The Cost European Union Consumers Bear to Support Rural Dairy Farmers

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March 10, 2009

Abstract

This study constructs a model of the European Union (EU-9: Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, and the UK) milk sector from 1973-1999 to estimate the loss to consumers due to the interventionist policies of the European Union's Common Agricultural Policy (CAP) . The CAP uses interventionist prices, production quotas, export subsidies, and import tariffs to create and artificially high domestic price for milk. The goal of these policies is to protect the life style of rural dairy farmers throughout Europe. First, the loss in consumer surplus due to the difference between the EU-9 milk price and the world price is calculated using a partial equilibrium model. Furthermore, in a general equilibrium model, consumer utility is found to measure the preferences of EU-9 consumers. Then, compensating variation is used to convey the income necessary to restore the consumers to the higher utility they were achieving at the world price. The conclusion is that consumers have born a substantial cost to protect inefficient, rural dairy farmers since 1968.

Table of Contents

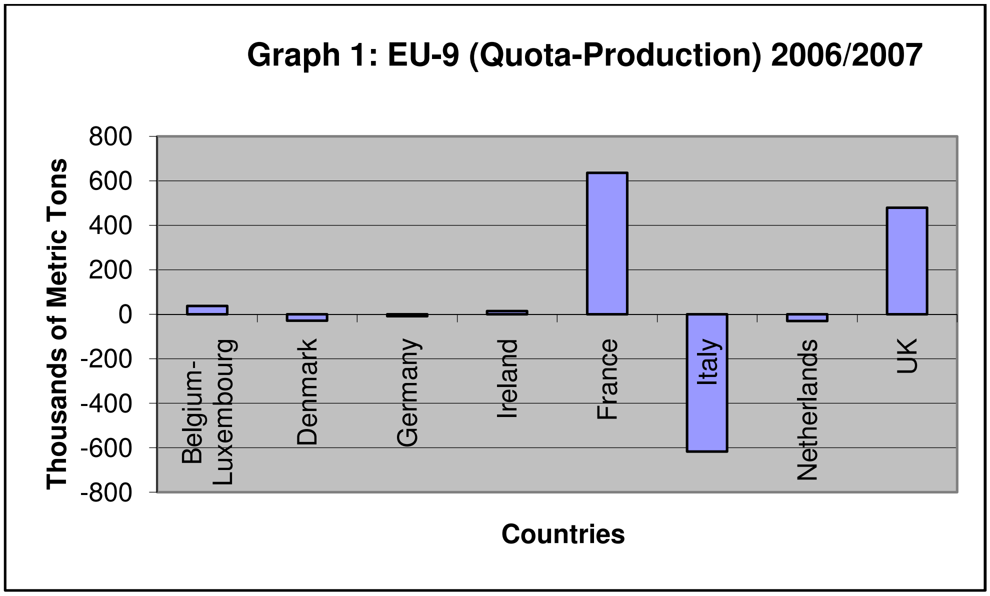
I. Introduction

The dairy sector is extremely important to the European Union's economy. The EU is currently the leading exporter of many dairy products. The European Commission (2006) emphasizes that dairy production makes up approximately fourteen percent of the EU's agricultural output and employs nearly thirteen percent of the EU's total workforce. Dairy farming is however not just seen as a profitable sector of the EU's and member states' economies. Every member state produces milk and many of the people in rural, mountainous areas would not be able to live in these areas without the income they receive from dairy farming. Many member states are even fearful that a certain cultural/environmental character would be lost in rural regions if dairy farming did not sustain the peoples' way of life. Because of the economic and cultural importance of the dairy sector, the EU's Common Agricultural Policy (CAP) has used economic interventionist policies and restrictive trade barriers to protect its domestic rural dairy industry since 1968.

In 1968, CAP established a common market for milk and milk products including fluid milk, cheese, butter, whole milk powder (WMP), skimmed milk powder (SMP), and other milk products. It has since determined the price for milk in all member states. From the beginning, the CAP implemented a price support program to aid rural dairy farmers. The government purchases SMP and butter up to a ceiling level of one hundred twenty thousand tons of butter and one hundred nine thousands tons of SMP if market prices fall below a certain level. These subsidized prices caused a surplus of milk in the 1970s and early 1980s, and thus, the CAP budget paid to store milk and butter in warehouses while the milk price dropped drastically. Due to the surplus and falling price, in the early 1980s, and idea to eliminate the subsidies was introduced. The article, "Farm follies revisited" published by the Economist in 2008, mentions however that the farm lobby outvoted this idea, and instead, the CAP decided to increase the price of milk by curbing production using a quota system as a supply management tool. The Milk Quota Policy was adopted on April 2, 1984. The policy applies levies to quantities of milk collected or sold above a set threshold for each member state. The EU uses the levies to finance expenditure in the milk sector.

In addition to the milk quota system, CAP implements large import tariffs on dairy products which greatly reduce foreign competition to sustain the EU market price for milk. These import tariffs are reduced for most favored nation countries as defined in their Tariff Rate Quota system (TRQ). The result of all these interventionist polices since 1984 has been an artificially high domestic price for milk compared to the rest of the world. Therefore, the EU additionally places export subsidies on dairy products to compensate producers who sell their products abroad. In 1994, however, the World Trade Organization (WTO), at the Uruguay Round, restricted the quantity/value of products that could receive export subsidies. Quantities over quota are now sold at the world price. Then, in 2003, the CAP revised its policy. Since 2004, it started and is still cutting intervention prices for dairy products, but at the same time, it is introducing direct payments to dairy farmers for quantities of production.

In recent years, the result of these policies has been an increase in demand for milk products and an increase in prices for dairy products while at the same time the surplus of products has fallen and the milk quota system is undershot each year. Member countries, such as France and the UK, who currently are two of the largest dairy producers in the EU that annually undershoot their quotas, justify the system emphasizing that it keeps employment high in rural areas. On the other hand, the CAP's policies are frustrating for farmers in Italy and the Netherlands who could produce more milk more efficiently to meet rising demand but are restricted by a quota system that makes high production unprofitable. Graph 1 below shows the difference in production and the quota for nine EU countries in 2006/2007.



Note: The data above was obtained from the European Commission's Agriculture and Rural Development section.

For countries that produce more than their allotted quota, the quota system escalates the price of milk further and additionally requires producers to pay levies to the CAP. Furthermore, if Italy could trade for production quotas from France much of the problem would be solved but the quota system does not allow member states to trade quotas. In the end, EU dairy farmers have been receiving a much higher price for milk than the rest of the world and are also receiving direct payments from the CAP. Even though certain member states disagree with the policies, the real cost of the CAP's intrusion in the EU dairy market has fallen on EU consumers.

Because the WTO has pushed to remove intervention in the dairy market in recent years and the EU's quota system (likely the most significant change to EU dairy policy) expires in 2015, many studies on the European dairy market have been released. The European Commission (2006) gives a detailed background of the EU's dairy market and policies. In addition, most of the journal articles published recently use partial, spatial, and general equilibrium models, representing multiple products and regions, to analyze the effect of potential future policies on the dairy market. These models range from representing the entire world or just the EU to disaggregate models that represent individual countries such as the UK. Although some of these models touch on the potential consumer surplus, producer surplus, and welfare effects of potential future policies, virtually none of the articles accentuate the loss to consumers in the form of consumer surplus or compensating variation due to the EU's intervention polices that have caused an artificially high domestic price for milk compared to the rest of the world since 1968.

This study constructs a partial and general equilibrium model for the milk sector in the EU. In the partial equilibrium model, the loss in consumer surplus due to the difference in the EU-9 country prices and the world price is computed. Then, in the general equilibrium model, utility is calculated and indifference curves are formed to measure the preferences of EU consumers in the milk sector. Furthermore, compensating variation, or the amount of income that would have to be given to consumers to make them as well off as they would be on the higher indifference curve at world prices, is calculated. The cost establishes the amount EU consumers have born to protect rural dairy farmers in the EU. The models are formed using fluid milk sector data from nine EU countries (Belgium-Luxembourg, Denmark, France, Germany, Ireland, Italy, the Netherlands, and the United Kingdom). These countries make up approximately seventy-five percent of EU production of milk. The data was collected for each country from 1999 back to the UK's integration into the European Community in 1973. The relevant data was obtained from the European Commission's Agriculture and Rural Development Sector, Eurostat, the United States Department of Agriculture (USDA), the Food and Agricultural Organization of the United

Nations (FAO), the United States Conference on Trade and Development (UNCTAD), and the IMF International Financial Statistical Yearbook (2000).

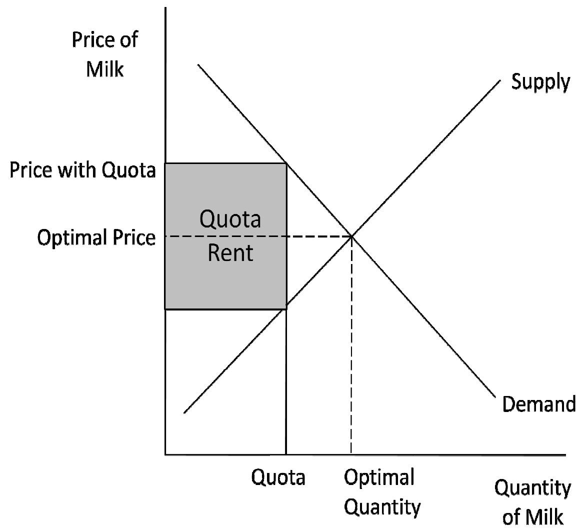
The hypothesized conclusion is that consumers have been losing a significant portion of their income in order to protect inefficient, rural farmers ever since 1968. The EU's quota system, along with import tariffs, export subsidies, interventionist prices, and direct payments to farmers should be removed. The elimination of these protectionist policies would benefit EU consumers. Without these policies, consumers would be purchasing milk and milk products at a price much closer to the world's price, and would not be paying extra amounts to subsidize farmers.

2. Literature Review

Many studies with different model types have been conducted on the dairy sector. These studies mainly focus on the impacts of certain policy implementations at the international, regional, and country level. Langley, Somwaru, & Normile (2006) use a partial equilibrium, multiple commodity, and multiregional model to display the effects of international dairy reform. They use the ERS-Penn State Trade model including twelve countries (such as the US, EU-15, China, Australia, New Zealand, and Argentina, etc.) which easily represents the dairy sector and its policies. Using the Agricultural Market Access Database (AMAD), they calculate the isolated impacts of four dairy policies on the world along with the specific effects on EU milk production and prices. The first scenario removes production quotas, which were most prevalent in the EU and Canada. The removal causes an increase of four percent in production, an increase in exported products, and a fall in milk prices. The second scenario which eliminates tariffs and TRQs (the EU having an eighty-five percent TRQ) causes milk production to fall by three percent. The third scenario removes intervention prices and domestic support which causes the world price to rise while milk production in the EU falls by 3.1 percent. The last and most important scenario cuts all dairy policies. This causes the world price to rise as the EU price and production levels fall by 9 and 3.2 percent consecutively. The study however does not take into account the EU expansion or the EU 2003 reform in its milk sector.

In a more specific study related to the first scenario conducted by Langley et al. (2006), Lips & Rieder (2005) focus only on the abolition of the raw milk quota in the EU. They use an applied general equilibrium model established by the Global Trade Analysis Project. The model includes 17 countries (the EU-15 as separate countries, Switzerland and the Rest of the World) and multiple sectors (raw milk product, dairy processing, food, and industry/man/service). It also uses an aggregate Cobb Douglas utility function including private households, government, and savings. It assumes that, since the EU is the largest exporter of dairy products, a change in its dairy policy will affect world prices. Lips & Rieder (2005) start by introducing the production quota as an additional factor payment or quota rent to raw milk producers. Producers therefore receive a higher price rather than a transfer payment. Figure 1 below illustrates the effects of a production quota on the domestic market for milk and the effects of eliminating it.

Figure 1: Effect of milk production quota on EU domestic market



In the figure above, with the quota, producers gain the entire shaded region which is the quota rent. The price producers get paid is "Price with Quota" where the equilibrium price is actually the "Optimal Price." If the quota were eliminated, the optimal quantity and price would be met, and consumers would not pay a part of the quota rent to the milk producers. Thus, Lips & Rieder (2005) evaluate the quota as more of a support price which is how the study of this paper analyzes the quota on the production of milk. Lips & Rieder (2005) use specific quota rent estimates from Requillart, Guyomard, Herrard, Bouamra-Mechemache, Couture, Dartigues, Burrell, & Jongeneel (2002). Thus, the factor payments of producers are divided into minimal necessary payment and quota rents.

In Lips's & Rieder's scenario, they greatly expand the quota quantity, eliminate export subsidies, and give direct payments of fifty Euros per ton of raw milk to producers after 2003. They do not however model intervention prices, remove tariffs, or account for EU enlargement. Their single scenario results convey that the EU's average milk price falls by 22% but that raw milk production increases by 2.9%. This studies systematic sensitivity analysis is however strongly dependent on uncertain estimates of quota rents. Overall, the effect on the EU and world is minor. EU exports would increase and imports into the EU would be replaced by non-members.

Patton, Binfield, Moss, Kostov, Zhang, Davis, and Westhoff (2007) additionally do a study on the impact of removing EU milk quotas. Their study focuses primarily on the UK, but also gives the impact on the EU-25. They use a partial equilibrium modeling system, the FAPRI-UK, in conjunction with the FAPRI European Union model, which contain annually validated econometric equations of beef, sheep, dairy, pig, poultry, cereal, and oilseed sectors in England, Wales, Scotland, and Northern Ireland. The baseline year is 2007, and then projections are made to 2016. Using latent milk output functions, they indicate how much each region would produce if the quota were not binding; however, the price is chosen were production is equal to the quota.

Patton et al. (2007) then analyzes four policy scenarios. The first is phasing out export subsidies completely between 2009 and 2013. Second, they analyze the first scenario in conjunction with phasing out milk quotas by 2010. Next, they evaluate the second situation along with reducing import tariffs to meet Uruguay Round agreements. The last scenario increases the quota by 2.5% a year from 2010-2015 until it is eliminated, reduces import tariffs, and eliminates export subsidies. This study again conveys that these scenarios have little impact on the EU. Under all scenarios, the expansion of milk production would be less than five percent while milk prices would fall between nine and fourteen percent which are similar to values found by Langley et al. (2006) and Lips & Rieder (2005). The price effect is significantly due to the reduction of export subsidies rather than the quota. The overall EU affect is that the productions of milk products increase while the price and imports/exports decrease. The UK's production falls by a greater amount than most member states, at about six percent, thus emphasizing that policies have different impacts on different members, which is emphasized in a study mentioned later by Mechemache et al. (2002).

Réquillart et al. (2002) additionally undergo a study to determine which method of eliminating protective policies would be least costly to consumers and producers in the EU. They interpret five scenarios placed on the EU-15 dairy sector between 2000/01-2014/15. In all scenarios, Uruguay Round agreements to reduce subsidized exports by 26.5% over five years starting in 2005/06 are met. The first scenario, decreases intervention prices from 2008 to 2015 until they are 15% below 2000 levels and increases quotas from 2008 to 2015 until quotas are 1.67% greater than 2000 levels. It also gives twenty-five Euros per ton as direct payments to farmers after 2000. The second policy resembles the first but intervention prices fall for butter and SMP by 30% and 20%, quotas increase by 4.67%, and direct payments increase to 41.66 Euros per ton. The third scenario is a two-tiered quota system where farmers still receive direct payments of 25 Euros per ton after 2008. Additionally, though, in 2008, quotas are reduced by 5%, but excess supplies can be exported without subsidies. The fourth scenario cuts quotas by 5% in 2005/06. The fifth scenario abolishes quotas in 2008 and gives direct payments of 50 Euros per ton to farmers starting in 2004/05.

Réquillart et al. (2002) use two stand-alone models that are econometrically estimated, the first for milk/beef production on farms and the second for processing milk into fourteen dairy products for domestic/foreign markets. The model has the demand assumption that demand for each dairy product will rise 0.75% a year which will decrease the subsidy, not the market price. The model also estimates the shadow price for milk which is the price that would induce dairy farmers to produce their current quota level if the quota constraint were absent which is equal to the marginal cost of production at the quota level. Thus, the specific quota rents (used by many studies) are the differences between the milk market price and shadow price. The study then uses consumer/producer surplus to determine which scenario is best. In all scenarios, production expands except in the cut quota scenario and milk prices fall but stay above world market prices. The largest welfare saving policy for milk producers and tax payers, because of direct payments, is the cut quota scenario. The best for processors and consumers is scenario five which abolishes the quota. Réquillart et al. (2002) started to touch on the welfare effects of dairy policies on consumers. Previous and simultaneous works by Réquillart and others give more emphasis on the impact of polices on consumer/producers surplus and overall welfare of the EU.

Bouamra Mechemache & Requillart (1999) display the effects of dairy policy in the EU on milk prices, dairy product prices, and farm revenue. They are the first from the studies above to emphasize efficiency and distributive effects of certain reform policies. In 1998, it was released by the Organization of Economic Co-operation and Development (OECD) that in 1996 the EU dairy sectors budgetary costs were 3.6 billion ECU while the actual producers' subsidy was around 22 billion ECU, close to 60% of the value of production. The support was realized to come from consumers that pay significant higher prices than world prices for dairy production. The study uses a partial equilibrium model that separates raw materials, intermediate products, and seven final products (butter, SMP, WMP, hard cheese, other cheese, liquid milk, yogurts, and other products). The model assumes that all of production is either consumed domestically or exported. Bouamra Mechemache & Requillart (1999) then apply the model to three scenarios.

The first implemented scenario by Bouamra Mechemache & Requillart (1999) is the GATT 2000 agreement which restricts subsidized exports to GATT levels. This causes a 6.6% decrease in the milk price which catalyzes into a decrease in farm producer surplus of 1523 million Euros, an increase in consumer surplus of 1159 million Euros, and a reduction in taxes of

540 million Euros. Thus, the social welfare increases by 177 million Euros and the policy is welfare-improving. The second scenario is the Berlin Agreement (1999). It increases quotas by 2.4%, reduces intervention prices by 15%, and gives 17.24 Euro/ton of milk as direct payments to farmers. This is modeled by increasing the price and giving transfer payments to taxpayers. The results are that the milk price drops by 15.5% and production increases by 2.4% due to the fact that final demand is inelastic and exports cannot be increased. These effects cause producers surplus to fall by 5.8 billion Euros, consumer surplus to rise by 4.5 billion Euros, taxpayer surplus to rise by 1.3 billion Euros, and net welfare to rise by 58 million Euros. The Berlin Agreement has a positive welfare effect. The third scenario is the two-tiered quota system described in Réquillart et al. (2002). The advantages of this system are that domestic prices can remain high while export competitiveness also increases. Therefore, the most efficient farms can increase production for exportation while higher domestic prices are used as a positive externality for regional development in the EU. The result of this scenario is actually welfare decreasing by 160 M Euro. This is due to the large increase in cheese exports which greatly pushes down the world price and causes taxes for subsidies to rise. The overall analysis is that a 1% increase in production causes a 3-4% drop in the milk price because subsidized exports are constrained.

In Bouamra Mechemache & Requillart (1999), the study deals mostly with the influence of already enacted policies. Bouamra Mechemach, Chavas, Cox, & Requillart (2002) is a follow up study that analyzes distributional welfare and price impacts of potential future policies in the EU dairy sector. The study focuses on the vertical, disaggregate aspects of the EU dairy sector. It uses a spatial market equilibrium model with two primary commodities (cows' milk and non-cows' milk), ten processed dairy commodities, and nine EU regions. The model is a Lancasterian model that gives each commodity a fixed proportion and all components are perfect substitutes. This study is different from Bouamra Mechemache & Requillart (1999) study because it is the first to attempt to evaluate the regional differences in consumption/production. It is also the first analysis to assess all trade instruments (milk quotas, intervention storage prices, domestic production/consumption subsidies, export refunds, and tariffs) rather than just production quotas and export subsidies. The study starts with 2000 as a base year and applies four scenarios to it.

The first scenario is the Berlin Accord of 1999 which had the same regulations mentioned in Bouamra Mechemache & Requillart (1999). Similar to this previous study, Bouamra Mechemach et al. (2002) found production of milk to rise by 2.4%, but the price only fell by 10.2% instead of 15.5%. What is contradictory is that total welfare for this study is negative by 237 million Euros while the other has a positive welfare effect. The second scenario involves a 30% decrease in export subsidies and a 100% increase in import access along with the Berlin Accord. This causes price to fall by 19% while production of milk increases by 1.6%. In addition, net welfare is positive by 257 million Euros, showing that export subsidies have a greater effect on consumer surplus and taxpayers than other policies. The third scenario increases the milk quota by 5.3% to give the same producer surplus as scenario 2. This causes price to fall by 19.1% while production increases by 4.7%. The consequence of this policy is a net welfare loss of 459 million Euros. This greatly reemphasizes what most previous studies mentioned that increasing quotas will hurt the welfare of the EU. The last scenario removes quotas, decreases export subsidies by 30% and doubles import access. This causes price to fall by 27%, production to increase by 3.1%, and total welfare to improve by 56 million Euros. The most welfare improving policy is to decrease export subsidies which would consequently reduce taxes and increase import access which in turn causes domestic prices to fall.

Each study above evaluates potential or enacted policies for the diary sector relating to the EU. In addition, most of these similar scenarios, when it comes to milk price percentage declines and production increases, have very comparable results. These results obviously demonstrate that all of these policies will hurt the producer surplus of dairy farmers. Despite these negative effects, some of the policies also have net welfare gains because consumer surplus would rise greatly. Decreases in export subsidies largely improves consumer surplus while increasing the quota slightly reduces consumer surplus. Thus, it is transparent that consumers have been paying a cost to aid rural dairy farmers in the EU for quite some time. Yet, virtually no one quantifies their burden. This study uses a partial and general equilibrium model to quantify the consumer surplus and compensating variation for consumers in nine EU countries since 1973.

III. Economic Model and Calculating Consumer Surplus and Compensating Variation

Moschini & Rizzi (2007) use a modification of the Stone Geary model to analyze the Italian vegetable market. In a similar fashion, this paper models the market for whole milk using the Stone Geary direct utility function written as

$$U(x_1, x_2) = (x_1 - \alpha)^a (x_2 - \beta)^b \text{ , where } a + b = 1.$$

The consumption quantity of whole milk is denoted by x_1 and all other consumption of goods and services is denoted as x_2. The parameters a and b are the consumption shares of milk and all other products respectively. The parameters α and β are certain minimal levels (subsistence consumption levels) of each good that has to be consumed irrespective of its price or consumer income. Because this study's dairy model assumes that fluid milk is a necessity while all other goods are considered to be luxury goods, β is set to zero. Therefore, the utility function becomes

$$U(x_1, x_2) = \left(x_1 - \alpha\right)^{a}(x_2)^{1-a}.$$

Using natural logarithms and the Lagrangian (see Appendix 1), the Marshallian, or uncompensated, demand equations become

$$x_1^*(p_1, M) = \alpha + \frac{a}{p_1}(M - \alpha p_1) \quad (1)$$

$$x_2^*(p_1, p_2, M) = \frac{(1-a)}{p_2}(M - \alpha p_1). \quad (2)$$

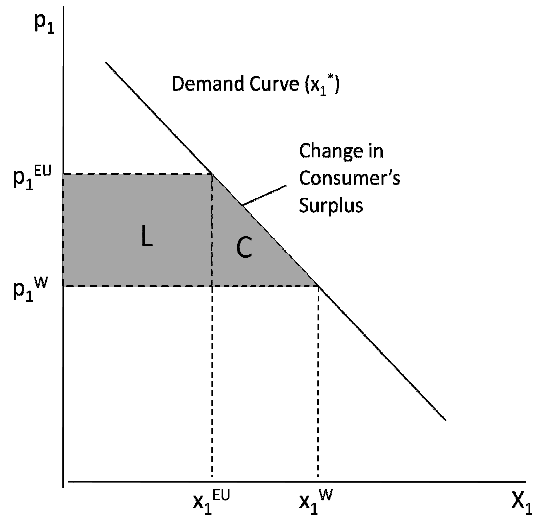
The variable p_1 is the price of whole milk, p_2 is the price of all other goods, and M is income. Because the model assumes that x_2^* is a numeraire, $p_2$becomes the numeraire price and is equal to one. Thus,

$$x_2^*(p_1, M) = (1-a)(M - \alpha p_1). \quad (3)$$

To evaluate the welfare effects of the EU's intervention prices, quota rents, export subsidies, and import tariffs on whole milk, this paper calculates consumer surplus and compensating variation.

Once the parameters a and α are econometrically estimated, Equation (1) is used to calculate the change in consumer surplus, which conveys how much EU consumers have lost by purchasing milk at an artificially high domestic price compared to a much lower world price. The shaded area in Figure 2 below shows the change in consumer surplus from the domestic to world price.

Figure 2: Change in Consumer's Surplus



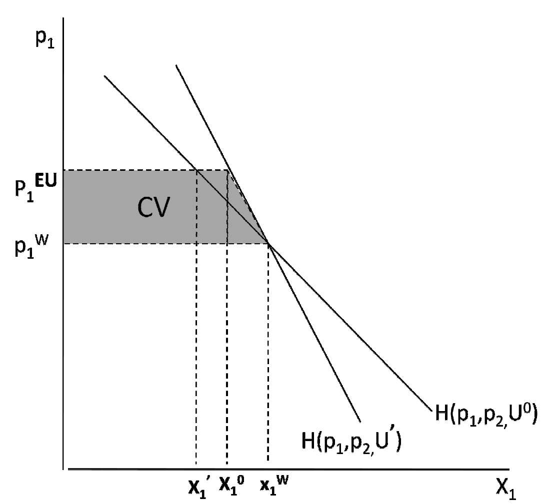
The variables is the quantity of whole milk the EU country would consume at the world price, , where is the domestic quantity currently being consumed at the domestic price, . Because of the high domestic price, consumers decide to consume less whole milk. Triangle C measures the loss in consumption of whole milk while L measures the loss from having to pay more. Thus, the total loss (negative change) in consumer surplus is area L+C. Because the demand curve for milk in Equation (1) is not linear but instead is slightly convex, calculating the area L+C requires taking the integral of the demand curve from to . Thus,

$$- \qquad (4)$$

Because Varian (2006) emphasizes that consumer surplus is only a good approximation of consumer welfare, compensating variation is also measured to analyze the income effects on consumers due to changes in consumer utility. Varian (2006) explains that compensating and equivalent variation are just two different methods to measure the distance between the tangent lines of two indifference curves in a general equilibrium model which gives a more accurate measurement of welfare effects. This model assumes the EU consumers are first consuming at the world price. Then, the budget line is rotated toward the origin to represent the higher domestic whole milk price due to the interventionist policies. Whereas equivalent variation measures how much money would have to be given to the consumers before the price change to leave him on the lower indifference curve, compensating variation measures how much money would need to be given to consumers after the price change to place him on the original indifference curve that passes through the original consumption point. Because the original indifference curve represent the utility consumers would have if they were buying milk at the world price, which the WTO is striving for, compensating variation appears to be a more appropriate measurement for this study.

Compensating variation can be measured in two ways. It can be found by calculating the area produced by the two Hicksian (compensated) demand equations as shown in Figure 3 below.

Figure 3: Compensating Variation



In Figure 3, the Hicksian demand curve, depending on the original utility at world prices, is denoted as $H(p_1,p_2,U^0)$ while the $H(p_1,p_2,U')$ represents the Hicksian with reduced utility due to the increased domestic price. The compensating variation is the shaded area denoted "CV."

In this study of the EU-9 milk market, however, the above graph is not used to calculate compensation variation. Instead, the expenditure function which is derived from the indirect Stone Geary utility function (see Appendix 1) is used. The expenditure function with p_2 as the numeraire price and p_1 as the price of whole milk is

$$E(p_1, U^*) = \alpha p_1 + U^* \left(\frac{p_1}{a}\right)^a \left(\frac{1}{1-a}\right)^{(1-a)}$$, where U* is the utility.

Thus, to find the compensating variation, the expenditure function depending on the world price (p_1^W) is subtracted from the expenditure function depending on the domestic price, p_1^{EU}. The independent variable, U^0, is the maximum utility consumers can achieve at the world price. The equation is as follows

$$CV = E(p_1^{EU},U^0) - E(p_1^W, U^0)$$

$$= \alpha p_1^{EU} + U^0 \left(\frac{p_1^{EU}}{a}\right)^a \left(\frac{1}{1-a}\right)^{(1-a)} - \alpha p_1^W - U^0 \left(\frac{p_1^W}{a}\right)^a \left(\frac{1}{1-a}\right)^{(1-a)}$$

$$= \alpha(p_1^{EU} - p_1^W) + U^0 \left(\frac{1}{1-a}\right)^{(1-a)} \left[\left(\frac{p_1^{EU}}{a}\right)^a - \left(\frac{p_1^W}{a}\right)^a\right].$$

Both the change in consumer surplus and compensating variation display how much EU consumers have lost to support rural dairy farmers.

IV. Data

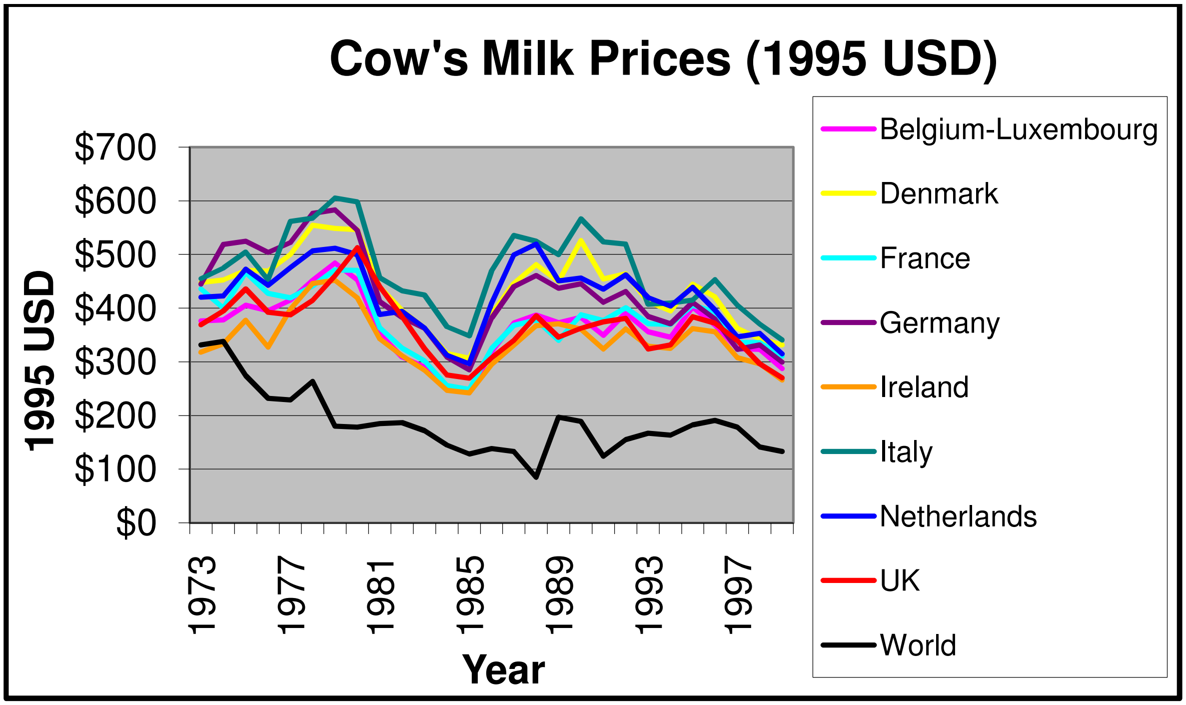
It was difficult to determine how many countries should be used to represent the EU since it is a rather new association. In order to get the most observations possible to estimate the parameter values using an econometric regression, the EU-9 is used to represent the entire EU. The EU-9 was formed in 1973 when Denmark, the UK, and Ireland joined the founders of the EU, which are Belgium, Luxembourg, Italy, the Netherlands, France, and the Federal Republic of Germany. In the EU-27 market for milk in 2007, these nine countries made up approximately 73.5% of milk production, with Germany, France, the UK, the Netherlands, and Italy as the five largest producers. Before the ten new members states were added in 2004, the EU-9 produced most of the EU's milk. Thus, the EU-9 is a valid representation of the EU milk market.

Because not all data was available, the econometric model is estimated from 1973 to 1995. Consumer surplus and compensating variation are however calculated from 1973 through 1999 since price data for milk, the world price for milk, and household consumption income was obtainable up until 1999 for every country. The model could not be estimated using the years 1995 through 1999 since the United States Department of Agriculture's (USDA) data on the consumption of fluid milk only went through the year 1995. In addition, in this analysis Belgium and Luxembourg are combined as one country and the data for the Federal Republic of Germany changes to include all of Germany in 1990.

For Equation 1 above (the demand for milk), the variables $x_1, p_{1,}$ and M come from three different data sources. The quantity demanded for milk, x_1, in each country is represented by the domestic consumption of fluid milk in metric tons which is given in a USDA (2008) data set for fluid milk consumption for every country from 1963 through 1995. The price for cow's milk, denoted $p_{1,}$ for each country comes from FAOSTAT (2009). The milk price for each country was listed in local currency per ton for the years 1973 through 1990 and then US dollars (USD) per ton from 1991 to 1999. All milk prices were converted to USD using the nominal annual market exchange rates for each country listed in the International Financial Statistics Yearbook (2000) produced by Carson (2000) of the IMF. The prices were then converted to 1995 dollars using the GDP deflator for each year also listed in the IMF publication. The variable M, usually denoted as income, is represented by total household consumption expenditure on goods and services. Total household consumption expenditure is reported for each country in USD by the UNCTAD (2008). Because it was a nominal value, it was also converted to 1995 dollars using the GDP deflator from above.

Last, the world price for milk that is used to calculate consumer surplus and compensating variation was taken as a combination of the New Zealand's and Argentina's milk price from available data from FAOSTAT (2009) since an annual world price for milk before 1995 was not obtainable. The USDA (2008) and Joseph (2005) often mention that both Argentina and New Zealand are some of the most cost effective producers of milk. Additionally, according to Paul Kiendl, the primary Dairy Economist at the USDA, New Zealand and Argentina have negligible Producer Support Estimates (PSEs) as defined by OECD (2004). According to OECD (2003), a PSE is a measurement of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers. PSEs include economic intervention policies and taxes. Because New Zealand and Argentina are both two of the most cost effective producers and have insignificant PSEs compared to other countries, their milk prices appeared to be the closest representation of the world price for cow's milk available. Graph 2 below shows the difference between the EU-9 prices of milk and the world price of milk.

Graph 2: Cow's Milk Prices (1995 USD)



Italy consistently has the highest milk price because it is greatly constrained by the quota system. Ireland on the other hand consistently has the lowest milk price throughout the entire period. Furthermore, it is interesting to note how the price dropped drastically from 1980 to 1985 because of the government interventionist prices that caused a surplus in milk production. Then, in 1985 the price increased dramatically again because of the newly implemented quota system. In addition, because the EU-9 prices and the world price often move in conjunction, the graph emphasizes that the EU-9 prices affect the world price of milk. In the end, the graph conveys the large difference between the world price and the prices of the EU-9 countries that has caused a loss to EU-9 consumers.

V. Estimating the Parameters

Equation (1), the demand for milk, was run as a stacked regression. Running the regression as a panel data set was an option, but it does not distinguish between the required milk consumption, α, for each country. Because the time effects of the analysis are less important due to the fact that every price was converted to 1995 dollars, a stacked regression with dummy variables for all 8 countries, except the UK to prevent perfect collinearity, was run. Thus, the results are all compared to the UK as the base country. The regression has 183 observations. One of the observations for Germany was discarded because it was missing a domestic consumption value for 1989. Immediately after the regression was run, it was tested for heteroskedasticity, and did have some. Therefore, the regression was corrected and rerun to find heteroskedasticity-robust standard errors. Although the robust standard errors and the t-statistics decreased slightly for each independent variable, the p-values remained at 0.000 for all variables. All independent variables were statistically significant at the 0% significance level. Despite the fact that the regression had heteroskedasticity and was corrected, the parameters did not change. This was expected because Wooldridge (2009) explains that heteroskedasticity will bias standard errors but not the estimators. In addition, the R-squared term was 0.9854, so household consumption expenditure, cow's milk price, and the dummy variables explained 98.54% of the variation in domestic consumption.

Listed below in Table 1 are the estimated parameters from the econometric equation that are used to compute the change in consumer surplus and compensating variation.

Table 1: Parameters of Demand Equations

	Parameter	Estimated Value
All Countries	α	0.0012218
Belgium-Luxembourg	α	3,332,542
Denmark	α	4,746,202
France	α	25,030,893
Germany	α	21,924,889
Ireland	α	5,124,758
Italy	α	10,580,881
Netherlands	α	11,446,808
United Kingdom	α	13,673,977

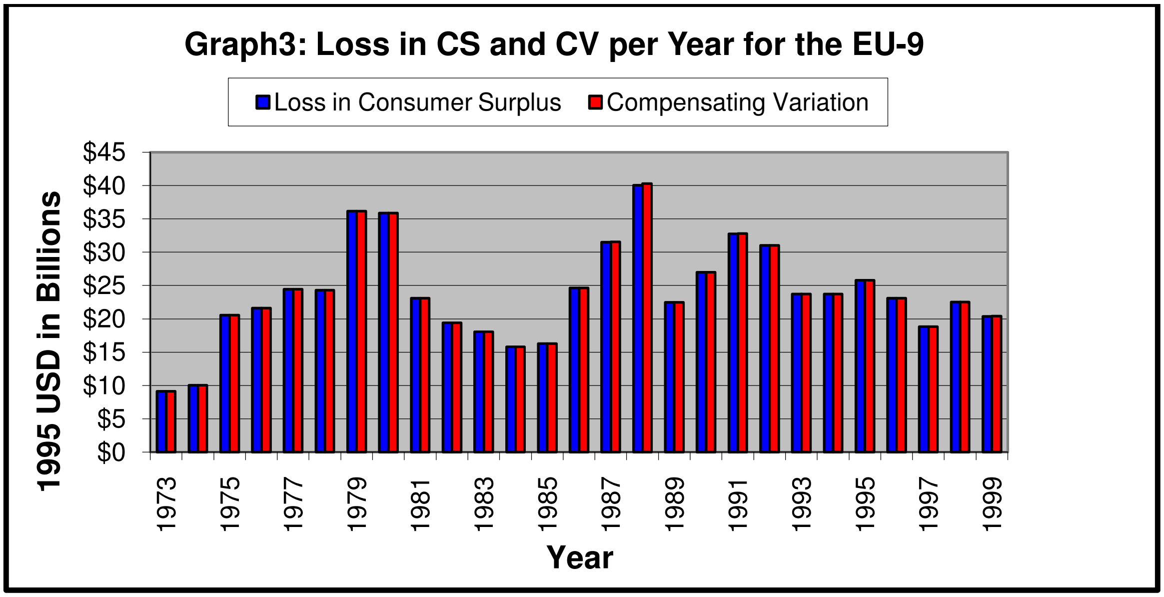
The consumption share of milk, denoted a, is equal to approximately 0.122% of the total goods and services consumed by households in the EU-9 economy. Therefore, all other goods and services consumed by households make up 99.878% of the economy. The other parameter, α, is the required milk consumption by each country since milk is considered a necessity in this study's model.

VI. Results

The estimated parameters where used along with the methods in section III to determine the loss in consumer surplus. Additionally, the compensating variation, or the amount of money that would have to be given to the consumer each year to make him/her as well off as he would have been at the world price, is calculated. The results for each country for every year from 1973 through 1999 are display in Table 4 and 5 of Appendix 2. The results for each year are displayed in Table 2 and Graph 3 below.

Table 2: EU-9 Loss in Consumer Surplus and Compensating Variation per Year in Billions of 1995 USD

	Loss in Consumer Surplus	Compensating Variation		Loss in Consumer Surplus	Compensating Variation
1973	$9.125	$9.126	**1987**	31.528	31.547
1974	10.029	10.031	**1988**	40.063	40.300
1975	20.571	20.577	**1989**	22.476	22.485
1976	21.594	21.602	**1990**	26.985	26.997
1977	24.425	24.434	**1991**	32.766	32.786
1978	24.303	24.312	**1992**	31.017	31.034
1979	36.167	36.187	**1993**	23.709	23.720
1980	35.874	35.893	**1994**	23.723	23.733
1981	23.100	23.109	**1995**	25.802	25.814
1982	19.391	19.399	**1996**	23.104	23.123
1983	18.054	18.061	**1997**	18.817	18.824
1984	15.778	15.784	**1998**	22.533	22.544
1985	16.295	16.302	**1999**	20.379	20.388
1986	24.617	24.630	**Total**	**$642.223**	**$642.743**



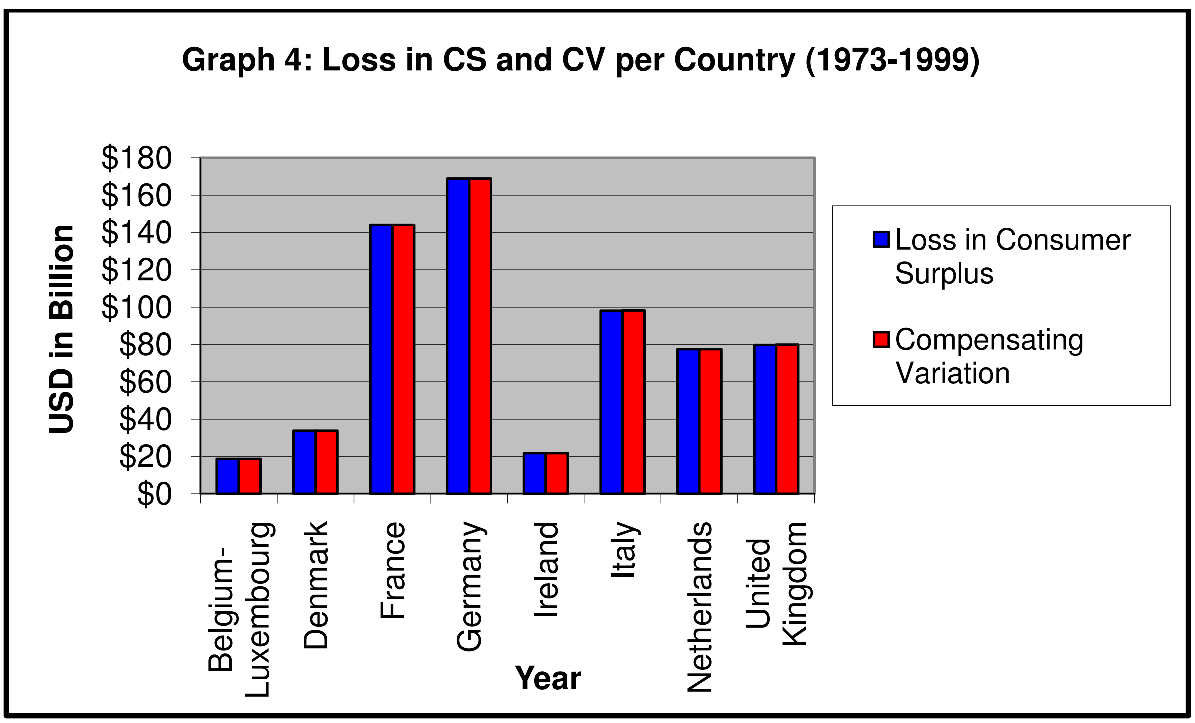
The results convey that EU-9 consumers have lost a substantial amount of money over these twenty-seven years to support rural dairy farmers. The loss in consumer surplus and the compensating variation have been fairly close each year. Compensating variation is always slightly bigger than consumer surplus in each year which is accurate due to the larger area that compensating variation represents. In 1981 through 1985, the large surplus of milk caused the price to fall and greatly reduced the loss in consumer surplus and compensating variation. Then, after the quota on milk in 1984, the loss in consumer surplus and compensating variation rose until it reached its peak in 1988 at approximately $40 billion. After 1994, the loss to consumers reduced largely because of the WTO's pressure to decrease quotas and trade restrictions. Despite the decline in the loss to consumers in the late 1990s, the results of the protectionist policies have cumulated into a total loss in consumer surplus of $642.223 billion over these twenty-seven years. In addition, the amount that the government would have to pay consumers to make them as well-off as they would have been at the world price over the past twenty-seven years is

$642.743 billion. This amount is almost double the GDP of the Netherlands and almost half the GDP of the UK and France in 1999 (in 1995 dollars).

Next, the results for each of the nine countries for the twenty-seven years are listed below in Table 3 and Graph 4.

Table 3: Total Loss in Consumer Surplus and Compensating Variation per Country (1973-1999) in Billions of USD

	Consumer Surplus Loss	Compensating Variation
Belgium-Luxembourg	$18.606	$18.642
Denmark	33.809	33.823
France	143.956	144.018
Germany	168.815	168.897
Ireland	21.790	21.799
Italy	98.120	98.173
Netherlands	77.495	77.533
United Kingdom	79.634	79.857
Total	$642.223	$642.743



The results convey that the consumers in each country have also lost a signification amount to support dairy farmers. Germany has lost the most at approximately $168 billion in consumer surplus/compensating variation while Belgium-Luxembourg has lost the least at $18.6 billion. Because the loss to consumers is directly related to population size, each country's loss per consumer per year is a better indication of which consumers actually lose the most from the EU interventionist policies in the milk market. Using the population size of each country from the International Financial Statistics Yearbook (2000) and compensating variation, the average amount each consumers would need to be compensated per year due to the intervention in the milk market is $65 for Belgium-Luxembourg, $236 for Denmark, $90 for France, $76 for Germany, $215 for Ireland, $63 for Italy, $182 for the Netherlands, and $50 for the UK. British consumers lose the least while Denmark's consumers lose the most. Despite these different country effects, on average the EU-9 consumer suffers a loss of $81 dollars per year to support dairy farmers.

The effects on EU-9 consumers are important, but the benefit to EU-9 dairy farmers is additionally relevant. Rohner-Thielen (2008) gives a list of the number of holdings with dairy cows and the number of dairy cows per holding in 1995 for most EU-27 countries. The number of holdings range from 15,960 in Denmark to 114,940 in Italy. The average cows per holding are in the 30s and 40s for all countries but Italy which has 18.9 cows per holding and the UK which has 66.6 cows per holding. Using this data, the additional amount paid to each holding per year due to higher prices paid by consumers is estimated along with the amount paid per cow. Each holding has received approximately $29.6 thousand per year in Belgium-Luxembourg, $78.5 thousands in Denmark, $54.1 thousand in France, $56.7 thousand in Germany, $19.0 thousand in Ireland, $31.6 thousand in Italy, $76.6 thousands in the Netherlands, and $77.0 thousand in the

UK. The amount paid per cow per year is $942 in Belgium-Luxembourg, $1,784 in Denmark, $1,373 in France, $1,476 in Germany, $616 in Ireland, $1,674 in Italy, $1,681 in the Netherlands, and $1,157 in the UK. Denmark, Italy, and the Netherlands pay the most per cow while Ireland pays the least at almost a third of the value. As a whole, the average EU-9 milk holding has received $48.9 thousand per year and about $1,375 per cow per year from 1973 to 1999. EU-9 dairy farmers have benefitted to some degree from the extra cost paid by consumers.

VII. Conclusion

From this study, it is evident that the cost EU-9 consumers have shouldered to maintain the way of life for rural dairy farmers are not incredibly large but are definitely not insignificant. France and Germany justify the protectionist policies of production quotas, export subsidies, interventionist prices, and import tariffs on dairy products by emphasizing that dairy farming brings character and employment to specific regions in their countries. It is however highly questionable if protecting the culture and jobs of a few rural farmers is worth the cost of $642.743 billion dollars from 1973 through 1999. The CAP and the farm lobby in the EU definitely believe it is worth the cost. On the other hand, it is plausible that EU consumers do not even know that each of them has lost about $81 dollars per year from 1973 to 1999 to aid these farmers. Furthermore, even if they do know the cost they bear, it is unlikely that all EU consumers could join together as a cohesive organization to counter the EU farm lobby. Because the farm lobby is made of up owners of dairy holdings that have received a benefit of about $48.9 thousand each year from consumers during the twenty-seven year time period, they are much more willing to band together and fight for what they think they deserve.

Since 1994, the issue of reforming the EU dairy sector has been addressed. The WTO, at the Uruguay Round, emphasized that the EU dairy sector should move towards a free market system, and it limited the number of dairy products that could receive export subsidies. Additionally, the WTO advocated for reducing production quotas in the milk sector. In 2003, the CAP started cutting intervention prices and raising the production quotas in the EU. The market for milk in the EU is finally starting to resemble a free-market, and the cost to consumers has decreased. Despite the CAP's movement away from interventionist policies in the milk market, in 2003 it also introduced direct payments to farmers. Therefore, a part of each consumer's general value added tax on all goods and services is aiding dairy farmers. This is starting to replace the amount lost due to the higher price for milk. In future years, a study to compare whether this new system with direct payments to farmers is more or less costly than the old system based on interventionist policies addressed in this paper would be rather interesting.

Currently, the EU is still considering options to change the CAP's intervention in the milk market. The implementation of possible future policies and the effects on consumers and producers have been published by Bouamra Mechemache & Requillart (1999) and Bouamra Mechemach et al. (2002). Most of these scholars agree that production quotas should at least be raised if not eliminated and interventionist prices and export subsidies should be removed. Furthermore, if quotas are not eliminated, the possibility of trading them between countries should be an option. This would decrease the price of milk for countries like Italy and the Netherlands that constantly go over quota to meet demand and thus must pay additional levies to the CAP while countries like France and Germany consistently underperform their allotted quotas.

Many policy options will be evaluated in the coming years, but only with the elimination of all the CAP's intervention will the EU milk market become efficient. If and when the aid from EU consumers is eliminated, the EU dairy market would finally increase the herd size in a single holding and decrease the number of holdings to become more cost effective producers. Thus, EU dairy farmers would finally be selling milk at or close to the world price. However, this would require the elimination of small holdings in rural mountainous areas. Whether EU consumers want to keep bearing the $81 cost per year to employ less productive rural dairy farmers is a decision that consumers must make.

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Appendix 1

The Stone Geary Demand System: Marshallian Demand Functions, Indirect Utility Function, and Expenditure Function for Two Goods

The Stone Geary Utility Function is

$$U(x_1, x_2) = (x_1 - \alpha)^a (x_2 - \beta)^b \text{ , where } a + b = 1.$$

The quantity of fluid milk is denoted by x_1 and all other products are denoted as x_2. The parameters a and b are the consumption shares of milk and all other products respectively. The parameters α and β are certain minimal levels (subsistence consumption levels) of each good that has to be consumed irrespective of its price or consumer income. Because this study assumes that fluid milk is a necessity while all other goods are luxury goods, β is set to zero. Therefore,

$$U(x_1, x_2) = (x_1 - \alpha)^a (x_2)^{1-a} .$$

Stone Geary uses natural logs to model utility. Thus,

$$\ln [U(x_1, x_2)] = \ln [(x_1 - \alpha)^a (x_2)^{1-a}]$$

$$= \ln (x_1 - \alpha)^a + \ln(x_2)^{1-a}$$

$$= a \ln(x_1 - \alpha) + (1 - a) \ln (x_2).$$

Next, the Lagrangian is used to find the Stone Geary Marshallian demand functions.

$$\mathcal{L} = a \ln(x_1 - \alpha) + (1 - a) \ln(x_2) - \lambda(p_1 x_1 + p_2 x_2 - M),$$

where p_1 and p_2 are price for x_1 and x_2 respectively.

Finding the partial derivatives with respect to x_1, x_2, and λ, gives

$$\frac{\partial \mathcal{L}}{\partial x_1} = \frac{a}{x_1 - \alpha} - \lambda p_1 = 0, \qquad (1)$$

$$\frac{\partial \mathcal{L}}{\partial x_2} = \frac{1-a}{x_2} - \lambda p_2 = 0, \qquad (2)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = p_1x_1 + p_2x_2 = M. \qquad (3)$$

The Lagrangian multiplier (λ) can be eliminated and x_2 can then be solved for using (1) and (2):

$$\frac{\frac{a}{x_1 - \alpha}}{\frac{1-a}{x_2}} = \frac{\lambda p_1}{\lambda p_2}$$

$$ap_2x_2 = p_1(x_1 - \alpha)(1-a)$$

$$x_2 = \frac{p_1}{p_2}(x_1 - \alpha)\frac{(1-a)}{a}. \qquad (4)$$

Then, the budget constraint (3) and Equation (4) can be used to find x_1.

$$p_1x_1 + p_2\left[\frac{p_1}{p_2}(x_1 - \alpha)\frac{(1-a)}{a}\right] = M$$

$$p_1x_1 + p_1(x_1 - \alpha)\frac{(1-a)}{a} = M$$

$$p_1x_1 + (1-a)\left[\frac{p_1x_1}{a} - \frac{p_1\alpha}{a}\right] = M$$

$$p_1x_1 + \frac{p_1x_1}{a} - \frac{p_1\alpha}{a} - p_1x_1 + p_1\alpha = M$$

$$x_1^*(p_1, M) = \alpha + \frac{a}{p_1}(M - \alpha p_1). \qquad (5)$$

Using (5),

$$x_2^* = \frac{p_1}{p_2}\left(\alpha + \frac{a}{p_1}(M - \alpha p_1) - \alpha\right)\frac{(1-a)}{a}.$$

Because this study assumes that that x_2^* is the numeraire good, p_2 is equal to 1. Therefore,

$$x_2^*(p_1, p_2, M) = (1-a)(M - \alpha p_1). \qquad (6)$$

Equations 5 and 6 are the Marshallian (uncompensated) demand functions.

Now, the Indirect Utility Function, $V(p_1, p_2, M)$, is found by taking the maximum of the utility function (substitution x_1^* and x_2^* into the utility function). Thus,

$$V(p_1, p_2, M) = (\mathrm{x}_1^* - \alpha)^a (\mathrm{x}_2^*)^{1-a}$$

$$= \left(\alpha + \frac{a}{p_1}(M - \alpha p_1) - \alpha\right)^a \left[\frac{(1-a)}{p_2}(M - \alpha p_1)\right]^{1-a}$$

$$= a^a (1-a)^{(1-a)} (M - \alpha p_1)^{a+(1-a)} p_1^{-a} p_2^{(a-1)}$$

$$V(p_1, p_2, M) = a^a (1-a)^{(1-a)} (M - \alpha p_1) p_1^{-a} p_2^{(a-1)} .$$

Therefore, with $p_2$as the numeraire price, the equation becomes

$$V(p_1, M) = a^a (1-a)^{(1-a)} (M - \alpha p_1) p_1^{-a}.$$

Last, the Expenditure Function is found by using Walras's Law which states that $M = E(p_1, p_2, U^*)$. (Note: Simply solve $V(p_1, p_2, M)$ for M.

$$U^* = a^a (1-a)^{(1-a)} (M - \alpha p_1) p_1^{-a} p_2^{(a-1)}$$

$$U^* = M a^a (1-a)^{(1-a)} p_1^{-a} p_2^{(a-1)} - \alpha p_1^{-a} p_2^{(a-1)} a^a (1-a)^{(1-a)}$$

$$M a^a (1-a)^{(1-a)} p_1^{-a} p_2^{(a-1)} = U^* + \alpha p_1^{-a} p_2^{(a-1)} a^a (1-a)^{(1-a)}$$

$$M = U^* p_1^a p_2^{(1-a)} a^{-a} (1-a)^{(a-1)} + \alpha p_1$$

$$E(p_1, p_2, U^*) = \alpha p_1 + U^* \left(\frac{p_1}{a}\right)^a \left(\frac{p_2}{1-a}\right)^{(1-a)}.$$

Therefore, with p_2 as the numeriare price, the equation becomes

$$E(p_1, U^*) = \alpha p_1 + U^* \left(\frac{p_1}{a}\right)^a \left(\frac{1}{1-a}\right)^{(1-a)}.$$

Appendix 2

Tables of Loss in Consumer Surplus and Compensating Variation

(Per Country for the years 1973-1999)

Table 4: Loss in Consumer Surplus in Millions of 1995 US Dollars

	Belg-Lux	Denmark	France	Germany	Ireland	Italy	Netherlands	UK	Total
1973	$160.84	$568.44	$2,747.90	$2,712.93	-$70.44	$1,415.07	$1,040.95	$549.13	**$9,124.81**
1974	143.18	560.54	1,639.41	4,308.60	-23.17	1,570.88	998.32	831.15	**10,028.91**
1975	479.95	963.06	5,134.26	6,038.56	533.03	2,672.28	2,348.62	2,401.12	**20,570.87**
1976	604.09	1,172.23	5,244.70	6,615.83	495.92	2,571.85	2,500.92	2,388.32	**21,593.84**
1977	695.24	1,344.93	5,118.53	7,200.29	880.07	3,865.94	2,947.56	2,372.01	**24,424.57**
1978	704.28	1,438.88	4,801.17	7,684.92	947.79	3,548.64	2,912.64	2,264.93	**24,303.25**
1979	1,165.79	1,846.93	8,034.29	10,217.86	1,421.01	5,112.09	4,009.66	4,359.26	**36,166.90**
1980	1,057.78	1,831.78	8,101.80	9,346.78	1,260.36	5,129.61	3,881.09	5,264.48	**35,873.68**
1981	632.17	1,261.01	4,931.10	5,708.42	829.20	3,302.47	2,440.66	3,994.56	**23,099.60**
1982	457.75	1,033.21	3,820.36	4,900.78	651.28	2,975.55	2,477.55	3,074.66	**19,391.15**
1983	444.08	947.82	3,559.03	4,774.82	588.54	3,070.63	2,282.52	2,386.20	**18,053.63**
1984	413.06	850.26	3,062.56	4,135.96	532.39	2,716.99	2,005.66	2,061.14	**15,778.03**
1985	435.43	893.27	3,353.80	3,992.28	598.11	2,744.87	2,018.29	2,258.63	**16,294.68**
1986	698.12	1,264.04	5,276.43	6,309.10	826.92	4,215.20	3,269.37	2,757.74	**24,616.92**
1987	938.57	1,590.34	6,721.03	8,117.08	1,045.46	5,235.00	4,436.39	3,444.18	**31,528.04**
1988	1,204.60	2,032.36	8,624.14	10,264.41	1,500.32	6,018.20	5,313.50	5,105.04	**40,062.57**
1989	671.74	1,265.88	4,028.19	6,181.67	913.92	3,902.23	3,051.57	2,460.67	**22,475.87**
1990	761.60	1,694.05	5,673.39	6,800.84	906.81	4,982.77	3,240.89	2,924.59	**26,984.95**
1991	921.73	1,687.40	7,380.22	7,948.19	1,062.45	5,557.59	3,822.08	4,386.73	**32,766.38**
1992	949.09	1,572.54	7,107.90	7,629.42	1,094.31	5,024.34	3,756.69	3,882.66	**31,016.95**
1993	754.34	1,243.66	5,862.36	6,015.28	858.27	3,220.14	3,087.69	2,667.69	**23,709.43**
1994	739.57	1,185.84	5,953.16	5,827.53	859.23	3,317.04	2,949.11	2,891.10	**23,722.58**
1995	888.97	1,346.84	6,456.08	6,463.31	953.46	3,123.50	3,161.53	3,408.54	**25,802.24**
1996	709.33	1,181.50	5,844.03	5,316.45	879.30	3,539.52	2,539.10	3,094.56	**23,103.80**
1997	585.99	947.02	4,548.61	4,058.29	690.71	3,076.40	2,072.29	2,838.15	**18,817.46**
1998	746.30	1,049.10	5,692.79	5,425.80	834.15	3,233.80	2,639.41	2,912.07	**22,533.41**
1999	642.50	1,033.82	5,238.89	4,820.01	721.02	2,977.20	2,290.86	2,654.48	**20,378.78**
Total	**$18,606.09**	**$33,806.75**	**$143,956.12**	**$168,815.41**	**$21,790.40**	**$98,119.79**	**$77,494.96**	**$79,633.79**	**$642,223.29**

Table 5: Compensating Variation in Millions of 1995 US Dollars

	Belg-Lux	Denmark	France	Germany	Ireland	Italy	Netherlands	UK	Total
1973	$160.85	$568.54	$2,748.34	$2,713.40	-$70.44	$1,415.33	$1,041.09	$549.16	**$9,126.27**
1974	143.19	560.63	1,639.57	4,309.65	-23.17	1,571.19	998.45	831.23	**10,030.75**
1975	480.05	963.35	5,135.79	6,040.72	533.13	2,673.19	2,349.34	2,401.75	**20,577.31**
1976	604.27	1,172.68	5,246.47	6,618.60	496.01	2,572.79	2,501.80	2,389.02	**21,601.66**
1977	695.47	1,345.50	5,120.25	7,203.48	880.34	3,867.77	2,948.73	2,372.71	**24,434.25**
1978	704.49	1,439.46	4,802.56	7,688.17	948.06	3,550.11	2,913.69	2,265.51	**24,312.06**
1979	1,166.40	1,847.97	8,038.34	10,224.00	1,421.70	5,115.23	4,011.81	4,361.42	**36,186.87**
1980	1,058.30	1,832.81	8,105.92	9,352.16	1,260.93	5,132.76	3,883.14	5,267.37	**35,893.39**
1981	632.40	1,261.59	4,932.93	5,710.90	829.48	3,304.06	2,441.64	3,996.42	**23,109.42**
1982	458.32	1,033.63	3,821.55	4,902.72	651.47	2,976.90	2,478.55	3,075.88	**19,399.02**
1983	444.21	948.20	3,560.16	4,776.76	588.70	3,072.11	2,283.44	2,387.04	**18,060.62**
1984	413.19	850.62	3,063.54	4,137.66	532.55	2,718.32	2,006.49	2,061.88	**15,784.26**
1985	435.58	893.68	3,355.03	3,994.01	598.32	2,746.32	2,019.19	2,259.55	**16,301.67**
1986	698.44	1,264.72	5,278.84	6,312.47	827.25	4,217.83	3,271.18	2,758.94	**24,629.68**
1987	939.07	1,591.31	6,724.61	8,122.07	1,045.96	5,238.64	4,439.25	3,445.91	**31,546.82**
1988	1,223.08	2,033.97	8,630.43	10,272.76	1,501.36	6,023.42	5,317.82	5,297.44	**40,300.28**
1989	671.98	1,266.44	4,029.42	6,184.35	914.24	3,904.17	3,052.92	2,461.45	**22,484.97**
1990	761.90	1,694.94	5,675.62	6,804.00	907.14	4,985.64	3,242.40	2,925.65	**26,997.28**
1991	922.24	1,688.48	7,384.46	7,952.96	1,062.98	5,561.62	3,824.46	4,389.28	**32,786.47**
1992	949.56	1,573.41	7,111.47	7,633.55	1,094.80	5,027.49	3,758.78	3,884.55	**31,033.62**
1993	754.65	1,244.25	5,864.89	6,018.01	858.59	3,221.70	3,089.19	2,668.68	**23,719.96**
1994	739.88	1,186.39	5,955.79	5,830.15	859.55	3,318.69	2,950.52	2,892.24	**23,733.20**
1995	889.35	1,347.48	6,458.88	6,466.19	953.81	3,124.91	3,163.01	3,409.94	**25,813.57**
1996	719.90	1,182.00	5,846.35	5,318.49	879.60	3,541.19	2,540.11	3,095.72	**23,123.37**
1997	586.19	947.38	4,550.22	4,059.65	690.92	3,077.79	2,073.04	2,839.17	**18,824.36**
1998	746.64	1,049.60	5,695.44	5,428.33	834.48	3,235.48	2,640.69	2,913.27	**22,543.91**
1999	642.77	1,034.32	5,241.29	4,822.17	721.30	2,978.72	2,291.92	2,655.54	**20,388.02**
Total	**$18,642.39**	**$33,823.34**	**$144,018.15**	**$168,897.40**	**$21,799.06**	**$98,173.37**	**$77,532.66**	**$79,856.71**	**$642,743.08**