribution Research 34(3), 70-76.

Consultancy and Market Research Food and Dairy (CLAL), 2008. Italy Statistics. Accessed July, 2008. Available at http://www.clal.it/en/index.php?section=chisiamo

Doster, I., 2006. A cheese by any other name: a palatable compromise to the conflict over Geographical Indications. Vanderbilt Law Review 59(3), 873-903.

European Commission (EC), 2006. Forms annexed to Commission Regulation (EC) No 1898/2006 laying down detailed rules of implementation of Council Regulation (EC) No 510/2006. http://ec.europa.eu/agriculture/foodqual/quali1_en.htm

European Commission (EC), 2007. Fact sheet-European policy for quality agricultural products. Accessed July 2008, available at http://ec.europa.eu/agriculture/publi/fact/quality/2007_en.pdf

European Commission (EC), 2008. PDO/PGI/TSG Downloads. Accessed July 2008, available at http://ec.europa.eu/agriculture/foodqual/protec/logo_en.htm

European Commission (EC), 2008. Protected Designation of Origin (PDO) / Protected Geographical Indication (PGI). Accessed August, 2008, available at http://ec.europa.eu/agriculture/qual/en/1bbaa_en.htm

Food and Agriculture Organization of the United Nations **(**FAOSTAT), 2008. Accessed July, 2008, available at http://faostat.fao.org/default.aspx

Fox, P. F., Guinee, T. P., Cogan, T. M., McSweeney, P. L. H., 2000. Fundamentals of Cheese Science. Aspen Publishers, Gaithersburg, MD.

Hayes, D., Lence, S., Stoppa, A., 2005. Farmer_Owned Brands? Agribusiness: An International Journal 20, 269-285.

Iburg, A. 2004. Dumont's Lexicon of Cheese. Rebo International b.v., Lisse, The Netherlands.

Josling, T. E., 2006. What's in a name? The economics of Geographical Indications for foods and beverages. IIIS Discussion Paper No. 109. Available at http://ssrn.com/abstract=922267

Lence, S. H., Merette, S., Hayes, D. J., Foster, W., 2007. Collective marketing for geographically differentiated agricultural products: welfare impacts and policy implications. American Agricultural Economics Association, vol. 89(4), 947-963.

Loureiro, M. L., McCluskey, J. J., 2000. Assessing consumer response to Protected Geographical Identification labeling. Agribusiness 16(3), 309-320.

Marette, S., Clemens, R., Babcock, B. A., 2007. The recent international and regulatory decisions about Geographical Indications. Iowa State University Staff General Research Papers 12706. Available at http://www.econ.iastate.edu/research/webpappers/paper_12706.pdf

Secretaría General de Agricultura y Alimentación (MAPA), 2005. Datos de las Denominaciones de Origen Protegidas (D.O.P.) e Indicaciones Geográficas Protegidas (I.G.P.) de Productos Agroalimentarios. Accessed June, 2008. Available at http://www.mapa.es

Tyler-Herbst, S., Herbst, R., 2007. The Cheese Lover's Companion. HarperCollins Publishers, New York, NY.

Table 1. Variable, Definition, Mean, and Standard Deviation for the Dependent and Independent Variables Use in the Model

Variable	Variable Definition	Mean (Std. Dev.)
P	Unit price of PDO cheeses, dollars per pound	21.92 (8.49)
Q	PDO production of the cheese, tons	7,276 (22,368)
PS	The price of substitutes is calculated as the unit price of artesian or farmstead local produced cheeses expressed in US dollars per pound	21.11 (7.66)
France	Dummy variable is 1 if the country of origin is France; 0 if otherwise	N/A
Italy	Dummy variable is 1 if the country of origin is Italy; 0 if otherwise	N/A
Portugal	Dummy variable is 1 if the country of origin is Portugal; 0 if otherwise	N/A
Spain	Dummy variable is 1 if the country of origin is Spain; 0 if otherwise	N/A
Cow	Dummy variable is 1 if the milk input for the cheese is from a cow; 0 if otherwise	N/A
Sheep	Dummy variable is 1 if the milk input for the cheese is from a sheep; 0 if otherwise	N/A
Goat	Dummy variable is 1 if the milk input for the cheese is from a goat; 0 if otherwise	N/A
Mix	Dummy variable is 1 if the milk input for the cheese is from a mix of cow, sheep, or goat milk; 0 if otherwise	N/A
Age (AG)	Age for the cheese, expressed in years	0.2811 (0.4088)

Table 2. PDO Registered Products and Data Used in this Study

PDO Name	Country	PDO Name	Country
Abondance	France	Reblochon	France
Banon	France	Roquefort	France
Beaufort	France	Sainte-Maure	France
Bleu d'Auvergne	France	Saint-Nectaire	France
Bleu de Gex Haut Jura	France	Selles-sur-Cher	France
Bleu des Causses	France	Vacherin Mont-d'Or	France
Brie de Meaux	France	Tomme de Savoie	France
Camembert de Normandie	France	Tomme des Pyrénées	France
Cantal	France	Valençay	France
Chabichou du Poitou	France	Afuega´L Pitu	Spain
Chaource	France	Arzúa-Ulloa	Spain
Chevrotin	France	Cabrales	Spain
Comté	France	Gamonedo	Spain
Crottin de Chavignol	France	Idiazábal	Spain
Epoisses	France	Mahón-Menorca	Spain
Fourme d'Ambert	France	Queso de Cantabria	Spain
Laguiole	France	Queso de L'alt Urgell	Spain
Langres	France	Queso de La Serena	Spain
Livarot	France	Queso de Murcia	Spain
Morbier	France	Queso de Murcia al Vino	Spain
Munster	France	Queso de Valdeón	Spain
Ossau Iraty	France	Queso Ibores	Spain
Picodon	France	Queso Majorero	Spain
Pont-l'Evêque	France	Queso Manchego	Spain
Pouligny Saint-Pierre	France	Queso Tetilla	Spain
Queso Zamorano	Spain	Castelmagno	Italy
Quesucos de Liébana	Spain	Fiore Sardo	Italy
Roncal	Spain	Fontina	Italy
San Simón da Costa	Spain	Gorgonzola	Italy
Torta del Casar	Spain	Grana Padano	Italy
Asiago d'Allevo	Italy	Montasio	Italy
Asiago Pressato	Italy	Monte Veronese	Italy
Bra	Italy	Parmigiano Reggiano	Italy
Caciocavallo Silano	Italy	Pecorino Romano	Italy
Pecorino Siciliano	Italy	Ragusano	Italy
Pecorino Toscano	Italy	Raschera	Italy
Provolone Valpadana	Italy	Taleggio	Italy

Table 2 continued

Toma Piemontese	Italy
Valtellina Casera	Italy
Queijo de Azeitão	Portugal
Queijo de Évora	Portugal
Queijo de Nisa	Portugal
Queijo São Jorge	Portugal
Queijo Serpa	Portugal
Queijo Serra da Estrela	Portugal
Queijos da Beira Baixa	Portugal

Table 3. Regression Coefficients, Standard Errors, and Hypothesis Test Results for the Model

Variable	Coefficient	Standard Errors
Intercept	17.48	2.82
Price of Substitute (PS)	0.31*	0.11
Age (AG)	4.23*	2.10
Quantity (QD)	-0.095*	0.05
Italy	-7.72*	2.14
Portugal	-2.96	3.10
Spain	-9.48*	1.98
Sheep	3.19	2.18
Goat	4.48*	1.82
Mix	4.08	2.76

***, **, and * denote significance at the 1%, 5%, and 10%, respectively.

Appendix A. Description of the History of PDO's and PGI's

A geographical designation protection to regional groups of producers has been implemented for centuries in France to protect agricultural products against imitations of those products. For example, the guarantee of protection to Roquefort cheese was given for perpetuity by the Parliament of Toulouse to the inhabitants of Roquefort-sur-Soulzon in the XVII century. In the 1800s, Napoleon III established the Grand Crus of the Bordeaux area as a starting point for the geographical designation for protection of products in Europe. By the end of the 19th century, the French government had created the AOC (Appellation d'Origine Contrôlée) in order to ensure fair competition for producers and guarantee the origin of wines for consumers. This concept was then adopted by other countries in Europe.

Geographical indication issues are addressed in the TRIPS (Trade-Related Aspects of Intellectual Property Rights) Agreement in the WTO. Under the TRIPS Agreement, Article 22 defines geographical indications as "identification of a good originated in the territory Member, or region/locality, where quality, reputation or other characteristic of the good is attributable to its geographical origin and stated a standard level of protection" (TRIPS-Annex 1C). They have to be protected in order to prevent unfair competition and misleading of consumers. Wines and spirits have a higher level of protection even if misuse would not cause any misleading of consumers with some exceptions which are under international negotiation at the present time.

For example, if a trademark identifying a good was applied before the geographical indication is protected, then implementation of the geographical indication "shall not prejudice eligibility or registration or/and the right to use of a trademark identical or similar to the geographical indication." Currently, there are two issues of debate on the TRIPS Agreement

related to geographical indications. These are 1) the multilateral register for wines and spirits that consist in creating a multilateral system for notifying and registering geographical indications and 2) extending the higher level of protection to all products (TRIPS: Geographical Indications 2005).

The EU, Switzerland and other countries have advocated extension of the Article 23 (intellectual protection of wines and spirits) protection to all products, a multilateral system of notification and registration for all products that would have effect on participant and non-participant countries and prohibited the use of well-known geographical indications in third countries. On the other hand, Australia, Canada, the US and other countries argue that actual protection is good and higher protection would disrupt actual marketing practices and added protection as either unnecessary or undesirable, blocking competition from new source of foods and giving an advantage to European producers (Josling).

For example, climatic conductions of a production area are favorable for abundant and high-quality fodder used to feed dairy cows and for development of the microbiological agents that give organoleptic and color characteristics to Gorgonzola cheese. All the process of production happens in a specific area in Italy. PGI products have specific characteristics or reputation linked to a geographical region and are at least produced and/or processed and/or prepared in that particular region. For example, the PGI label accredited to Mortadella Bologna is due to the traditional production consisted exclusively in the technical skills of the operatives. A general harmonized framework for protecting designations of origin throughout the EU had as an overall objective of encouraging producers to diversify their agricultural production, improve their income and revitalize rural economies as well as informing consumers of the specific

characteristics of the products (Fact Sheet-European Policy for Quality Agricultural Products 2007).

Once a specific brand name has been approved by the EC, all the producers/processors in the designated region who fulfill all the specifications of the product can market under the PDO or PGI registered name. This framework gives producers/processors property rights in order to prevent imitations, the ability to communally market a differentiated product and the capacity to identify niches among consumers in order to capture a price. Given that the labeled product can only come from a select geographical area and must meet specific requirements based on the attributes of the region, supply control is asserted under the PDO/PGI protection system.

In 1992 the EU introduced a voluntary system to protect and promote traditional and regional products under a PDO/PGI designation. The regulations were updated in 2006 in order to simplify the system and receive applications from non-EU countries producers/processors groups ruled by the World Trade Organization. In order to apply for a PDO/PGI label certification a group of producers and/or processor from the EU must characterize their product's specification accurately and apply to the correct EU Member State. Any other non-EU country producers and/or processor groups must submit application directly to the EC. Application forms specified in Annex-I in the Commission Regulation (EC) No 1898/2006 are available to the public in the EC website (http://ec.europa.eu/agriculture/foodqual/quali1_en.htm).

For example, Café de Colombia (Colombian Coffee http://juanvaldez.com/) is a PGI label given to the groups of producers of the Federación Nacional de Cafeteros de Colombia (National Federation of Coffee Producers of Colombia (http://www.cafedecolombia.com/index.jsp)) and the respective inspection body is ALMACAFÉ (a Federación Nacional de Cafeteros de Colombia company created in 1965 with the objective to

improve the coffee growers quality of life and generate added value). Both organizations were developed by Colombian coffee growers. Colombian Coffee is registered under the other Annex-I products category in the EU system. The specification of the products must include the name and description of the product, a definition of the geographical area and evidence of origination in that particular area. It should detail any labeling requirements and any requirements needed by the EU or national provisions. It is necessary that the group of producers/processors contract an inspection institution that verifies that the requirements of the registered specifications are met. After the application is analyzed by the respective national authorities and if accepted, it is passed on to the EC. The EC is in charge of publishing in the Official Journal of the European Union if it has been approved. Once published, producers can begin marketing their products under the PDO/PGI name using the respective label shown in figure A1.

Table A1 shows 832 products registered under the EU protected food name scheme. France, Italy, and Spain are countries that developed a system to link product characteristics to a geographical region prior to the 2006 regulations which explains why these countries have so many PDOs/PGIs. In August 2008, the products produced in these countries represented 54% of the total PDO and PGI products. Germany, Portugal, and Greece have registered 118, 87, and 81 products, respectively, or another 35% of the total PDO and PGI products. Café de Colombia (Colombian Coffee) is the only Non-EU origin product under the production system. The larger categories of products are fruit, vegetables and cereal which account for 169 registered products; cheeses (163); fresh meat (107); oils and fats (105); and meat base products (86).

Figure A1. Official labels for PDO (Protected Designation of Origin) and PGI (Protected Geographical Indications)

Source: EC (Department of Agricultural and Rural Development) 2008

Table A1. PDO / PGI Registered Products in the EU as of August 1, 2008

Country	Total	Cheese	Meat Base	Fresh Meat	Fish	Other Animal Products	Oils and Fats	Table Olive	Fruit, Vegetable and Cereals	Bread and Bakery	Beer	Other Drinks	Other
Austria	12	6	2	0	0	0	1	0	3	0	0	0	0
Belgium	5	1	2	0	0	0	1	0	0	1	0	0	0
Colombia	1	0	0	0	0	0	0	0	0	0	0	0	1
Cyprus	1	0	0	0	0	0	0	0	0	1	0	0	0
Czech Republic	13	0	0	0	3	0	0	0	2	5	3	0	0
Denmark	3	2	0	0	0	0	0	0	1	0	0	0	0
Finland	1	0	0	0	0	0	0	0	1	0	0	0	0
France	155	45	4	52	2	6	9	3	27	2	0	5	0
Germany	118	4	8	3	52	0	1	0	3	4	12	31	0
Greece	81	20	0	0	1	1	26	10	22	1	0	0	0
Hungary	1	0	1	0	0	0	0	0	0	0	0	0	0
Ireland	4	1	1	1	1	0	0	0	0	0	0	0	0
Italy	164	33	29	2	0	2	38	2	53	3	0	0	2
Luxemburg	4	0	1	1	0	1	1	0	0	0	0	0	0
Poland	2	2	0	0	0	0	0	0	0	0	0	0	0
Portugal	87	12	10	27	0	10	6	1	21	0	0	0	0
Slovakia	1	0	0	0	0	0	0	0	0	1	0	0	0
Slovenia	1	0	0	0	0	0	1	0	0	0	0	0	0
Spain	130	20	28	13	1	3	21	0	33	7	0	0	4
Sweden	2	1	0	0	0	0	0	0	0	1	0	0	0
The Netherlands	6	4	0	0	0	0	0	0	2	0	0	0	0
United Kingdom	40	12	0	8	13	1	0	0	1	0	2	3	0

Source: EC (Department of Agricultural and Rural Development) 2008