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Assessing the Potential Impact of Geographical Indications for Common Cheeses on the US Dairy Sector

Prepared for:

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Ingredients | Products | Global Markets

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Glossary

ADF	Augmented Dickey-Fuller
AOC	Appellations d'Origine Contrôlées
DPI	Dairy Price Index
EEC	European Economic Community
ECJ	European Court of Justice
EDM	Equilibrium Displacement Model
EFM	Export Forecast Model
EU	European Union
FAO	Food and Agricultural Organization of the UN
GDP	Gross Domestic Product
GI	Geographical Indication
GTT	Global Trade Tracker
IMPLAN	Impact Analysis for Planning
NASS	National Agricultural Statistics Service
OLS	Ordinary Least Squares
PDO	Protected Designation of Origin
PGI	Protected Geographic Indication
RPSG	Relative Price of a Substitute Good
TSG	Traditional Specialties' Guaranteed Product
USD	US Dollar
USDA	US Department of Agriculture
USDEC	US Dairy Export Council
WTP	Willingness to Pay

Disclaimer

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I. EXECUTIVE SUMMARY

The EU is aggressively pursuing geographic indication status for common cheeses and other agricultural products within its borders and abroad. This study is a follow-up to a previous Informa study (*Assessing the Potential Impact of Geographical Indications for Common Cheeses on the US Dairy Sector*, 2016) which examined the likely impacts on the US dairy industry if the EU were to prevail in its drive to limit the use of a variety of common cheese names and the consequences of continued advancement by the EU to restrict the use of yet more terms that long ago originated in Europe. This study builds upon the previous study by incorporating additional cheese varieties into the analysis as well as calculating the impact on US cheese exports from bilateral trade agreements between the EU and third countries. The EU is pushing for new restrictive language in its trade deals which will impact US cheese exports. This study examines the hypothetical impact of the EU expanding its GI restrictions worldwide.

This study examines the potential impact of such a hypothetical scenario that would require US cheese makers to stop marketing common cheeses under newly protected names (like “feta”) as well as the impact from select importers’ inability to import cheese under protected names from the US. Economic theory suggests that consumers, faced with the decision of purchasing an imported product with a “familiar” but GI-protected name or a product with an “unfamiliar” name, would purchase less of the “unfamiliar” name cheese and pay less for it. This study estimated the magnitude of the consumer response and the implications for the US dairy industry.

The statistical and empirical methods used in this study include analogous cases, notably, the market impacts in Germany, Denmark, France and the United Kingdom incurred by granting GI status to parmesan and feta cheese; equilibrium displacement models; the Relative Price of a Substitute Good method; and dynamic global dairy industry models.

Results from this study indicate that consumption of US-produced cheeses that would be subject to GI restrictions would fall dramatically if GI regulations or other tools that have a similar effect were implemented in the United States in ways that restrict the use of common cheese names. Moreover, demand for US cheese exports would fall by a similar percentage to what would be observed in the domestic market. Based on analysis of the European case studies, US imports of European GI-labeled cheese are likely to increase by 13%. The collective effect of these market responses is that demand for US cheese would contract sharply, with prices falling 14% and consumption falling by 306 to 814 million pounds. In the short run, US cheese makers would be hard pressed to make significant economic responses to the shifting consumer demand curve and domestic demand for milk at all stages states of the dairy industry would fall.

The consumer reaction would trigger a sharp contraction in the US dairy industry. During the first three years of GI regulations restricting common names in the US, declining milk equivalent consumption would strongly pressure farm gate milk prices, which could fall by \$0.97 per cwt. to \$2.14 per cwt. (-5.4% to -11.9%). Consequently, dairy farm revenue would fall between 7.8% and 16.6% over three years, leading to revenue losses of \$9.5 billion to \$20.2 billion.

Beyond the impacts generated by European regulations on cheeses already having GI status, this study also examines the impact of subsequent GI status approval for current non-GI cheeses, like provolone and mozzarella, given the continued addition of previously generic terms to the EU's GI system, the continued expansion of the EU GI system in the EU as well as abroad through free trade agreements (FTAs), and the EU's refusal to date to provide clear assurances that use of those additional terms will not be restricted in the future.

The delayed impacts of GI status for cheeses like provolone and mozzarella would be more severe than the initial impacts due to the market sizes for these cheeses. Results from models on GI impacts show the total US milk equivalent consumption would fall between 56 billion and 136 billion pounds (2.7% to 6.7%). The average farm price in the long-run scenario ranges from \$0.90 to \$2.03 per cwt. lower than in the baseline case. Farm-gate margins would remain significantly below breakeven levels for 7 of the 10 years modeled in this study, forcing greater liquidation of the US dairy herd. The loss in herd size would range between 460,000 to 740,000 head due to the implications of GI restrictions on common cheese terms in the US. Finally, farm revenue losses would continue to mount with the delayed impacts, reaching a cumulative \$71.8 billion in lost revenue over ten years under the full WTP. The losses in US farm gate revenues are larger in this study, compared with the previous study, primarily due to expected losses in US exports. Farm gate revenue losses from likely lower exports resulting additional FTAs are forecast at \$7.55 billion under the partial WTP and \$10.3 billion under the full WTP over 10 years in this study.

Granting GI status to common cheeses has even broader impacts in the US than model results suggest. The declining demand for American-produced cheese would force cheese manufacturers out of business. Larger firms with higher equity and greater marketing/re-branding capabilities may be the best positioned to weather the economic conditions but even they face significant challenges if decisions to convert facilities to produce different varieties or products must be made. Small and medium-sized firms would be significantly pressured from lower cheese prices and demand, but may be well-positioned to continue marketing in the smaller niche and specialty cheeses markets.

The economic impacts would hardly be limited to cheese manufacturing. Industries such as butter and cream manufacturing facilities and whole/skim milk powder manufacturing would benefit from lower milk prices but, due to the expected high volume of milk moving from cheese production into alternative products, would see prices fall for their products. While the economic damage may not be as great in these industries as in the cheese manufacturing and dairy farming industries, the glut of additional product in the market would create financial strain for all industries connected to milk and milk products.

II. INTRODUCTION

The objective of this study is to quantify the likely effects of granting “Geographical Indication” (GI) status to European cheese makers for common varieties that are produced in the United States and other countries with which EU FTAs are negotiated. Cheeses currently holding GI protections in Europe have a long history of production in the United States, but continued production could be jeopardized by allowing EU efforts to limit global competition by restricting common names to continue to expand. Already, such US production is facing export constraints in a variety of global markets. If the rights of US cheese makers to use common terms without restriction are not preserved, strong negative economic impacts are likely to occur in the US dairy industry. Additionally, the acceptance of these GI restrictions by other countries through FTAs with the EU also would adversely impact their markets in terms of both exports and imports. The focus of this work is to model and quantify the extent of such impacts on the US dairy sector while incorporating the decreased ability of US cheese exporters to export to third countries where the EU has a trade agreement restricting the use of common cheese terms through GIs.

Currently[1], 256 cheeses have been granted GI status in the European Union (EU) or are in the process of acquiring it. The EU has been aggressive in enforcing GI protections within its own borders and has secured GI status for many of its products in trade agreements with other countries. The practical effect of GI status is that countries and firms not located within the area specified by the GI agreement (herein, non-GI countries or non-GI areas) cannot use words or terms that the EU claims are associated with the GI region. If US cheese manufacturers were forced to adhere to EU GI regulations, US cheese makers would likely be required to suspend use of common names restricted by those GI rules.

Prohibiting use of common names by US cheese makers would likely be followed by a strong and negative consumer reaction. US consumers, long familiar with purchasing “feta” and “parmesan” cheeses, among others, may not purchase as frequently, or pay as much for, the same cheese that is now re-labeled as “crumbled sheep cheese” or “hard grated cheese”. For instance, recipes often call for using a specific cheese type, which could now be sourced only from Europe. Restaurants would need to consider the consumer perception impact of relabeling menu offerings vs. altering supply sources to conform with consumer expectations. This research examines, through case studies of EU countries, equilibrium displacement models, and dynamic long-run global dairy industry models, the extent of the consumer reaction and the impacts on the US dairy industry as well as on foreign markets.

[1] As of the end of September 2018

III. BACKGROUND

A. History of PDO/PGIs in the European Union

PDO/PGI regulations originated in the French “Appellations d'Origine Contrôlées” or AOC system, which was created in 1935 to cover French wines and spirits. AOC products had to present particular characteristics due to natural and human factors and were linked to a geographical region.

The cited objective of the AOC designation is to protect the established reputation of unprocessed and processed agricultural products that are linked directly with the area, region, or country and with qualities and characteristics that are a result of the “terroir” or geographical environment, encompassed of both natural and human factors. The French AOC system was expanded in 1990 to include dairy products and other agricultural products.

At the same time, the European Economic Community (EEC) was just beginning to debate the future and development of rural zones and the promotion of products from these regions. In 1992, the EEC first adopted a system of protection for geographic names involving two categories under regulation R(EC) 2081/92: Protected Designation of Origin (PDO) and Protected Geographic Indication (PGI).

The purpose of the regulation was:

1) To encourage the diversification of agricultural production,
2) To promote characteristic products,
3) To improve farmers' revenues,
4) To keep the rural population in its zone and
5) To provide consumers with clear information.

The two GIs indicate different levels of connection with a geographic area, but both restrict the use of the term covered by the respective registration.

A PDO involves a relationship between the product and its origin, resulting solely from the terrain and abilities of producers in the region of production with which they are associated. PDO products require preparation, processing and production phases to be carried out in the geographical area.

Products with the PGI logo have a similar relationship with the area though only one stage in the production process must be carried out in the geographic location while the raw materials can come from another region.

Below are the exact definitions[2] of the PDO/PGI/TSG indications.

Protected Designation of Origin (PDO)

'Designation of origin' is a name that identifies a product:

(a) originating in a specific place, region or, in exceptional cases, a country;

(b) whose quality or characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; and

(c) the production steps of which all take place in the defined geographical area.

Protected Geographical Indication (PGI)

'Geographical indication' is a name that identifies a product:

(a) originating in a specific place, region or country;

(b) whose given quality, reputation or other characteristic is essentially attributable to its geographical origin; and

(c) at least one of the production steps of which take place in the defined geographical area

Traditional Specialties' Guaranteed Product (TSG)

A name shall be eligible for registration as a 'traditional specialties' guaranteed' where it describes a specific product or foodstuff that:

(a) results from a mode of production, processing or composition corresponding to traditional practice for that product or foodstuff; or

(b) is produced from raw materials or ingredients that are those traditionally used.

All agricultural products are covered under the PDO/PGI regulation including foodstuffs such as cheeses, meats and hams, beer and oil. In addition, a separate and similar system exists for wines and spirits in the EU. PDO/PGI registration is considered a type of intellectual property right and gives producers exclusive rights to use the registered name for their products in the EU.

Outside the EU, the European Commission has used bilateral trade agreements to help establish registration of products with EU PDO/PGI status. Increasingly, other countries have their own systems for protecting PDO/PGIs in place – whether through a GI-specific system or through a trademark system – and as such producers could register their terms independently as well.

A brief timeline of the history of PDO/PGI regulation, with special emphasis on products germane to this research, is provided in Box 1.

[2] Source: European Commission

Box 1: A Brief History of Geographical Indications in EU Cheeses

1996: *June 12* – Parmigiano Reggiano, Grana Padano, and Feta granted PDO by European Commission Regulation No. 1107/96.

2001: *October 9* – An opinion of the European Court of Justice (ECJ) Advocate General in case C-66/00, maintains that "parmesan" is the translation of "Parimigiano" (one of the GI terms) and therefore Italy is entitled to prohibit the production "parmesan" cheese that does not follow PDO specifications.

2002: *June 25* – Final decision handed down including "parmesan" under PDO protection.

2003: *May 20* – The French company Ravil imports, grates, pre-packages and distributes in France, among other products, Grana Padano cheese, which it markets under the name "Grana Padano râpé frais" (Grana Padano freshly grated). The Italian company Biraghi, a producer of Grana Padano cheese in Italy, and the French company Bellon, the exclusive importer and distributor of Biraghi products in France, sought for Ravil to cease distribution, arguing before the French courts that Italian law makes the use of the Grana Padano name subject to the condition that the grating and packaging are done in the region of production.

2004: *April 7* – Commission sends final written warning to German Government over failure to provide PDO protection for "Parmigiano Reggiano" that encompasses the term "parmesan."
July 9 – EU Commission refers Germany to ECJ for failure to provide full protection of "Parmigiano Reggiano" PDO (i.e. failure to enforce against the use of "parmesan") within territory.

2005: *October 25* – ECJ upholds that "feta" is a PDO of Greece; Germany and Denmark (supported by France, UK, and Northern Ireland v. Greece) brought the suit attempting to establish "feta" as a generic name.

2007: *June 28* – Advocate General of the European Court of Justice delivers opinion stating that regardless of whether "Parmesan" is an exact translation of "Parmigiano Reggiano", it represents an evocation of the protected PDO, thus is protected under EU GI legislation.
September 12 – The ECJ rules that the term "Grana" is not generic and is thus reserved to "Grana Padano" PDO producers.

2008: *February 26* – The final ECJ judgement upholds that parmesan is an evocation of "Parmigiano Reggiano" and adds that the only inspection structures that are obliged to ensure compliance with PDOs are those of the Member State from which the PDO in question originates. Responsibility for monitoring compliance with the specification for the PDO 'Parmigiano Reggiano' does not, therefore, lie with the German inspection authorities.

2012: *November 21* - New EU Regulation 1151/2012 on Geographical Indications which, amongst other changes, introduces the obligation for Member States authorities to police their markets and take (*ex officio)* action for GI infringements.

B. Impacts of GI Protections in Europe

Using Informa Economics IEG's Export Forecast Model (more on the Export Forecast Model can be found in Appendix A), the trade impacts of PDOs on Danish and German exports were quantified. The analysis indicated that Germany lost over $259.6 million USD as a result of PDO implementation (Exhibit 1). In Germany, most of these export declines were driven by losses in the feta cheese market, which greatly outweighed gains from sheep cheese exports, a common feta substitute. Domestically, Germany also suffered significant economic loses as a result of increased imports.

Leveraging the Relative Price of a Substitute Good Model (RPSG), which tests for structural breaks in prices of exports relative to a projected baseline (more details in Appendix A), IEG identified a 30% price decline in German export prices of parmesan, relative to the projected Italian baseline. This structural break was identified in April of 2005, just a few months before the Parmigiano Reggiano PDOs extension to include parmesan became active.

Denmark tells a similar story. Demark lost over $115 million USD after PDO protection for feta became active (Exhibit 2). Again, a significant portion of these loses were a result of plummeting feta exports. Note, economic loss can be defined as the difference between forecasted exports (had PDOs impacting use of generic terms not been upheld) and actual exports (which, of course, include the effects of PDOs that impacted the use of generic terms).

Exhibit 1: Total German Export Value Impacts as a result of European PDO Restrictions on Generic Terms ($USD)

Years[1]	Losses from Feta Exports	Domestic Losses (Feta)	Gains from Exports of Feta's Substitutes	Years[2]	Losses from Parmesan Exports	Domestic Losses (Parmesan)	Gains from Exports of Parmesan's Substitutes	Total Impact
2010	-$36,106,002	-$15,810,455	$3,642,742	**2007**	-$1,007,300	-$16,196,568	-$13,593,647	-$79,071,230
2011	-$42,345,151	-$23,180,935	$4,579,330	**2008**	-$2,218,306	-$32,080,235	$2,456,967	-$92,788,330
2012	-$64,610,476	-$17,637,089	$3,452,456	**2009**	-$1,760,741	-$16,234,803	$9,008,020	-$87,782,633
Total	**-$143,061,629**	**-$56,628,479**	**$11,674,528**	**Total**	**-$4,986,347**	**-$64,511,606**	**-$2,128,660**	**-$259,642,193**

1. PDO status upheld in 2005 and activated 5 years later (2010) when EU grace period ended.
2. PDO status upheld in 2002 and activated 5 years later (2007) when EU grace period ended.
Source: Informa Agribusiness Consulting and GTIS

Exhibit 2: Total Danish Export Value Impacts as a result of European PDO Restrictions on Generic Terms ($USD)

Years[1]	Losses from Feta Exports	Domestic Losses (Feta)	Gains from Exports of Feta's Substitutes	Years[2]	Losses from Parmesan Exports	Domestic Losses (Parmesan)	Gains from Exports of Parmesan's Substitutes	Total Impact
2010	-$36,307,677	$792,760	$948,060	**2007**	-$1,198,877	-$597,255	$2,083,469	-$34,279,520
2011	-$47,095,935	$532,265	$1,742,487	**2008**	-$62,254	$131,342	$6,241,868	-$38,510,227
2012	-$43,116,452	$391,682	-$952,330	**2009**	-$16,972	$267,304	$510,523	-$42,916,245
Total	**-$126,520,064**	**$1,716,707**	**$1,738,217**	**Total**	**-$1,278,103**	**-$198,609**	**$8,835,860**	**-$115,705,992**

1. PDO status upheld in 2005 and activated 5 years later (2010) when EU grace period ended.
2. PDO status upheld in 2002 and activated 5 years later (2007) when EU grace period ended.
Source: Informa Agribusiness Consulting and GTIS

The price impacts in the Danish feta market were also very significant. Immediately following the 5-year derogation period imposed by the European Court of Justice, prices of Danish feta exports decreased 13%. Furthermore, Greek export prices increased 10% over the same period. This implies an increase in demand for Greek feta and a decrease in demand for Danish feta.

C. Key Takeaway

On average, the PDO status for feta and parmesan cheeses in the EU created a 14% price decrease in EU countries producing these product types. This, coupled with sharply declining export values, showcases just how damaging PDO decisions impacting common product category were in the EU and could be in the United States' export markets.

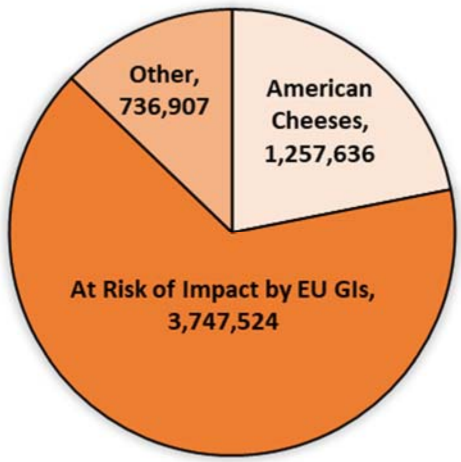
IV. US CHEESE MARKET DYNAMICS

A. Overview

In 2017, the US produced over 5.7 million metric tons of cheese. Among the cheeses produced are American-style cheeses along with others that may be at risk of being impacted by EU GI classification, including asiago, brie/camembert, cheddar, emmental, feta, fontina, gorgonzola, gouda, grana, havarti, mozzarella, muenster, parmesan, provolone and romano. Production of these cheese varieties totaled 4.3 million metric tons in 2017 and accounted for 65 percent of total US cheese production.

Exhibit 3: 2017 US Cheese Production by Type

In Metric Tons



Source: NASS/USDA

B. Cheeses Subject to and Likely Subject to GI Protections

Across the European Union, 266 cheese varieties either have registered PGI/PDO status or have pending registrations as of September 2018. The EU has formally registered 235 different cheese varieties with either PGI or PDO status. As of September 2018, an additional four cheeses (two are new varieties, two are for adjustments to cheeses which are already registered) have published regulations concerning proposed PDO/PGI status that are under the five-month "opposition" period that provides an opportunity for the public to voice concerns over the proposal. Finally, as of September 2018, 27 (19 are new varieties, 8 are for adjustments to cheeses which are already registered) cheeses have pending applications for PGI or PDO status that are still under consideration by the Commission and have not yet been published for public comment.

To estimate the impact of granting GI registrations to common name cheeses in the United States, American-produced cheeses are broken down into three categories. The first category contains those cheeses that are currently produced and marketed in the US under names that are currently registered or have pending registrations for PDO/PGI designation in Europe. Those cheeses include asiago, feta, fontina, gorgonzola, grana, havarti, muenster, neufchatel, parmesan and romano. Such cheeses would, depending on the specifics of the scenario, be immediately subject to GI labeling restrictions. Accordingly, US cheese manufactures would be forced to rename, rebrand, and relabel cheeses to avoid conflicts with EU GI labeling laws, were they to be imposed in the US.

The second category is composed of cheeses that, either due to their name or their status as American-origin, would not be subject to GI restrictions either near-term or in the future. Such cheeses, including American brick cheese, colby, monterey jack, and others, are very unlikely to have European PDO/PGI status that would pose a threat to US cheese manufacturers. The cheeses are assumed to be forever free from the threat of European GI restrictions and include blue cheese, monterey jack, baby jack, brick, colby, and processed cheese (including Velveeta, Kraft Singles, etc.). While the terms swiss and baby swiss are not currently being pursued by the EU through the use of GIs, Switzerland is pressing for restricting the use of country names. The use of the terms swiss and baby swiss are currently not restricted; however, it is difficult to suggest they are forever free from restriction given the push by Switzerland. For that reason, swiss and baby swiss are analyzed in this report as unrestricted, however, it is important to note that this may change in the future.

Finally, the third category of cheeses includes those where European GI designations do not currently restrict the use of the common name but could be applied for or interpreted in ways that do restrict its use in the future, given past EU precedents and continual expansion of the EU GI regime. Accordingly, this study treats these cheeses as subject to delayed GI restrictions.

For example, if the current model of European GI restrictions were imposed at this stage in the US, US cheese manufacturers could still produce and market “mozzarella” cheese because EU PDO/PGI status does not currently exist for the term “mozzarella” when used in isolation. However, there are no barriers to prevent EU members from applying for and receiving PDO/PGI status for “mozzarella” in the future. Nor are there iron-clad barriers to ensure that the existing PDO for “Mozzarella di Bufala Campana” could not be later interpreted in a way that restricted use of “mozzarella”. The specific cheeses analyzed that are possibly subject to future GI restrictions include cheddar[3], brie, camembert, emmental, gouda, provolone, mozzarella and pecorino.

[3] The use of cheddar is uncertain given the future of the UK with their decision to leave the EU. In this report, cheddar was included in delayed restrictions; however, the terms of the UK leaving the EU will determine the use of the term cheddar.

The European Commission has to date declined to utilize its regulatory process or other public statements to issue clear rulings safeguarding the future unrestricted use of these generic terms. This is despite the fact that many of these terms possess internationally-recognized Codex Alimentarius standards. Due to European reluctance to issue such clear assurances to date, the aforementioned cheeses that are likely subject to delayed GI restrictions are included and considered subject to GI restrictions for the balance of this work.

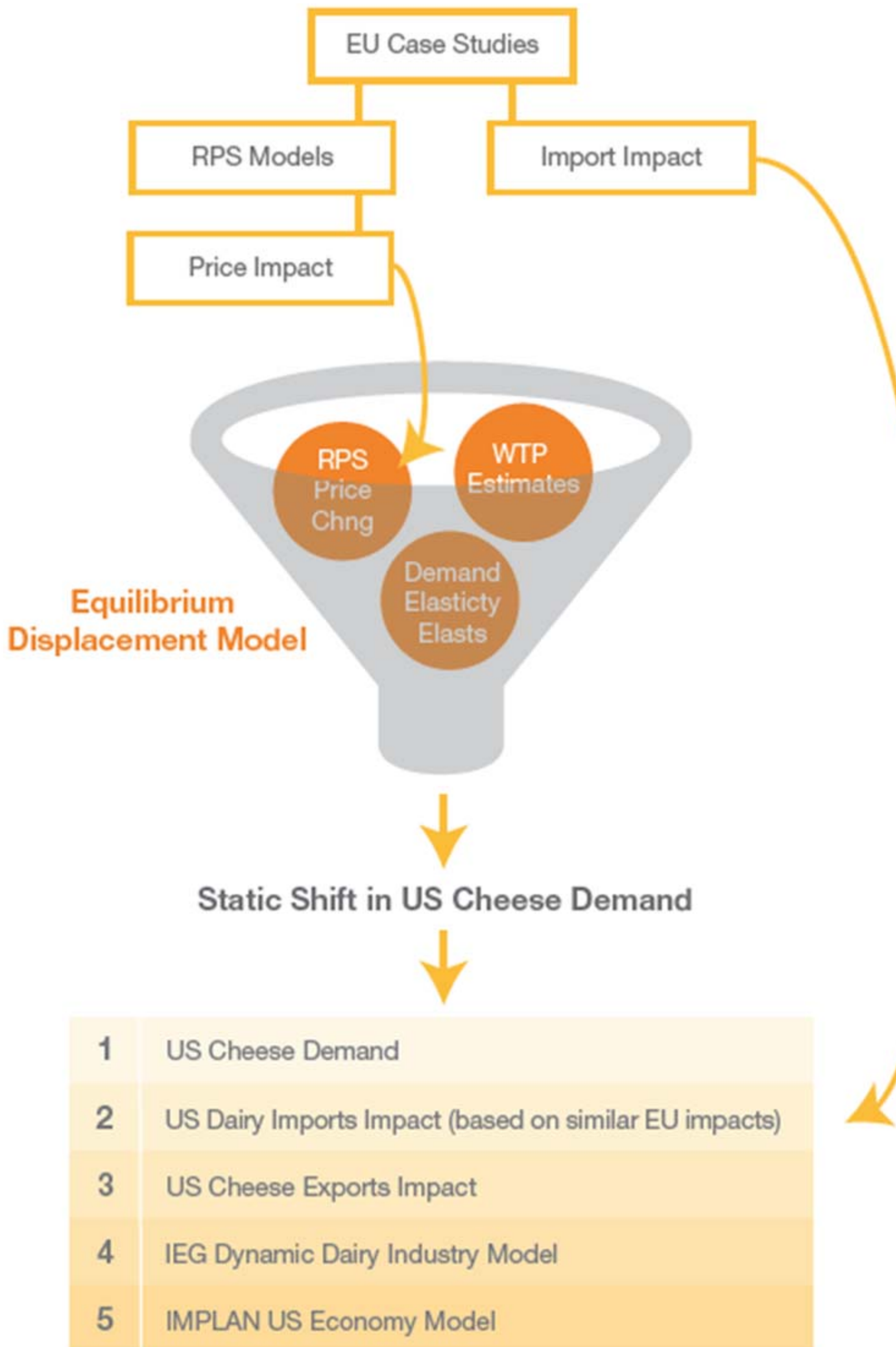
V. METHODOLOGY AND DATA

Due to the size and complexity of this project, multiple econometric techniques were utilized to determine how enforcing European geographical indicators on US cheeses bearing common names would impact the US dairy industry. First, this study uses the case study approach to acquire baseline estimates of consumer/producer reactions to GI rulings in similar countries. Specific techniques used to analyze the EU case studies included Informa Economics IEG's Export Forecast Models (see Appendix A for details) and the Relative Price of a Substitute Good (RPSG) model. The results from these models provided inputs into the second step in this analysis: using an equilibrium displacement model (EDM) to estimate consumer reactions. The equilibrium displacement model uses various price and supply and demand curve information to trace the change in quantity demanded after a demand (or supply) curve shift. In this application, the EDM was used to estimate the static[4] change in demand for US-produced cheeses if GI restrictions were enforced on US cheese producers.

The static change in the quantity demanded of US-produced cheeses was used as the starting point in Informa Economics IEG's proprietary dynamic, long-run dairy industry models. The dynamic models use milk equivalents to trace the effects of supply or demand changes on US dairy production, exports, imports, and consumption. The model was also adjusted to incorporate the decreased ability of exports to third countries where the EU has trade agreements restricting cheese trade through GIs. The dynamic models provide a view of the continual adjustments producers and consumers make based on current (projected) market conditions. The results from the dynamic dairy industry model are then incorporated into IMPLAN® economic input-output models to evaluate the impact that changes in the dairy sector would have on the US national economy. Exhibit 4 shows a graphical depiction of the research steps for this analysis.

[4] As used in this study, the EDM does not account for changes in the supply curve of US-produced cheeses, only the change in price and quantity demanded. The EDM is a static model where impacts do not have further implications. In reality, however, such a change would, of course, elicit responses from US cheese manufactures. These responses are modeled dynamically in Informa Economics IEG's long-run dairy industry model, calibrated with the initial consumption response from the EDM.

Exhibit 4: Research Steps and Methods



While the methodological details for the Export Forecast Models and the Relative Price of a Substitute Good model are presented in Appendix A, the economic theory and methodologies for the equilibrium displacement model are detailed here.

A. Equilibrium Displacement Model

In order to estimate the effect of the GI enforcement on US cheese demand, Informa utilized the Equilibrium Displacement Model (EDM), which has become more commonly used in the analysis of policy impacts on a given market (e.g. Piggott, 1992[5]; Zhao et al., 2000[6]; Lusk and Anderson, 2004[7]; Balagtas and Kim, 2007[8]). EDM's are derived by first establishing a system of equations in which supply and demand are functions of price and exogenous shifts. The EDM utilized in this study is derived in Appendix B. A benefit of EDMs is that it is not necessary to specify functional forms for supply and demand, making results more robust.

A drawback to EDMs is that they are static models. For this reason, the EDM in this study was used just to estimate a change in demand for US cheese. This value was then used to calibrate a dynamic model for long-term impacts to the US dairy industry. To determine the demand change from the EDM for this study, Informa first needed demand and elasticities as well as exogenous shifts. It was assumed that shifts in the producer's cost curve would be negligible as production practices would not change, and only minor labeling costs would be incurred. In actuality, the cheese industry would face considerable costs for promotion, but these would likely be realized in the long run, and not the short run. So, the major concern for cheese producers in the short run would not so much be an increase in cost, but a decrease in demand.

For exogenous shifts in demand, the re-classification of cheese marketed under common names now newly restricted by GIs to entirely new names without any relation to the GI would result in a change in consumer willingness-to-pay. From the derived equations, by plugging in exogenous shifts in demand, relative price changes, and demand elasticities, the relative change in quantity can be determined. Analogous cases provided a baseline for estimates of relative price changes and made it possible to determine changes in quantity without estimating supply elasticities.

1. Components of Equilibrium Displacement Models

The general specification for an EDM estimating the change in quantity demanded take the form:

$$1)\quad \boldsymbol{dlnQ_i = \eta_i\,(dlnP_i - \delta_i)}$$

Where *dlnQ* is the change in quantity demanded of product *i, η* is the own-price elasticity of demand, $dlnP_i$ is the percentage change in price, and *δ* is the willingness to pay for product *i.* In short, the change in

[5] Piggot (1992). Available here: http://onlinelibrary.wiley.com/doi/10.1111/j.1467-8489.1992.tb00516.x/pdf

[6] Zhao et al. (2000). Available here: http://ageconsearch.umn.edu/bitstream/28007/1/er000004.pdf

[7] Lusk and Anderson (2004). Available here: http://ageconsearch.umn.edu/bitstream/31110/1/29020185.pdf

[8] Balagtas and Kim (2007). Available here: http://www.agecon.purdue.edu/staff/balagtas/dairy_advertising_AJAE07.pdf

quantity of cheese demanded is equal to the own-price demand elasticity of cheese times the change in price less the consumer willingness-to-pay.

(a) Own-Price Demand Elasticity

Estimates for the own-price elasticities of demand used in this study as parameters for the equilibrium displacement model (EDM) were gathered from academic research on cheese demand (i.e. Afrini et al., 2006[9]; Bouhlal et al., 2013[10]; Davis et al., 2010[11]; Davis et al., 2011[12]; Hassan et al., 2011[13]; Schmit et al., 2002[14]). For instances in which the studies did not provide an elasticity for a particular variety of cheese, the elasticities of closely related categories were used in the model. Exhibit 5 details the elasticities used in this study. Elasticities range from the most inelastic of -0.61 for cream cheese to the most elastic of -2.24 for muenster. For a given elasticity, the value represents the percentage change in quantity demanded given a 1 percent increase in price. In the case of muenster, on average a 1 percent increase in price causes a 2.24 percent decrease in quantity demanded.

[9] Afrini et al. (2006). Available here: http://ec.europa.eu/agriculture/quality/certification/docs/case8_en.pdf

[10] Bouhlal et al. (2013). Available here: http://ageconsearch.umn.edu/bitstream/151298/2/Yasser%20Bouhlal%20AAEA2013.pdf

[11] Davis et al. (2010). Available here: http://www.ers.usda.gov/media/134547/tb1928.pdf

[12] Davis et al. (2011). Available here: http://ageconsearch.umn.edu/bitstream/104621/2/jaae393.pdf

[13] Hassan et al. (2011). Available here: http://www.tse-fr.eu/sites/default/files/medias/doc/wp/fff/11-225.pdf

[14] Schmit et al. (2002). Available here: http://ageconsearch.umn.edu/bitstream/31088/1/27010165.pdf

Exhibit 5: Demand Elasticity Estimates

Variety	Own-Price Demand Elasticity	Source
AMERICAN CHEESE		
CHEDDAR		
CHEDDAR FOR PROCESSING		
CHEDDAR FOR RETAIL	-0.92	Bouhlal, Capps, Ishdorj
COLBY & JACK & MONTEREY Cheese	-0.92	
ASIAGO	-1.73	Bouhlal, Capps, Ishdorj
BLUE & GORGONZOLA CHEESE	-1.64	
BLUE		
GORGONZOLA	-1.73	Bouhlal, Capps, Ishdorj
BRICK & MUENSTER, CHEESE		
BRICK		
MUENSTER	-2.24	Hassan, Monier-Dilhan, and Orozco
CAMEMBERT	-1.73	Bouhlal, Capps, Ishdorj
COTTAGE CHEESE		
CREAM & NEUFCHATEL CHEESE*	-0.61	Bouhlal, Capps, Ishdorj
EMMENTAL CHEESE	-1.73	Bouhlal, Capps, Ishdorj
FETA CHEESE	-1.70	Bouhlal, Capps, Ishdorj
FONTINA CHEESE	-1.73	Bouhlal, Capps, Ishdorj
GOUDA CHEESE	-1.55	Davis, et al. 2011
HAVARTI	-1.73	Bouhlal, Capps, Ishdorj
HISPANIC CHEESE		
ITALIAN CHEESE		
ITALIAN CHEESE, HARD, PARMESAN & SIMILARS	-2.25	Davis, et al. 2011
ITALIAN CHEESE, HARD, PROVOLONE & SIMILARS	-2.14	USDA ERS
ITALIAN CHEESE, HARD, ROMANO & SIMILARS	-2.14	USDA ERS
ITALIAN CHEESE, OTHER	-2.14	USDA ERS
ITALIAN CHEESE, SOFT, MOZZARELLA	-1.08	Bouhlal, Capps, Ishdorj
ITALIAN CHEESE, SOFT & SIMILARS	-2.14	USDA ERS
PECORINO	-2.14	USDA ERS
GRANA	-2.14	USDA ERS
OTHER CHEESE	-1.69	USDA ERS
SWISS CHEESE		

Note: cheeses not subject to GI restrictions are highlighted in grey *Data restrictions did not let us separate cream cheese from neufchatel

(b) Willingness-to-Pay

Willingness-to-pay (WTP) estimates were obtained from Deselnicu et al. (2013)[15]. Other studies estimating willingness-to-pay for GI products were available, but the methods and results presented by Deselnicu et al. appeared more robust and applicable to the current research. In their meta-analysis, they find the average American willingness to pay for GI labeled products is 39%. Because this study is estimating the likely decrease in willingness-to-pay for US cheeses that no longer use GI names, we use the negative value of the WTP found by Deselnicu et al., or -39%. Due to a lack of data, 39% was used as a pseudo willingness-to-pay for select foreign countries.

Informa believes this estimate best serves as an upper-bound value representing the more dramatic change in demand. The full 39% WTP was used in Equation 1 and the resulting impacts were assumed to be the worst-case scenario from the perspective of the US cheese demand. By using the full WTP in Equation 1, we assume that American consumers currently have no willingness to pay for cheeses with a European Union GI label. In reality, American consumers do appear willing to pay higher prices for imported cheeses[16]. Accordingly, a second method of estimating the consumption impact was created. To serve as a sort of sensitivity analysis, under the second method the WTP premium is assumed to be 60 percent of the estimate reported by Deselnicu et al. to represent the current WTP premium exhibited by the American consumer.

(c) Price Change

For this study, the average price impact found from the Relative Price of a Substitute Good model (see detailed methodology in Appendix A) was used for the price change expected in the US cheese market upon enforcement of GI restrictions. The average impact was a price decrease of 14%. The average price change due to GI restrictions was used as the price change for all individually estimated cheeses in the study.

B. IEG Dynamic Dairy Industry Model

Upon estimation of consumer demand changes for US-produced cheeses under GI restrictions, dairy industry impacts were estimated using Informa Agribusiness Consulting's long range model of the US and global dairy markets. The models are built using milk equivalent units and dynamically model production, imports, exports, domestic consumption and inventory for the US, EU-28, and New Zealand. The models include the global effects of GI policy with respect to Denmark, France, Germany, Mexico, South Korea,

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[15] Deselnicu et al. (2013). Available here: http://www.waeaonline.org/jareonline/archives/38.2%20-%20August%202013/JAREAug20135Deselnicup204.pdf

[16] Based on currently observed retail prices.

Japan, Canada, and China. One of the main differentiating aspects of this study from the previous study is its incorporation of the trade implications of bilateral trade agreements into Informa's long range model allowing for the impact of US exports to be modelled. Exports out of other exporting countries are either fixed or continue along the long-term trend. Imports are modeled for the rest of the world combined into a single ROW category. The model solves for prices that balance supply and demand in each of the major exporting countries as well as balancing supply and demand in the global market simultaneously. Results from the model show the impact to US milk production, cow herd numbers, milk prices, farm-gate revenue, and other similar impacts.

C. Estimated Impacts on US Economy

The final step in estimating the possible effects of granting GI status to European cheese makers in the US is to determine the impact on the broader economy. Though the largest impacts would be felt in the dairy products manufacturing and dairy farming industries, the economic links between these and other industries would cause a national "ripple effect."

The effects on the US economy were estimated using IMPLAN economic input-output software. IMPLAN is econometric software that estimates the economic links between industries and how changes in one industry affect other industries. IMPLAN includes the linkages between industry spending (costs in one industry linked to revenues in another), labor income (wages and salaries), and employment. IMPLAN provides for three types of impacts:

- Direct impacts are those felt in the industry in which a change occurs. In this case, the direct impacts of a change in cheese prices would be felt in the cheese production industry.
- Indirect impacts are those incurred by industries with economic linkages to the industry being impacted. For the current case, the dairy farming industry would feel the indirect impacts of revenues changes in the cheese manufacturing industry.
- Finally, the induced impacts are those created by changes in the spending patterns of employees in a given industry. The employees of a cheese manufacturing firm which has experienced revenue loss may receive subsequent reductions in wages or salaries. The reduced spending of employee wages creates induced impacts in industries where those employees spend their wages.

For this report, the dairy industry farm-gate revenue, employment[17], labor income, and proprietor income (essentially profit) losses were obtained from Informa Economics IEG's dynamic dairy industry model and used as starting parameters or "events" in IMPLAN. Further details are available in Chapter IX.

[17] Employment changes were estimated by taking the number of cows per dairy farm employee and multiplying by the estimated herd change from the dynamic dairy industry model.

VI. EQULIBRIUM DISPLACEMENT MODEL RESULTS

Using 2017 USDA NASS production and consumption data for the US cheese manufacturing industry, apparent consumption[18] of US-produced cheeses was calculated (**Error! Reference source not found.**). Additional assumptions were made regarding consumption for specific cheese varieties. While NASS provided sufficient data to estimate consumption of cheddar cheese, no distinction is made between cheddar destined for processing and cheddar destined for retail markets. Cheddar for processing into other products (Velveeta® or Kraft Singles®, for example) does not currently have any branding that would be subject to GI regulations. As such, it is excluded from the EDM and further analysis. Informa Economics IEG estimates just over one billion pounds of cheddar go into processed cheeses each year and this volume was subsequently excluded from the analysis.

Similarly, NASS provides aggregated data for "brick and muenster" cheese but does not further breakdown the volume of production/consumption by type. Informa Economics IEG's data suggests 95% of "brick and muenster" production is muenster and consumption volumes are allocated accordingly. Finally, NASS data on mozzarella production was broken into two subcategories: mozzarella for pizza and mozzarella for retail. Consumption is assumed to be equal between the two subcategories but mozzarella for retail is assumed to have a $0.03 per pound price premium to mozzarella for pizzas.

Two EDMs were created to estimate the impact of cheeses immediately subject to GI restrictions and those likely subject to delayed restrictions[19]. According to the theory and use of equilibrium displacement models, three parameters were set up for each EDM and each cheese variety in the study: the expected price change, the estimated own-price demand elasticity, and the willingness-to-pay premium for GI labeled products. For each cheese variety, the price change used in the model was -14%, based on findings from the RPSG model used in the EU case studies. The own-price demand elasticities were obtained from academic sources (see section **Error! Reference source not found.**) for each cheese variety as available. In the case of cheese varieties where no specific demand elasticity could be obtained, demand elasticities for other, similar cheeses were used in proxy. Finally, the willingness-to-pay coefficient was obtained from Deselnicu, et al. 2013[20], which found a 39% premium in US markets.

For each of the equilibrium displacement models estimating the immediate and delayed impacts of GI regulations on US cheese demand, two additional scenarios were created (**Error! Reference source not found.**). In the first scenario, the full willingness-to-pay (WTP) from Deselnicu et al. 2013 was used. In the

[18] Apparent consumption is equal to production less imports less exports less cheese stocks.

[19] The identification of cheeses subject to immediate and delayed GI rules is detailed in Chapter IV of this report.

[20] Deselnicu et al. (2013). Available here: http://www.waeaonline.org/jareonline/archives/38.2%20-%20August%202013/JAREAug20135Deselnicup204.pdf.

second, the WTP was lowered to 23% and is herein referred to as the partial WTP scenario. The rationale behind creating a full- and partial-WTP scenario is twofold. This approach performs a type of sensitivity analysis around one of the central assumption in the study. Anecdotal evidence suggests US consumers are currently paying higher prices for EU imported/GI labeled cheeses. As such, some portion of the maximum WTP for European GI labeled cheeses is being used. By reducing the WTP in the partial-WTP scenario, we account for this phenomenon and estimate the remaining WTP that would be utilized post-US GI enforcement.

Exhibit 6: Equilibrium Displacement Models Used to Estimate Changing Cheese Demand

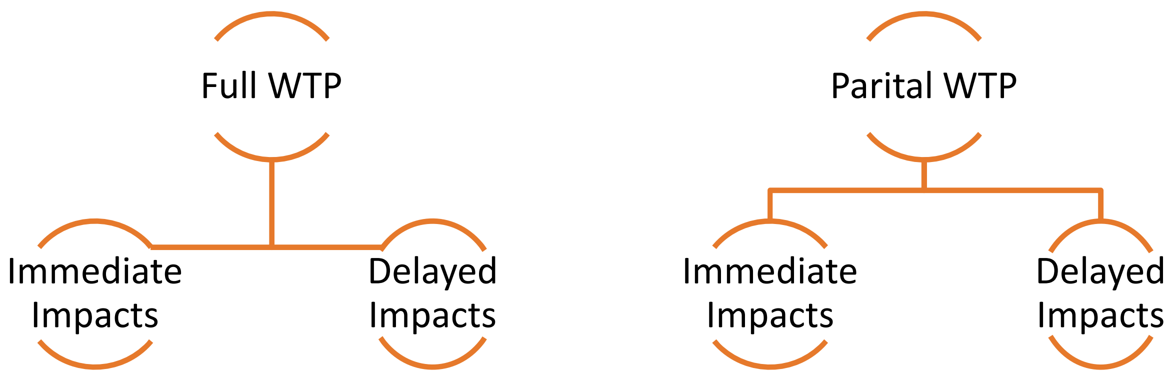


Exhibit 7: 2017 Apparent US Consumption of Cheeses Produced in the US

Cheese Type	Consumption (Million Pounds)
American Cheese	4,607
Cheddar	3,337
Cheddar for Processing	1,076
Cheddar for Retail	2,261
Colby, Jack, & Monterey Cheese	1,270
Asiago	35
Blue & Gorgonzola Cheese	86
Blue	43
Gorgonzola	43
Brick & Muenster Cheese	179
Brick	9
Muenster	171
Camembert	13
Cottage Cheese	991
Cream & Neufchatel Cheese	880
Emmental	52
Feta Cheese	121
Fontina	12
Gouda Cheese	57
Hispanic Cheese	263
Italian Cheese	5,016
Italian Cheese, Parmesan & Similar	409
Italian Cheese, Provolone & Similar	369
Italian Cheese, Romano & Similar	55
Italian Cheese, Other	73
Italian Cheese, Mozzarella	3,874
Mozzarella for Pizza	1,937
Mozzarella for Retail	1,937
Italian Cheese, Ricotta & Similar	232
Grana	4
Other Cheese	164
Swiss Cheese	293
Total	**12,865**

Results

Results from the equilibrium displacement models suggest that under the full-WTP model, the immediate impacts of GI restrictions in the US would be to reduce consumption of US-produced cheeses by 814 million pounds. This equates to six percent of total US cheese consumption in 2017. At current market prices, the value of lost consumption totals $3.1 billion.

The delayed impacts of GI restrictions on US demand for US-produced cheeses are even greater. Under the full-WTP scenario, consumption of US produced cheeses falls by 1.85 billion pounds, or 14 percent of 2017 total US cheese consumption. The market value of the expected consumption loss is $4 billion.

In total, the immediate and delayed impacts of enforcing GI protections for common name cheeses within the US would be to **reduce consumption of US-produced cheeses by 2.668 billion pounds at a market value of $7.1 billion**.

Results from the partial-WTP model are more moderate. The partial-WTP model predicts consumption of cheeses immediately subject to GI restrictions would fall by 306 million pounds, or two percent of US cheese consumption. The market value of this impact is $1.2 billion. The impact of delayed GI enforcement on cheeses like mozzarella and cheddar is expected to reduce US consumption of these cheeses by 697 million pounds, or five percent of current US-produced cheese consumption. The market value of this consumption loss is $1.5 billion.

Under the partial-WTP model, the impact of enforcing GI restrictions on US cheeses would be to reduce demand for US-produced cheeses by just over one billion pounds, or eight percent. The market value of consumption that "would have occurred" totals $2.7 billion.

Exhibit 8: Equilibrium Displacement Model Results

Scenario	Impact	Consumption Change (Mill. lbs.)	% of US All-Cheese Consumption	Current Market Value (Mill. USD)
Full WTP	Immediate Impacts	-814	-6%	-$3,136
	Delayed Impacts	-1,854	-14%	-$3,977
	Total Impact	**-2,668**	**-21%**	**-$7,122**
Partial WTP	Immediate Impacts	-306	-2%	-$1,179
	Delayed Impacts	-697	-5%	-$1,495
	Total Impact	**-1,003**	**-8%**	**-$2,674**

Source: Informa Economics IEG

VII. IMPACT ON SELECT IMPORTERS AND EXPORTS

A. Summary

Since global impacts of GI status granted to the EU not only impact US consumption and exports of US cheeses, potential changes in cheese supply and demand are also evaluated in select importing countries including Canada, China, Japan, Korea and Mexico as well as a world total. Also examined are the potential impacts on select cheese exporters including Germany, Denmark and France. Foreign country acceptance of GIs impacts US ability to export to those countries. This compounds the impact on the US dairy sector leading to further downward pressure on demand of US produced cheese.

If worldwide GI restrictions on common named cheeses were enforced against US cheese makers, the resulting lower demand for US produced cheese would have a significant and deleterious impact on US dairy farmers. Under the partial willingness to pay (WTP) scenario, farm gate milk prices average \$0.90/cwt. lower than our baseline over a 10 year period with cumulative farm gate revenue down \$36.5 billion. In the full WTP scenario, the farm gate milk price averages \$2.03/cwt. below baseline with the 10 year cumulative impact on revenue at -\$71.8 billion.

In both WTP scenarios, farm gate margins drop below breakeven for an extended period of time which would drive farmers out of the industry and reduce the size of the dairy cow herd. In the partial willingness to pay scenario, margins would be significantly below breakeven in 3 out of the 10 year forecast horizon while in the full WTP scenario, margins would be significantly below breakeven for 7 of the 10 years analyzed.

B. Model Details and Assumptions

Impacts were estimated using Informa's long range model of the US and global dairy markets. The models are built using milk equivalent units and dynamically model production, imports, exports, domestic consumption and inventory for the US, EU-28, and New Zealand. The models include the global effects of GI policy with respect to exporters including Denmark, France, and Germany and importers including Mexico, South Korea, Japan, Canada, and China. Exports out of other exporting countries are either fixed or continue along the long-term trend. Imports are modeled for the rest of the world combined into a single ROW category. The model solves for prices that balance supply and demand in each of the major exporting countries as well as balancing supply and demand in the global market simultaneously.

For the partial and full WTP scenarios we introduced shocks to domestic consumption, imports, and exports. We used the decrease in quantity demanded for domestic consumption from our EDM models to estimate the shock to domestic consumption. We assumed that demand for cheese included in the GI policy would fall by the same percentage as the US domestic market for all countries observed. We assumed that production of specialty cheeses in origin countries would increase in the long run. Based on import increases in GI cheese origin countries following GI enforcement, we assumed that US imports from the EU would increase by 6%. We converted the shocks to milk equivalent units assuming 9.63 pounds of milk per pound of cheese.

C. Select Importers

Importing countries examined in this study were Canada, China, Japan, Korea and Mexico. These are key export markets for US produced cheese and disruptions from EU FTAs including GIs would adversely impact the US dairy sector.

1. Mexico

Mexico is the largest destination for US cheese exports, totaling 756.2 million pounds in 2017 worth $1.46 billion. Mexican cheese consumption is expected to drop a total of 69.7 million pounds or 2.1%, from the baseline forecast, over the course of ten years. This decline in consumption is anticipated to reduce US cheese exports to Mexico by 55.1 million pounds with an estimated value of $106.38 million over ten years.

2. Korea

Korea is the second largest destination for US cheese exports, totaling 115.4 million pounds in 2017 worth $212.8 million. Korean cheese consumption is expected to drop a total of 265.1 million pounds or 7.8%, from the baseline forecast, over the course of ten year. This decline in consumption is anticipated to reduce US cheese exports to Korea by 113.4 million pounds with an estimated value of $209.11 million over ten years.

3. Japan

Japan is the third largest destination for US cheese exports, totaling 71.6 million pounds in 2017 worth $143.7 million. Japanese cheese consumption is expected to drop a total 296.7 million pounds or 4.2%, from the baseline forecast, over the course of ten years. This decline in consumption is anticipated to reduce US cheese exports to Japan by 35.9 million pounds with an estimated value of $72.05 million over ten years.

4. China

China is the fifth largest destination for US cheese exports, totaling 31.6 million pounds in 2017 worth $63.1 million. Chinese cheese consumption is expected to totaling a drop of 83.9 million pounds or 2.3%, from the baseline forecast, over the course of ten years. This decline in consumption is anticipated to reduce US cheese exports to China by 3.3 million pounds with an estimated value of $6.59 million over ten years.

5. Canada

Canada is the sixth largest destination for US cheese exports, totaling 27.7 million pounds in 2017 worth $68.78 million. Informa's models indicate that Canadian cheese consumption could drop 33.4 million pounds or 4.8%, from the baseline forecast, over the course of ten years. This decline in consumption is anticipated to reduce US cheese exports to Canada by 14.4 million pounds with an estimated value of $35.75 million over ten years.

D. Select Exporters

Much like the US, other large cheese exporting countries are adversely impacted by EU FTAs including GIs. The exporters examined in this study are Germany, Denmark and France.

1. Germany

Germany is the largest cheese exporter in the world, totaling 2.67 billion pounds in 2017 worth $4.4 billion. Informa's models indicate Germany's cheese exports could drop a total of 202.1 million pounds or 4.48%, over the course of ten years, with an estimated value of $332.8 million.

2. France

France is the third largest cheese exporter in the world, totaling 1.497 billion pounds in 2017 worth $3.45 billion. French cheese exports are expected to drop a total 611.6 million pounds or 3.5%, over the course of ten years, with an estimated value of $1.41 billion.

3. Denmark

Denmark is the seventh largest cheese exporter in the world, totaling 842.99 million pounds in 2017 worth $1.7 billion. Denmark's cheese exports are expected to drop a total of 631.2 million pounds or 6.41%, over the course of ten years, with an estimated value of $1.27 billion.

VIII. PROJECTED IMPACT ON US DAIRY INDUSTRY

A. Summary

If GI restrictions on common named cheeses were enforced against US cheese makers, including taking into account EU FTAs with other countries that include GI restrictions, the resulting lower demand for US produced cheese would have a significant and deleterious impact on US dairy farmers. Under the partial willingness to pay (WTP) scenario, farm gate milk prices average $0.90/cwt. lower than our baseline over a 10-year period with cumulative farm gate revenue down $36.5 billion. In the full WTP scenario, the farm gate milk price averages $2.03/cwt. below baseline with the 10-year cumulative impact on revenue at $71.8 billion as shown in Exhibit 21.

In both WTP scenarios, farm gate margins drop below breakeven for an extended period of time which would drive farmers out of the industry reduce the size of the dairy cow herd. In the partial willingness to pay scenario, margins would be significantly below breakeven in 3 out of the 10-year forecast horizon while in the full WTP scenario, margins would be significantly below breakeven for 7 of the 10 years analyzed.

B. Model details and assumptions

Impacts were estimated using Informa Economics IEG long range model of the US and global dairy markets. The models are built using milk equivalent units and dynamically model production, imports, exports, domestic consumption and inventory for the US, EU-28, and New Zealand. Exports are modeled for Germany, Denmark and for other exporting countries assuming exporting countries continue along their long-term trend. Imports are modeled for Canada, China, Japan, Korea, Mexico and the rest of the world combined into a single ROW category. The model solves for prices that balance supply and demand in each of the major exporting countries as well as balancing supply and demand in the global market simultaneously.

For the partial and full WTP scenarios we introduced shocks to domestic consumption, imports, and exports. We used the decrease in quantity demanded for domestic consumption from our EDM models to estimate the shock to domestic consumption. We assumed that demand for US produced cheese in the export market would fall by the same percentage as the domestic market. Based on import increases in Germany and Denmark after GI enforcement took effect for parmesan and feta, we assumed that US imports from the EU would increase by 13%. We converted the shocks to milk equivalent units assuming 9.63 pounds of milk per pound of cheese. The shocks GI applied to US exports from FTAs are included in Exhibit 9 and Exhibit 10.

Exhibit 9: Shock to US Produced Cheese Consumption, Million Pounds

	Immediate	Delayed	Total
Full WTP	-814	-1,854	**-2,668**
Partial WTP	-306	-697	**-1,003**

Source: Informa Economics IEG

Exhibit 10: Shock to US Cheese Milk Equivalent Exports, Million Pounds

	Immediate	Delayed	Total
Full WTP	-7,139	-15,558	**-22,697**
Partial WTP	-5,021	-9,477	**-1,045**

Source: Informa Economics IEG

The models were calibrated to forecast the 10-year period from 2019 to 2028. Immediate impacts started in 2019 while delayed impacts were assumed to hit 3 years later in 2021.

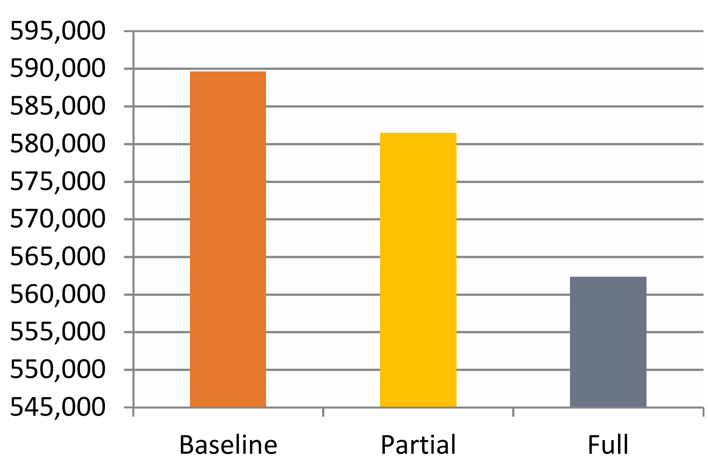
C. Results

Reduced demand for US produced cheese results in negative shocks to dairy demand, which results in lower prices, negative margins for dairy farmers, a decrease in the number of dairy cows, a lower long-run path for US milk production and substantial lost revenue for US dairy farmers compared with the baseline. The lower dairy prices do boost domestic consumption of other dairy products, and it does increase exports, but not nearly enough to offset the drop in cheese consumption.

1. Immediate (3 year) Impacts

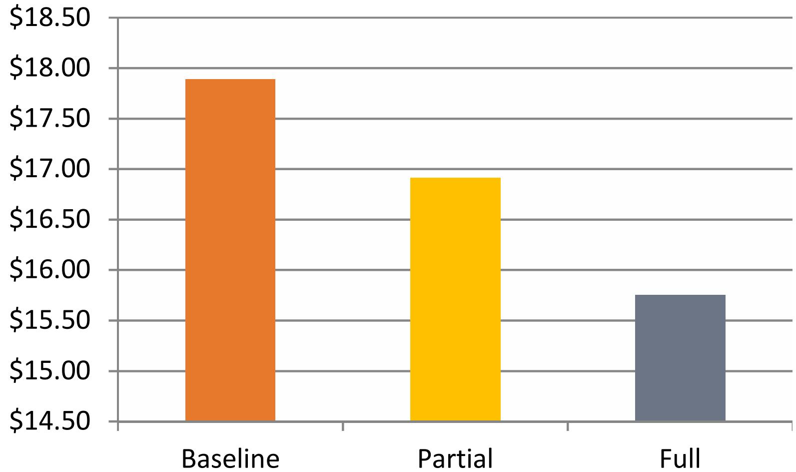
Over the first 3 years, 2019-2021 period, domestic milk equivalent consumption in the partial WTP scenario totals 8.1 billion pounds (-1.4%) less than the baseline while domestic consumption is down 27.1 billion pounds (-4.6%) in the full WTP scenario. The drop in domestic demand pushes prices lower. In the partial WTP scenario the farm gate milk price averages \$0.97/cwt. (-5.4%) lower than the baseline. In the full WTP scenario, the price averages \$2.14/cwt. (-11.9%) below the baseline.

Exhibit 11: US Milk Equivalent Consumption, 2019-2021 Total (Million Pounds)



Source: Informa Economics IEG

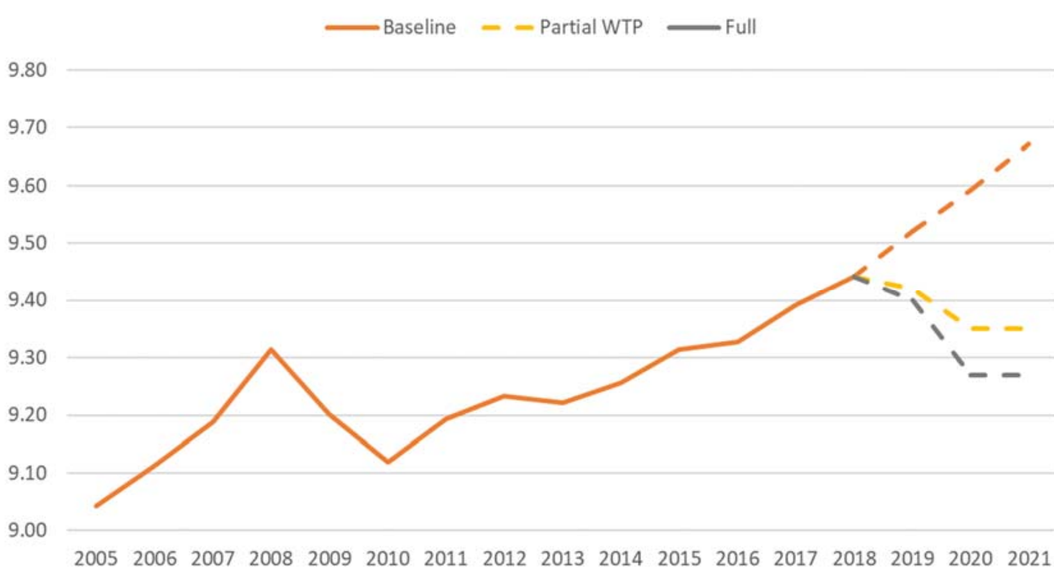
Exhibit 12: US Farm-gate Milk Price, 2019-2021 Average ($/cwt.)



Source: Informa Economics IEG

The lower milk prices push farm-gate margins down to unprofitable levels and the US Dairy herd declines as farmers go out of business. In the partial WTP scenario the dairy herd in 2021 is 320,000 head smaller (-3.3%) than the baseline while in the full WTP scenario the dairy herd is 400,000 head (-4.2%) than the baseline.

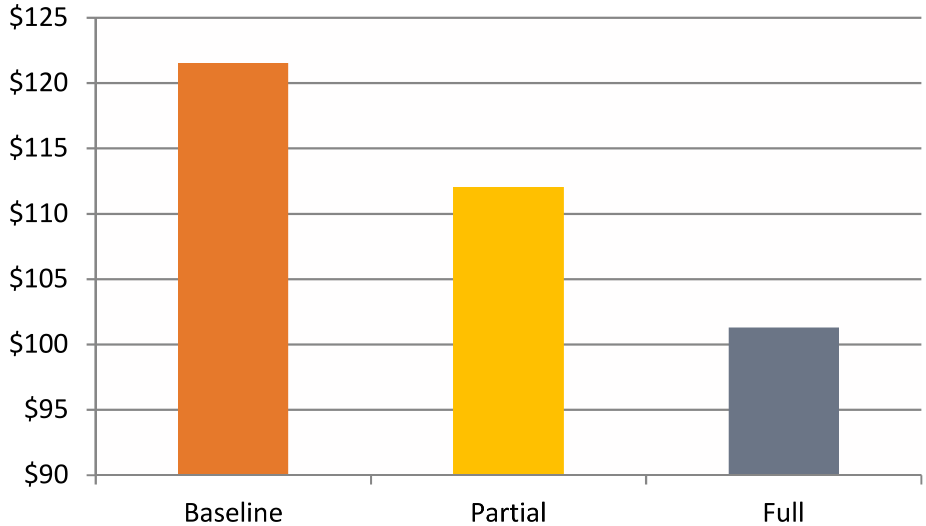
Exhibit 13: US Dairy Herd, 2005-2021, Million Head



Source: Informa Economics IEG

Fewer cows and lower milk prices result in large cumulative losses in farm-gate milk revenue. In the partial WTP scenario, total revenue is down $9.5 billion (-5.5%) while in the full WTP scenario, total revenue is down $20.2 billion (-12.7%).

Exhibit 14: US Farm-gate Milk Revenue, 2019-2021 Total (Billion USD)



Source: Informa Economics IEG

Exhibit 15: Estimated Milk Equivalent Impacts from GI Cheese in US (2019-2021 Totals)

	Baseline	Partial WTP	Full WTP	Partial WTP		Full WTP	
				Change	% Change	Change	% Change
Milk Price (Average, $/cwt.)	$17.89	$16.92	$15.75	-$0.97	-5.4%	-$2.14	-11.9%
Milk Production (Mil. Lbs.)	678,522	661,492	642,226	-17,029	-2.5%	-36,296	-5.3%
Domestic Consumption (Mil. Lbs.)	588,860	580,722	561,661	-8,138	-1.4%	-27,198	-4.6%
Imports (Mil. Lbs.)	18,293	18,551	18,922	258	1.4%	629	3.4%
Exports (Mil. Lbs.)	110,940	105,919	103,800	-5,021	-4.5%	-7,139	-6.4%
Farm-gate Milk Revenue (Bil. $)	$122	$112	$101	-$9.5	-7.8%	-$20.2	-16.6%
Herd Size Mil Head	9.67	9.35	9.27	-0.32	-3.3%	-0.40	-4.2%

Source: Informa Economics IEG

The total expected farm gate revenue loss under the full willingness to pay model is $20.2 billion. The expected losses on farm gate revenue from the decline in domestic consumption under the full willingness to pay model was $16.02 billion totaling 79 percent of total farm gate revenue loss. The expected losses on farm gate revenue from the expected decline in exports under the full willingness to pay model is $4.21 billion or 21 percent of total farm gate revenue loss.

The total expected farm gate revenue loss under the partial willingness to pay model is $9.5 billion. The expected losses on farm gate revenue from the decline in domestic consumption under the partial willingness to pay model was $5.86 billion totaling 62 percent of total farm gate revenue loss. The expected losses on farm gate revenue from the expected decline in exports under the full willingness to pay model is $3.61 billion or 38 percent of total farm gate revenue loss.

Exhibit 16: Estimated Effect of Domestic Consumption and Exports on Farm Gate Revenue Loss (2019-2021) Billion Dollars

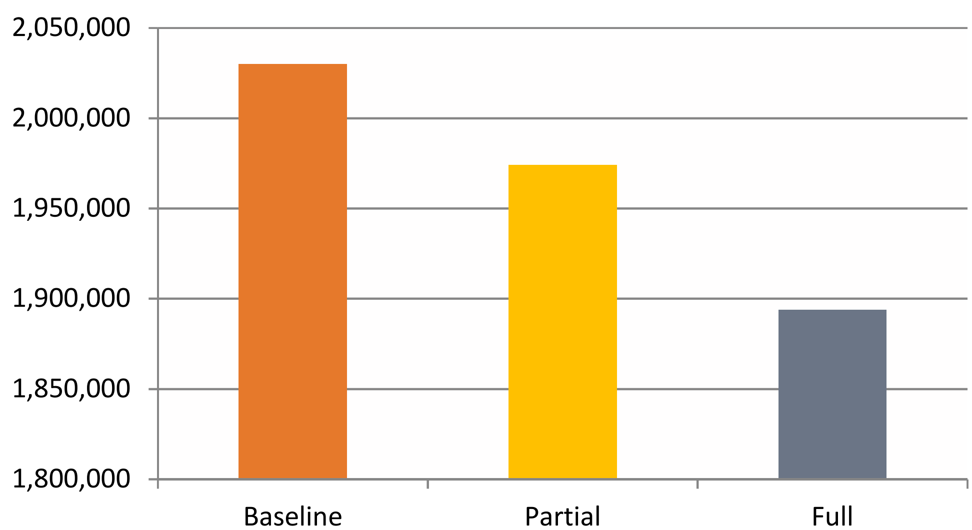
	Partial WTP		Full WTP	
	Change	%	Change	%
Domestic Consumption	-$5.8	62%	-$16.0	79%
Exports	-$3.6	38%	-$4.2	21%
Total	**-$9.5**	**100%**	**-$20.2**	**100%**

Source: Informa Economics IEG

2. Full 10-year impacts

Over the 2019-2028 period, domestic milk equivalent consumption in the partial WTP scenario totals 55.6 billion pounds (-2.7%) less than the baseline while domestic consumption is down 135.7 billion pounds (-6.7%) in the full WTP scenario (Exhibit 17).

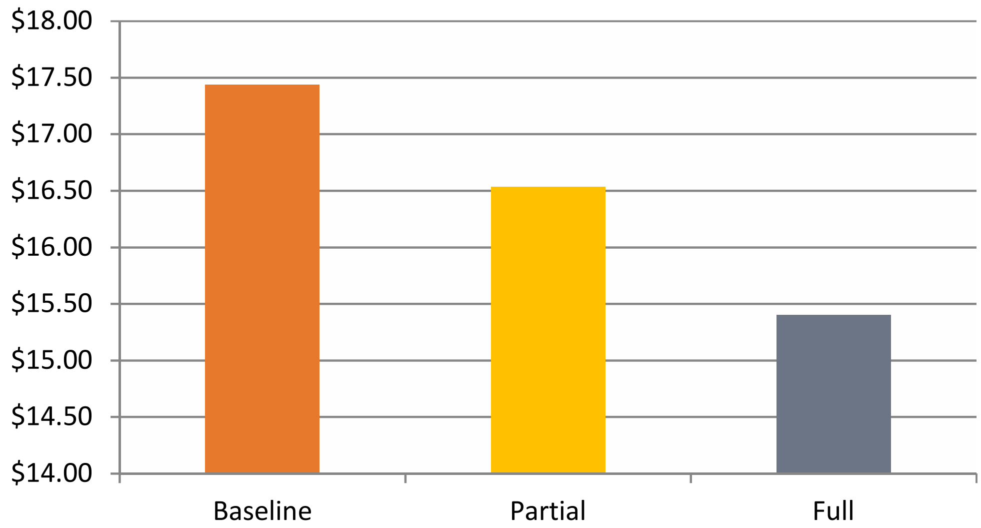
Exhibit 17: Total US Milk Equivalent Consumption 2019-2028, Million Pounds



Source: Informa Economics IEG

The drop in domestic demand pushes prices lower. In the partial WTP scenario the farm gate milk price averages $0.90/cwt. (-5.2%) lower than the baseline. In the full WTP scenario, the price averages $2.03/cwt. (-11.7%) below the baseline.

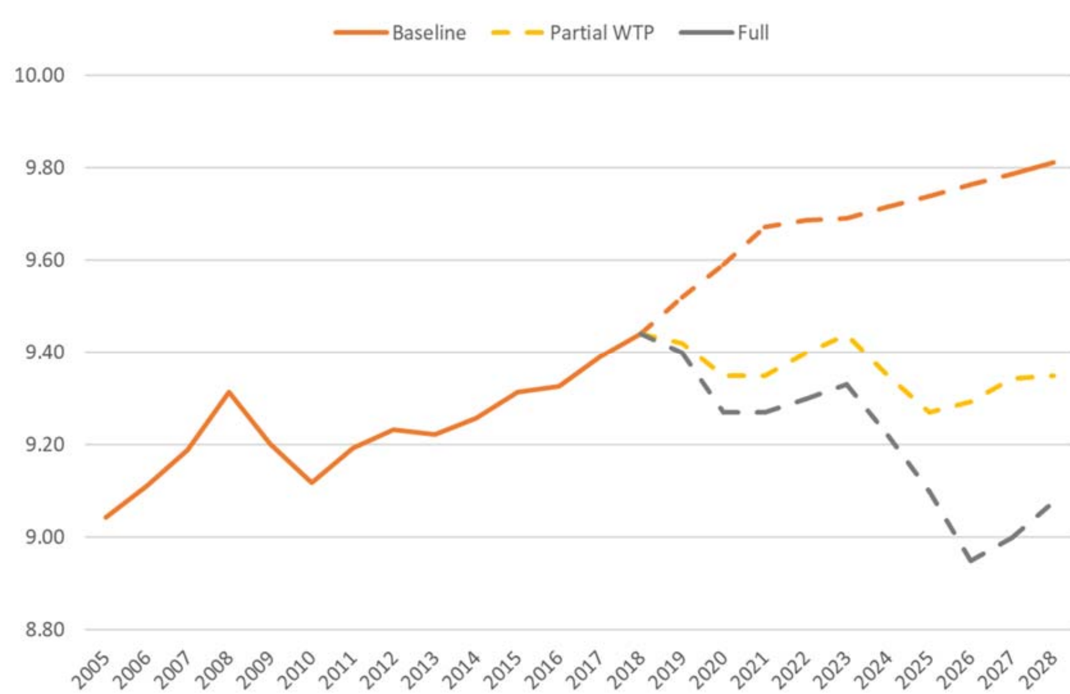
Exhibit 18: US Farm-gate Milk Price, 2019-2028 ($/cwt.)



Source: Informa Economics IEG

The lower milk prices push farm-gate margins down to unprofitable levels and the US Dairy herd declines as farmers go out of business. In the partial WTP scenario the dairy herd in 2028 is 460,000 head smaller (-4.7%) than the baseline while in the full WTP scenario the dairy herd is 740,000 head (-7.5%) smaller than the baseline.

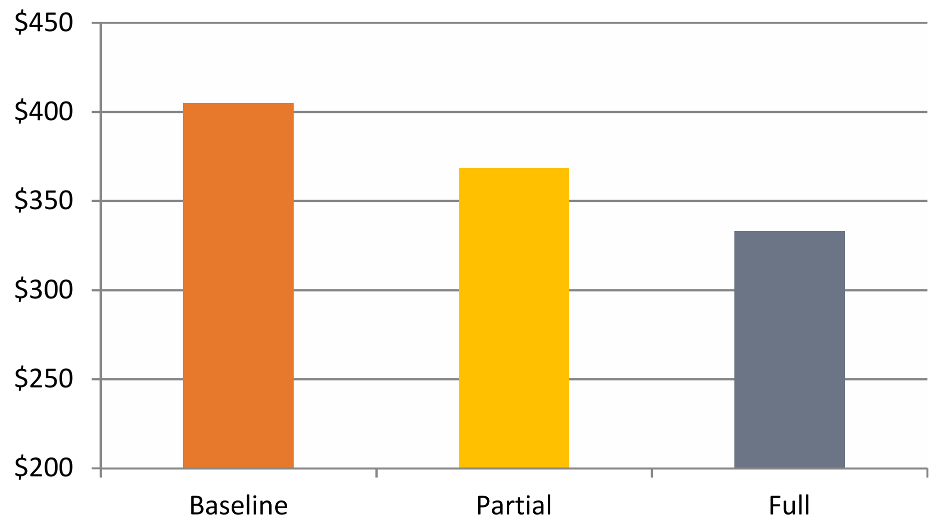
Exhibit 19: US Dairy Herd, 2005-2028, Million Head



Source: Informa Economics IEG

Fewer cows and lower milk prices result in large cumulative losses in farm-gate milk revenue. In the partial WTP scenario total revenue is down $36.5 billion (-9%) while in the full WTP scenario, total revenue is down $71.8 billion (-17.7%).

Exhibit 20: US Farm-gate Milk Revenue, 2019-2028 Total, Billion USD.



Source: Informa Economics IEG

Exhibit 21: Estimated Milk Equivalent Impacts from GI Cheese in the US (2019-2028 Totals)

	Baseline	Partial WTP	Full WTP	Partial WTP		Full WTP	
				Change	% Change	Change	% Change
Milk Price (Average, $/cwt.)	$17.44	$16.54	$15.40	-$0.90	-5.2%	-$2.03	-11.7%
Milk Production (Mil. Lbs.)	2,364,214	2,268,769	2,202,688	(95,445)	-4.0%	(161,525)	-6.8%
Domestic Consumption (Mil. Lbs.)	2,027,137	1,971,541	1,891,400	(55,595)	-2.7%	(135,737)	-6.7%
Imports (Mil. Lbs.)	62,504	66,585	67,917	4,081	6.5%	5,413	8.7%
Exports (Mil. Lbs.)	424,463	409,965	401,766	-14,498	-3.4%	-22,697	-5.3%
Farm-gate Milk Revenue (Bil. $)	$405	$369	$333	-$36.5	-9.0%	-$71.8	-17.7%
Herd Size Mil Head	9.81	9.35	9.08	-0.46	-4.7%	-0.74	-7.5%

Source: Informa Economics IEG

The total expected farm gate revenue loss under the full willingness to pay model is $-71.8 billion. The expected losses on farm gate revenue from the decline in domestic consumption under the full willingness to pay model was $61.51 billion totaling 86 percent of total farm gate revenue loss. The expected losses on farm gate revenue from the expected decline in exports under the full willingness to pay model is $10.29 billion or 14 percent of total farm gate revenue loss.

The total expected farm gate revenue loss under the partial willingness to pay model is $-36.5 billion. The expected losses on farm gate revenue from the decline in domestic consumption under the partial willingness to pay model was $28.94 billion totaling 79 percent of total farm gate revenue loss. The expected losses on farm gate revenue from the expected decline in exports under the partial willingness to pay model is $7.55 billion or 38 percent of total farm gate revenue loss.

Exhibit 22: Estimated Effect of Domestic Consumption and Exports on Farm Gate Revenue Loss (2019-2028) Billion Dollars

	Partial WTP		Full WTP	
	Change	%	Change	%
Domestic Consumption	-$28.94	79%	-$61.51	86%
Exports	-$7.55	21%	-$10.29	14%
Total	-$36.5	100%	-$71.8	100%

Source: Informa Economics IEG

IX. PROJECTED IMPACT ON US ECONOMY

A. Summary

The results from the previously identified IMPLAN models suggest granting GI status to European cheese makers for common name cheese would have profound impacts on the US economy. The effects would hardly be limited to the specialty cheese manufacturing industry with the ripple effects instead spreading across multiple linked industries. Indeed, results from IMPLAN models tracing the effects of GI restrictions on the US dairy industry (based on output from the dynamic industry models) suggests the total impact on the US economy could reduce economic output by between $30 billion and $63 billion over three years. Similarly, US GDP could shrink by between $12 billion to $25 billion over the same time period.

B. Methodology

IMPLAN models were created for each of the scenarios presented in this research: immediate and delayed impacts for full- and partial-willingness-to-pay models. The farm-gate impacts identified by the dynamic dairy industry model were incorporated as “events” in the US dairy farming sector (IMPLAN Sector 12). The revenue and employment events were run in IMPLAN to determine the impact that changes in dairy farm profitability would create in the broader US economy.

Each event in the IMPLAN models included four specific parameters: changes in revenue, changes in employment, changes in labor income (wages and salaries), and changes in proprietor income. Revenue impacts were directly taken from the results of the dynamic dairy industry model while the change in the dairy industry labor force was derived from the change in the American dairy cow herd. Employment changes were estimated by dividing the change in cow numbers by the average number of cows per employee. A review of the relevant literature suggests an average of 50 cows per employee[21]. To estimate labor income effects, the employment change was multiplied by $35,000 of annual labor income per employee. The Bureau of Labor Statistics reports the average yearly wage of Agricultural Workers is $19,330 per year[22] and that the average annual wage for Farmers, Ranchers, and Other Agricultural

[21] Ohio State University estimated (available here) an average of 27 to 45 workers per cow. Michigan State University estimated one full-time employee per 75 cows (available here) while an Ontario, Canada (available here) survey found 27 cows per worker, unadjusted to full-time equivalents. Finally, a National Milk Producers Federation survey (available here) found the average farm size was 297 cows with 4 full-time employees and 1.6 part-time employees, which equates to roughly 61.2 cows per worker. Based on these results, ranging from 27 to 75 cows per worker, 50 cows per full-time employee was used in this study.

[22] US Department of Labor, Bureau of Labor Statistics. Available here: http://www.bls.gov/ooh/farming-fishing-and-forestry/agricultural-workers.htm

Managers is $68,050 per year[23]. Using a ratio of two agricultural workers per agricultural manager, the weighted average annual salary was (rounded) $35,000. Finally, proprietor income changes were assumed to be equal to 15 percent of the revenue loss for each model.

While the dynamic, long-run dairy industry model provided impact estimates over a 10-year period, only the short run impacts were analyzed in IMPLAN. Because IMPLAN is a linear, unbounded modeling system and because prices and wages are fixed, IMPLAN is best suited for short to medium-term impacts. Using IMPLAN for longer-run implications often leads to results at the upper-bound of realistic expectations. Accordingly, only the immediate impacts of GI restrictions in the US are modeled in this report.

C. Results

Results from the IMPLAN models suggest implementation of GI regulations that restrict common names across the US dairy industry would have broad-reaching, detrimental impacts on the US economy. The negative effects are created not only by the direct impact to the dairy farming industry but also to industries linked to dairy farming, like grain farming, veterinary services, transportation, and others. Moreover, the reduced spending from workers formerly employed in the dairy farming industry impacts multiple additional industries such as grocery stores, hospitals, retail stores, and others. The aggregation of these impacts could reduce US GDP by between $12 billion to $25 billion over three years.

1. Partial Willingness-to-Pay Model

Results from the partial-willingness-to-pay models run in IMPLAN indicate the short run (three year) impact of GI regulations in the US would risk roughly 108,000 full-time equivalent jobs, lower US GDP by $12 billion, and reduce economic output by $30 billion (Exhibit 23).

Exhibit 23: Impacts from Short Run Partial-Willingness-to-Pay Model

Impact Type	Employment	Labor Income (Bil USD)	US GDP (Bil USD)	Output (Bil USD)
Direct Effect	-6,448	-$1.65	-$2.68	-$9.47
Indirect Effect	-59,062	-$3.14	-$5.31	-$13.03
Induced Effect	-42,381	-$2.22	-$3.95	-$7.06
Total Effect	**-107,891**	**-$7.01**	**-$11.94**	**-$29.55**

Source: IMPLAN and Informa Economics IEG

[23] Ibid. available here: http://www.bls.gov/ooh/management/farmers-ranchers-and-other-agricultural-managers.htm

2. Full Willingness-to-Pay Model

As expected, the results from the full-willingness-to-pay model show larger economic impacts to the US economy. In the short run model, around 223,000 jobs would be at risk due to the direct revenue losses to the dairy industry, the indirect effects of lower spending by dairy farms[24], and the induced effects from reduced spending of labor wages. US GDP could fall by roughly $25 billion. Finally, US economic output would be suppressed by $63 billion following implementation of GI regulations inside the US (Exhibit 24).

Exhibit 24: Impacts from Short Run Full-Willingness-to-Pay Model

Impact Type	Employment	Labor Income (Bil USD)	US GDP (Bil USD)	Output (Bil USD)
Direct Effect	-8,048	-$3.32	-$5.52	-$20.23
Indirect Effect	-126,165	-$6.72	-$11.34	-$27.83
Induced Effect	-88,722	-$4.66	-$8.27	-$14.77
Total Effect	**-222,935**	**-$14.69**	**-$25.13**	**-$62.83**

Source: IMPLAN and Informa Economics IEG

One caveat to consider when interpreting these results is the nature of the IMPLAN modeling system. IMPLAN uses linear, unbounded models to trace the effects of changes in one industry in the entire economy. As such, IMPLAN models do not account for non-linear responses by industries. For example, IMPLAN models do not account for diminishing marginal returns to increasing output, do not account for increasing efficiencies with scale or scope, and assume less than full employment. Moreover, IMPLAN models assume prices and wages are fixed. The net effect of these model specifics is that results from IMPLAN models often represent the upper bound on expected impacts. Models that account dynamically for changes in prices and wages and can incorporate non-linear responses may offer results near the lower-bound or the mid-point of expected result ranges. Future research in this area could include such models to give additional robustness to results and implications.

[24] The indirect effects would occur from two drivers. First, dairy farms facing margins below breakeven levels would seek to reduce spending and lower variable costs to remain profitable, thereby lowering spending in (and revenue for) linked industries. Secondly, as dairy farms go out of business and exit the industry the lost business activity would further translate to lost revenue to industries associated with dairy farming.

X. CONCLUSION

This study examined the economic impacts of establishing geographic indication ("GI") protections for several common name cheeses that were originally produced in Europe. US cheese manufacturers would consequently be unable to use those names and similar terms (e.g. "parmesan" or "feta-like") and would be forced to rebrand and relabel cheeses they have been producing for decades. Economic theory suggests US consumers, faced with purchasing either imported cheeses with familiar names or US-produced cheeses rebranded with "new" unknown names would purchase less US-made cheese and pay less for it.

Results from case studies of price responses to GI regulations in European countries indicate an average price decrease of 14% would be observed in the market for American-produced cheeses that could no longer use common names due to GI restrictions. US demand for cheeses formerly marketed under common names but since rebranded/labeled would be sharply lower. Consumption could fall by 306 million to 814 million pounds in the first three years. The delayed impacts would likely be much larger, ranging from 697 million to 1.9 billion pounds of lost cheese consumption.

The changing consumer demand for US cheeses would have profound and deleterious impacts on the US dairy industry. US milk equivalent consumption would fall by 1.4% to 4.6% in the first three years while the delayed impacts would range from -2.7% to -6.7%. The falling milk equivalent consumption would lower farm gate milk prices from baseline forecasts by $0.97 per cwt. (-5.4%) to $2.14 per cwt. (-11.9%) in the first three years. Dairy farm margins would be significantly below breakeven levels 7 out of the 10-year forecast horizon. US dairy farms with high equity and/or excellent relationships with lenders would be the most well-positioned to survive the economic conditions.

Low milk prices and poor farm margins would exacerbate the ongoing loss of US dairy farms. US dairy cow numbers would fall 3.3% to 4.2% below baseline in the short run, or by approximately 320,000 to 400,000 head. By 2025, the US dairy cow herd would shrink 4.7% to 7.5% from the baseline, equivalent to 460,000 to 740,000 head.

The impact of lower farm milk prices and fewer cows creates strongly negative financial conditions for US dairy farmers. By 2025, US dairy farmers would have lost a cumulative $36.5 billion (9%) to $71.8 billion (17.7%) in farm revenue.

The economic impacts would not be limited to the US dairy industry. The broader US economy could lose 108,000 to 223,000 jobs and $12 billion to $25 billion in GDP in the first three years.

In order to guard against this, use of common names by the US dairy industry should be preserved, both for domestic and international use. Such a result would help assure the continued success and viability of the US cheese manufacturing and dairy farming industries and the broader US economy.

XI. APPENDIX A – DETAILED METHODOLOGY AND RESULTS FOR EXPORT FORECAST MODELS AND RELATIVE PRICE OF A SUBSTITUTE GOOD MODEL

The information in this appendix outlines the methodology for Informa's Export Forecasts Models that were used to estimate the impact of GI restrictions on relevant European cheese export markets. This research was conducted to estimate the impact of GI events that are similar to what would be realized in the US if GI restrictions on the use of common cheese names were established. Additionally, this section outlines the methods and results for the Relative Price of a Substitute Good model that was used to estimate the price impact of GI restrictions impacting common names on European countries outside the geographically protected region (e.g., the impact to Germany's parmesan price after Italy won GI status for "Parmigiano Reggiano").

A. Methodology

Case study analysis is a strategy widely utilized in situations where traditional data sources, to answer important questions, are unavailable. Researchers typically use the case study approach for the following purposes:[25]

- to explore new areas and issues where little theory is available or measurement is unclear
- to describe a process or the effects of an event or an intervention, especially when such events affect many different parties
- to explain a complex phenomenon

The case study approach was leveraged in this study to identify how the implementation of PDOs would affect the United States. To achieve this, the impacts of PDO effects in Europe were analyzed as the first step toward understanding how similar policies could impact other regions. Denmark and Germany were identified as two key European cheese markets exposed to PDOs, IEG conducted a more a detailed econometric analysis in these markets in order to gain and create a quantitative framework to better understand and predict the potential economic impacts of PDO introduction in the United States.

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[25] Methods in Case Study Analysis, Linda T. Kohn, Ph.D. 1997, Link

1. Export Forecast Model

Overview

Informa's Export Forecast Model uses an ordinary least squares (OLS) linear regression to predict various trade flows. OLS regressions are a widely utilized statistical method for predicting future events especially in circumstances with limited data availability. The Export Forecast Model predicts trade flows using three key structural variables. With this approach, Informa is able to incorporate future changes in global price, consumption and trends into the forecast. Capturing future changes in supply and demand makes Informa's forecast a marketable improvement over the previous study's "average annual growth rate" method, which simply projects an existing annual trend.

Structural Variables

As mentioned earlier, Informa utilized three structural variables in our Export Forecast Model. Each structural variable is listed and discussed below.

1. **EU Imports**

   The EU Imports variable represents total EU imports from the world. For example, in the Denmark feta model, the EU Imports variable consists of total EU imports of feta cheese. The EU imports variable was included as a proxy for total EU consumption. Actual consumption information disaggregated to the specific cheese level was not available.

2. **Dairy Price Index (DPI)**

   Informa also leveraged FAO's Dairy Price Index in order to factor in how price changes affect exports. The DPI includes a wide range of dairy products and is very representative of global dairy market performance. The DPI is also helping to dive accuracy in the unit price element of our forecast.

3. **GDP**

   A world GDP variable was included to account for the general trends in world macro-economic output. With the GDP variable, we are able to explain and account for the general trends in global markets. GDP figures were taken from the USDA's macroeconomic dataset.

General Equation

The general equation for Informa's Export Forecast Model takes the form:

$$Export_{i,j,t} = \beta_0 + \alpha_1 EU.Import_{i,t} + \alpha_2 DPI_t + \alpha_3 GDP_t + e_t,$$

where *i, j,* and *t* are indexes corresponding to cheese type, county, and date (using monthly data), *EU.Import* is the total European Union imports of cheese *i* in time *t,* DPI is the FAO Dairy Price Index, GDP is the world GDP in a given month, and e_t is the error term. All Export Forecast Models in this research were estimated using this equation, except for Germany's parmesan exports[26].

For brevity, this report omits the statistical output (regression coefficients, standard errors, etc.) from each regression model. However, the output for each model is available from the authors upon request.

Post-Estimation Statistical Tests

Following estimation of each model, post-estimation statistical tests were run to test for the presence of statistical anomalies in the given model. Specifically, models were tested for heteroscedasticity, serial- and autocorrelation, multicollinearity, and omitted variable bias. Based on the results of these post-estimation tests, the standard OLS regressions were replaced with OLS models using robust standard errors and a lagged dependent variable was included. Inclusion of the lagged dependent variable and use of robust standard errors was intended to address issues of autocorrelation and heteroscedasticity in an attempt to reduce model error and bias, allowing for greater confidence and certainty in forested trade flows.

Following the inclusion of the lagged dependent variable, Informa's Export Forecast Model takes the form:

$$Export_{i,j,t} = \beta_0 + \alpha_1 EU.Import_{i,t} + \alpha_2 DPI_t + \alpha_3 GDP_t + \alpha_4 Export_{i,j,t-1} + e_t,$$

where $Export_{i,j,t-1}$ is the export value of the given cheese variety in the previous month and all other variables maintain their previous definitions. Again, statistical output from these models is omitted for brevity but is available from the authors upon request.

[26] Because Germany is a large net importer of parmesan cheese, even before "parmesan" was granted de-facto GI status in 2008, a variable was added for German parmesan imports. Thus, Germany's import supplies are allowed to become an explanatory factor driving German parmesan exports.

2. Relative Price of a Substitute Good Model

Overview

Informa's Relative Price of a Substitute Good Model (RPSG) builds on the previous work of Carter and Smith (2007), which analyzed the price impacts of the StarLink corn incident of 2000. The StarLink incident was one where a genetically modified corn variety was found in corn intended for human consumption prior to approval. The RPSG model analyzes the relative price of a given good relative to a substitute good to identify the price effects of an event.

The RPSG model does not call for specification of structural models and thus reduces concerns for the misspecification of models (Carter and Smith, 2007). Instead of structural models, the focus of the RPSG model is on the dynamics of relative prices (Carter and Smith, 2007). The relative price dynamics between two products can be defined as a function of quantities and factors that shift supply and demand as in equation (1):

1) $log(P_{1t} / P_{2t}) = f(Q_{1t}, Q_{2t}, Z_t)$

where Z_t represents factors shifting supply and demand, and the f function is without specification. According to Carter and Smith (2007), it is not required that the function f be correctly specified, if at all. These properties of the RPSG model make it an appropriate estimation technique for this study as limited data and even fewer supply and demand function estimations inhibit the ability to econometrically estimate price effects using other methods.

Model Requirements

Using this method, it is required to have a stable relationship between the prices before an event occurs in the form of equation (2):

2) $\log(P_{1t} / P_{2t}) = \mu + \beta Z_t + u_t$

where u_t is a stationary random variable Z_t still represents supply and demand shifters, which Carter and Smith (2007) state "are only needed if the log relative price is not stationary." Given this form, shifts in the parameter μ can be tested for.

Estimation

Although the events impacting a market may occur at a specific time, their actual impact on the market may not be immediately observable. The RPSG model makes it possible to estimate the time at which these impacts occur by testing to determine if significant structural breaks occur, and when. Determination of structural breaks is accomplished by using the sup-F test proposed by Bai and Perron

(1998). The sup-F test collects the F-statistic from regressions run at every observation point in the data set. Bai and Perron argue that the most significant structural break occurs at the point with the highest F-statistic. In other words, the structural break is found at the observation(s) with the highest F-statistic from the often-utilized Chow (1960) test.

After identifying the structural breaks, it is possible to estimate the impact on the price of each good. To do this, the relative prices are decomposed into absolute price changes for each good. The actual prices seen after the structural break are compared to the prices forecasted[27] as if the break did not occur. In doing so, the price effects of a given event can be determined. Informa uses this methodology and the RPSG model to estimate the price effects of events reinforcing geographical indications.

Data

In order to use the RPSG model, data were collected on parmesan and feta export prices from selected countries across the European Union. Data were acquired in the form of export value and volume, which were subsequently used to estimate the per-unit export prices of each cheese by country. These per-unit export prices were used directly in the RPSG model as described above.

B. Results

1. Export Forecast Models

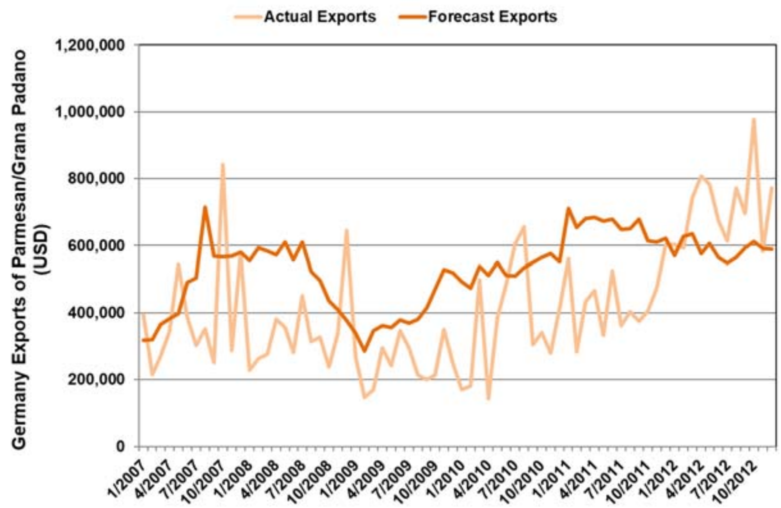
Germany's Parmesan Market

Following the ECJ ruling of 2007, German exports of parmesan fell for a period of roughly three years (Exhibit 25). However, not all of the fall in exports appears to be driven by the GI event. Informa's Export Model predicts, based on global dairy product prices and other factors, a general decrease in Germany's parmesan exports. The observed exports are, however, significantly lower than were predicted by the EFM. Accordingly, we conclude that the ECJ ruling granting GI status to parmesan did work to lower Germany's parmesan exports.

According to the Export Forecast Model (EFM), German losses of parmesan exports to other EU countries in the three years following the full implementation of the ECJ ruling in 2002 were $4.9 million. All variables in the German parmesan EFM were statistically significant at the 10% level. Detailed model results are available from the authors upon request.

[27] Price forecasts are generated using an error correction model (ECM) for the log of each price series in question. For further details, please see Carter and Smith (2007).

Exhibit 25: Germany Monthly Exports of Parmesan to EU27, Actual vs Forecast (USD)



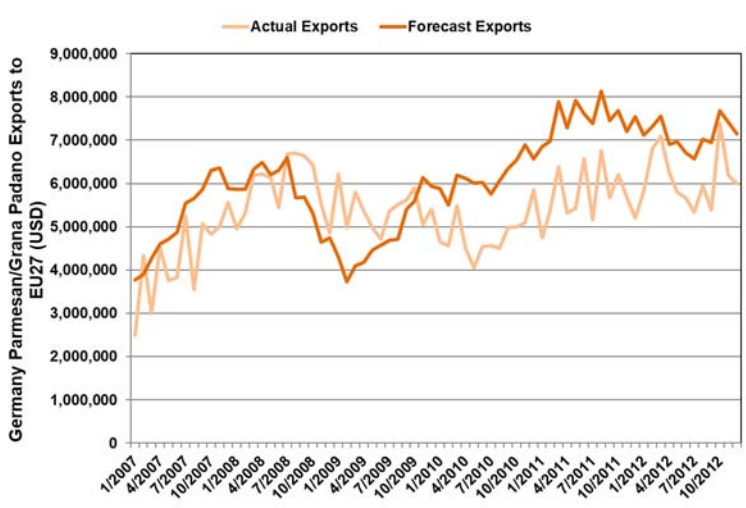
Source: GTIS, Informa Economics IEG

Economic theory would suggest German parmesan producers would switch from exporting "parmesan" to exporting other hard, grated cheeses under different names. As such, it is possible for increased exports of substitute cheeses to offset losses experienced in lost parmesan exports.

The EFM shows initial strong loses in German exports of grated cheese to other EU countries amounting to $13.5 million in the first year. However, overall losses in grated cheese moderated from 2007 to 2009 total $2.1 million. In total, it appears the ECJ ruling created a negative impact on both German parmesan and grated cheese exports.

Exhibit 26: Germany Monthly Exports of Grated Cheese Exports to EU27,

Actual vs Forecast (USD)



Source: GTIS, Informa Economics IEG

The table below summarizes the losses of parmesan and any gains/losses in grated cheese exports to EU27 countries as a result of the ECJ ruling in 2002. Losses were estimated through Informa's Export Forecast Model (EFM) detailed in the Methodology section of this report. In essence, the EFM estimates economic losses occurring from PDO status for cheeses by comparing what "would have been" to the observed export data.

The EFM suggests losses amounted to $4.9 million for parmesan exports and significant losses in grated cheese ($2.1 million) signifying that grated cheese exports also suffered as a result of the ruling. In total, granting de-facto PDO status to parmesan cheese created net losses of $71.6 million over the three-year period 2007 to 2009[28].

Exhibit 27: Summary of Losses/Gains from Parmesan and Grated Cheese Export Model

Year	*Losses from Parmesan Exports*	*Domestic Losses (Parmesan)*	*Gains from Exports of Parmesan's Substitutes*	*Net Impact*
2007	-$1,007,300	-$16,196,568	-$13,593,647	-$30,797,515
2008	-$2,218,306	-$32,080,235	$2,456,967	-$31,841,574
2009	-$1,760,741	-$16,234,803	$9,008,020	-$8,987,524
Total	**-$4,986,348**	**-$64,511,606**	**-$2,128,659**	**-$71,626,613**

Source: GTIS, Informa Economics IEG

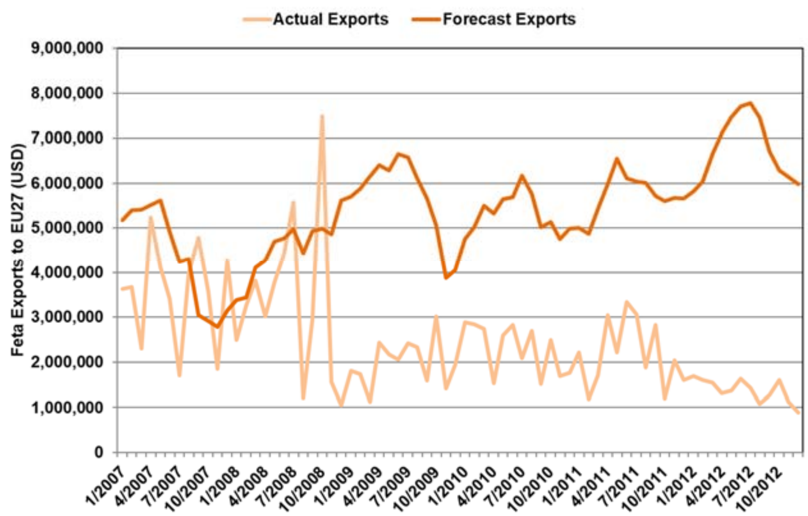
Germany's Feta Market

As shown in Exhibit 28, German exports of feta cheese fell dramatically beginning in 2007 following the ECJ ruling upholding the PDO status for feta. According to the Export Forecast Model (EFM), German losses of feta exports to other EU countries in the three years following the full implementation of the ECJ ruling in 2010 totaled $143 million. Overall losses in German exports to EU27 from 2010 to 2012, amount to $188 million.

[28] For the purposes of this paper, only the four-year period 2007 – 2010 is considered because during 2011 statistical evidence shows multiple other structural breaks occurred in the cheese markets. Of note is the break created by Russia's drought in 2010/11, which reduced feed availability and decreased milk production. Accordingly, Russian cheese imports from the EU increased dramatically, which caused fundamental, structural breaks in the cheese markets of EU member countries.

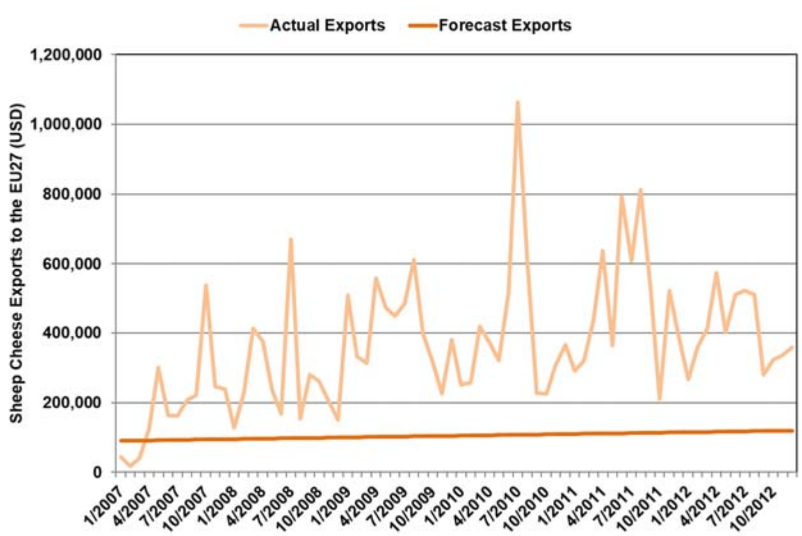
German exports of sheep milk cheese to other EU countries grew steadily after the ECJ ruling regarding feta's GI status as some previously labeled feta was exported as sheep cheese instead. While Informa Economics IEG's Export Forecast Model was run to predict Germany's sheep milk cheese exports if GI status for feta had not been granted, model results indicated negative exports and regression coefficients were not significant. Accordingly, a linear trend line was used to forecast German feta exports that "would have occurred" without GI restrictions. Results show Germany gained $11.6 million in exports of sheep cheese following feta's upheld status as a PDO (Exhibit 28).

Exhibit 28: Monthly German Feta Exports to EU27, Actual vs Forecast (USD)



Source: GTIS, Informa Economics IEG

Exhibit 29: German Sheep Cheese Exports to EU27, Actual vs. Forecast (USD)



Source: GTIS, Informa Economics IEG

Germany's domestic market also suffered economic losses as a result of the ECJ ruling on feta. In this study, domestic losses are defined as the increase in import value resulting from granting GI status for various cheeses. In the case of Germany's feta market, domestic losses totaled $56.6 million over three years. In total, losses in Germany's feta cheese market totaled $188 million from 2010 to 2012 (Exhibit 30).

Exhibit 30: Summary of Losses/Gains in Germany's Feta Cheese Market

Year	*Losses from Feta Exports*	*Domestic Losses (Feta)*	*Gains from Exports of Feta´s Substitutes*	*Net Impact*
2010	-$36,106,002	-$15,810,455	$3,642,742	-$48,273,715
2011	-$42,345,151	-$23,180,935	$4,579,330	-$60,946,757
2012	-$64,610,476	-$17,637,089	$3,452,456	-$78,795,110
Total	**-$143,061,629**	**-$56,628,480**	**$11,674,528**	**-$188,015,582**

Source: Informa Economics IEG

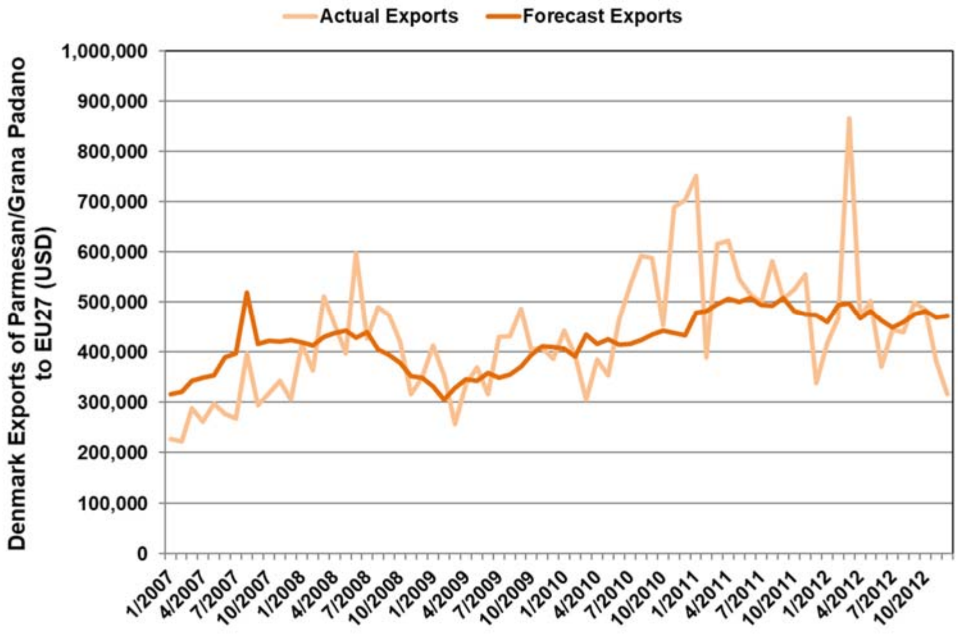
In total, granting GI status to parmesan and feta cheeses had a significantly negative impact on the German cheese market. Total economic losses in the three years following the implementation of GI regulations for each cheese total $259.6 million.

Denmark's Parmesan Market

Germany was not the only country to be affected by the ECJ ruling on parmesan. Indeed, Denmark's cheese exports experience small but significant shocks after the ruling was issued. The forecasts generated by Informa's EFM indicate actual Danish parmesan exports were lower following the ECJ ruling than would have been otherwise observed (Exhibit 31). Danish losses of parmesan exports to other EU countries in the three years following the full implementation of the ECJ ruling in 2007 were $1.3 million based on the EFM forecasts. Overall losses in Danish exports from 2007 to 2012, amount to $1.4 million.

Contrary to the German case, Denmark's grated cheese export increased following the ruling granting GI-status to parmesan cheese. This indicated Danish producers were able to substitute production or re-label cheeses to maintain exports. However, in the long run Danish grated cheese exports fell to levels slightly lower than was predicted by Informa's models.

Exhibit 31: Denmark Monthly Exports of Parmesan Exports to EU27, Actual vs Forecast (USD)



Source: GTIS, Informa Economics IEG

The EFM forecasts Danish exports of grated cheese to other EU27 countries increased in the first three years and but have since moderated, leaving total gains in exports of parmesan substitutes at $8.8 million over three years.

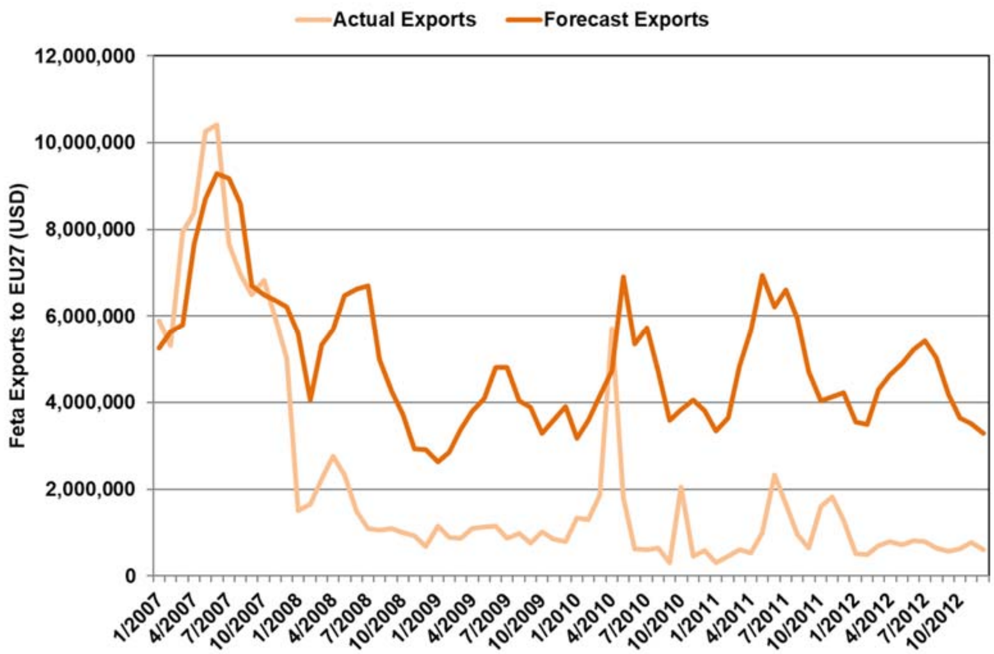
Denmark's Feta Market

Danish losses of feta exports to other EU countries in the three years following the implementation of the ECJ ruling in 2007 were $73.8 million based on the EFM forecasts. Overall losses in Danish exports to EU27 from 2007 to 2012, amount to $200.3 million.

According to the EFM forecasts, Danish exports of sheep cheese to other EU27 countries had gains of $1.7 million in the first three years but overall losses of $1.0 million over the period 2010 to 2014 as initial gains in sheep cheese exports to EU27 did not last[29] (Exhibit 33).

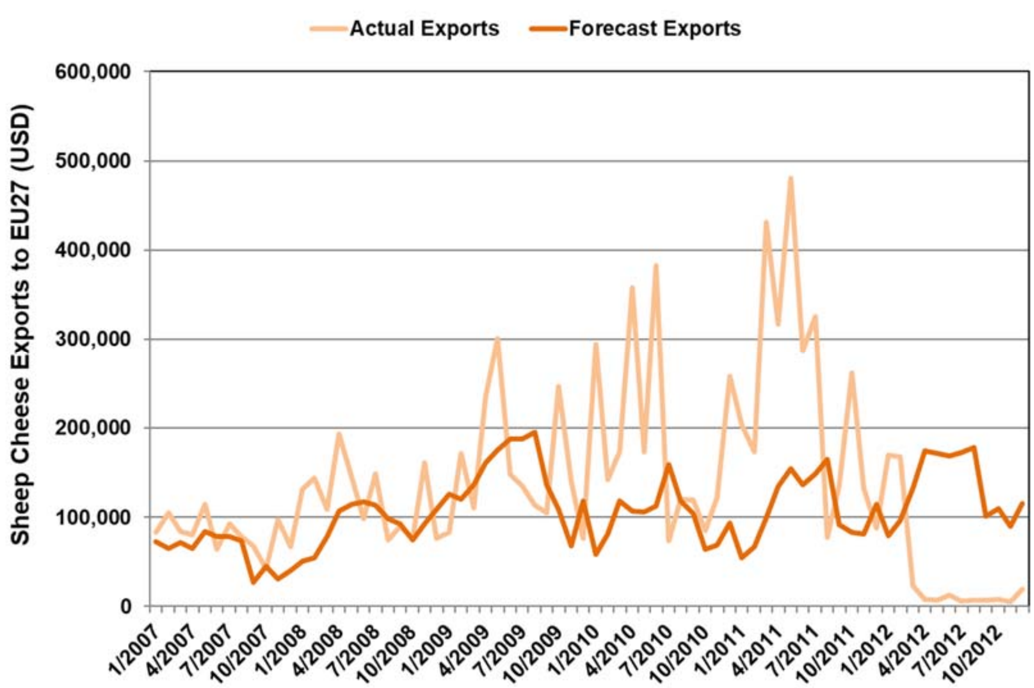
[29] The dramatic fall in Denmark's sheep cheese exports in 2012 is likely due to data reporting issues, rather than market fundamentals.

Exhibit 32: Denmark Monthly Exports of Feta to EU27, Actual vs Forecast (USD)



Source: GTIS, Informa Economics IEG

Exhibit 33: Denmark Monthly Exports of Sheep Cheese to EU27 Actual vs Forecast (USD)



Source: GTIS, Informa Economics IEG

Denmark's feta market is a key example of the effects of granting GI status for common name food products can have on non-GI holding countries relying on those common terms. In the first three years after feta's GI status was upheld by the ECJ ruling and its subsequent implementation, economic losses in the form of foregone feta exports totaled $126.5 million (Exhibit 34).

Exhibit 34: Summary of Losses/Gains in Denmark's Feta Cheese Market

Years	Losses from Feta Exports	Domestic Losses (Feta)	Gains from Exports of Feta´s Substitutes	Net Impact
2010	-$36,307,677	$792,760	$948,060	-$34,566,857
2011	-$47,095,935	$532,265	$1,742,487	-$44,821,182
2012	-$43,116,452	$391,682	-$952,330	-$43,677,100
Total	**-$126,520,063**	**-$1,716,707**	**$1,738,218**	**-$123,065,138**

Source: Informa Economics IEG

2. Relative Price of a Substitute Good Model

As Carter and Smith (2007) noted, the RPSG model is applicable to cases where two price series are cointegrated with a (1,-1) cointegrating vector before the shock occurs. This condition is required to prove that the two prices are influenced by the same supply and demand shocks, thereby omitting the need for inclusion of additional explanatory variables (Carter and Smith, 2007). To test the cointegration of each combination of prices in this model, Augmented Dickey-Fuller (ADF) tests were run to test for the presence of a unit root in each relative price series. Results from the tests (Exhibit 35) show that of the 16 models tested, 10 were cointegrated.

Exhibit 35: ADF Test Results for Relative Price Models

RPSG Model	ADF Statistic	Lag Order	P-Value	Conclusion
Germany Feta/Greece Feta	-4.45	2	0.010	No Unit Root -> Cointegration
Denmark Feta/Greece Feta	-3.77	2	0.025	No Unit Root -> Cointegration
France Feta/Greece Feta	-6.36	1	0.010	No Unit Root -> Cointegration
United Kingdom Feta/Greece Feta	-3.15	2	0.099	No Unit Root -> Cointegration
Germany Sheep/Greece Sheep	-4.52	1	0.010	No Unit Root -> Cointegration
Denmark Sheep/Greece Sheep	-4.94	1	0.010	No Unit Root -> Cointegration
France Sheep/Greece Sheep	-3.07	2	0.131	Unit Root
United Kingdom Sheep/Greece Sheep	-2.01	3	0.573	Unit Root
Germany Parmesan/Italy Parmesan	-6.09	2	0.010	No Unit Root -> Cointegration
Denmark Parmesan/Italy Parmesan	-3.38	2	0.064	No Unit Root -> Cointegration
France Parmesan/Italy Parmesan	-6.35	2	0.010	No Unit Root -> Cointegration
United Kingdom Parmesan/Italy Parmesan	-6.78	1	0.010	No Unit Root -> Cointegration
Germany Grated/Italy Grated	-2.56	3	0.345	Unit Root
Denmark Grated/Italy Grated	-2.62	3	0.319	Unit Root
France Grated/Italy Grated	-0.64	2	0.973	Unit Root
United Kingdom Grated/Italy Grated	-3.08	2	0.129	Unit Root

Source: Informa Economics IEG

For each of the 10 models that were cointegrated before the market shocks created by ECJ rulings on PDO/PGI status for the applicable cheeses, RPSG models were run following the methods outlined in Carter and Smith (2007). From those 10 models, six were found to be sufficiently robust[30] for use in further analysis. The breakpoints indicated by the Chow (1960) test were consistent with the timing of ECJ rulings on enforcing GI measures in European parmesan and feta markets. Results from the Chow tests are shown in Exhibit 36, where the date corresponding to the maximum F-statistic value is indicated by the "Primary Breakpoint" column and additional, statistically significant breakpoints are indicated in the "Alternate Breakpoints" columns.

[30] Model output is available from the authors upon request.

Exhibit 36: Breakpoints in Relative Price Models

Model	Primary Breakpoint	Alternate Breakpoints	
Germany Feta/Greece Feta	3/1/2007		
Denmark Feta/Greece Feta	4/1/2008	8/1/2009	
France Feta/Greece Feta	8/4/2004		
United Kingdom Feta/Greece Feta	11/1/2003	8/1/2005	
Germany Sheep/Greece Sheep	11/1/2004	3/1/2003	6/1/2006
Germany Parmesan/Italy Parmesan	4/1/2005		
Denmark Parmesan/Italy Parmesan	6/1/2006	3/1/2005	6/1/2009

Source: Informa Economics IEG

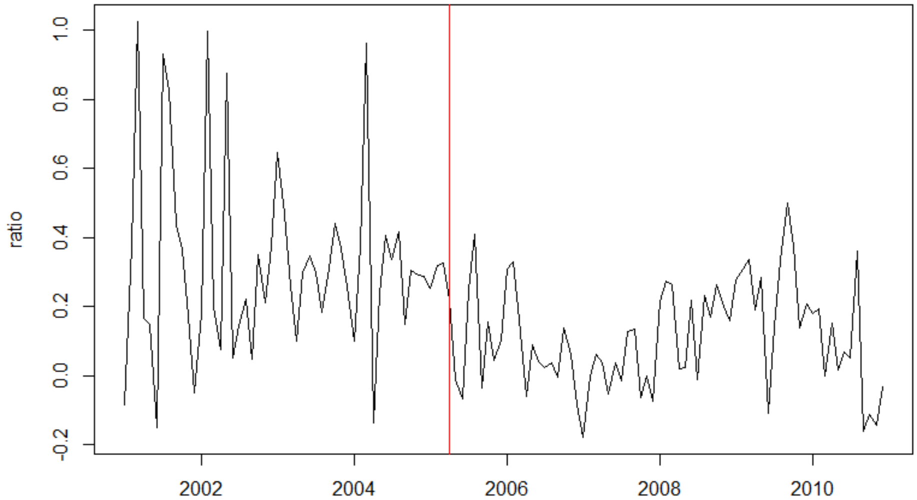
Following the estimation of significant breaks in the natural log of the relative prices of two exporting countries, error correction models were run to determine the specific price impact that was exerted on each series by the shock. The remainder of this section is dedicated to exploring individual model results in greater detail.

(a) Parmesan

Germany – Italy

The RPSG model testing for structural breaks in the price of German parmesan exports relative to Italian parmesan exports identified a structural break in April of 2005. At this point, the German parmesan export prices decreased 30 percent relative to the projected price during the 12 months following the break. During the same period, Italian parmesan prices remained unchanged from baseline forecasts. In Exhibit 37, the break is marked by the red line, which falls within the five year derogation period for implementation following a ruling by the European Court of Justice in 2002 that “parmesan” is to be protected under the “Parmigiano Reggiano” GI.

Exhibit 37: Structural Breaks in the Natural Log of Germany/Italian Parmesan Export Prices



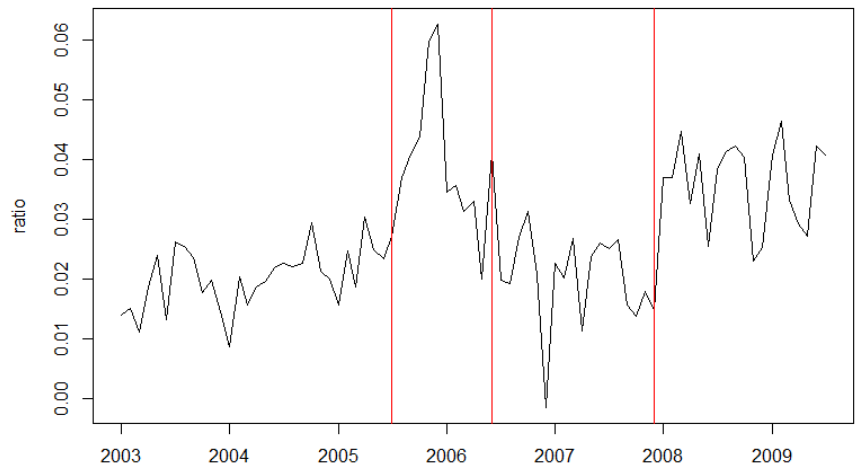
Source: Informa Economics IEG

Parmesan: Denmark – Italy

In a case similar to that of Germany and Italy's parmesan exports, the RPSG model identifies three structural breaks during the period from 2001 to 2011. The first occurs in July of 2005, which is within the five year derogation period for implementation following a ruling by the European Court of Justice. The second occurs in June of 2006 and is followed by a significant decrease in the relative price. Accordingly, it is statistically likely that the GI ruling created the second structural break in Denmark's parmesan prices. The third break occurs in December, 2007 and is likely the result of additional market shocks unrelated to the GI ruling.

The impact of the GI ruling regarding feta was to suppress Danish parmesan export prices 2% lower than would have been otherwise realized (Exhibit 38). The effects of the GI ruling on Denmark's parmesan export prices appear to have lasted approximately 18 months. During the same time period, Italian parmesan export prices stayed the same.

Exhibit 38: Structural Breaks in the Natural Log of Denmark's and Italy's Parmesan Export Price Ratio

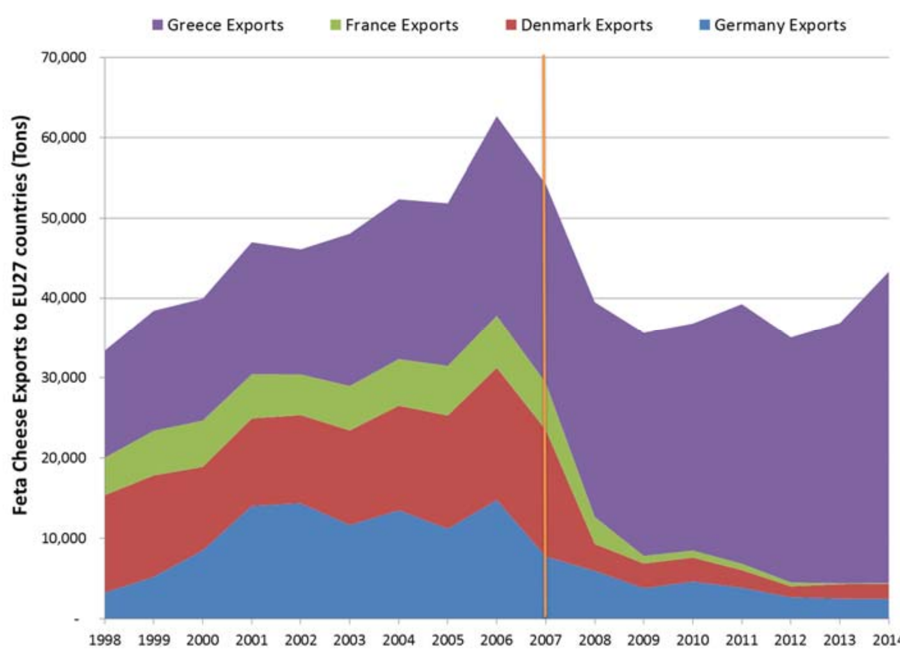


Source: Informa Economics IEG

(b) Feta

After the ECJ upheld feta's status as a PDO, exports of feta cheese from Denmark, Germany, France, and the United Kingdom (not shown) fell dramatically (Exhibit 39). Not only did export volumes fall but the price at which the product was sold fell dramatically as well. Results presented in this section show the export prices from non-Greek exporters fell by 3% to 56% immediately following the ECJ ruling.

Exhibit 39: Feta Cheese Exports to EU countries, Tons



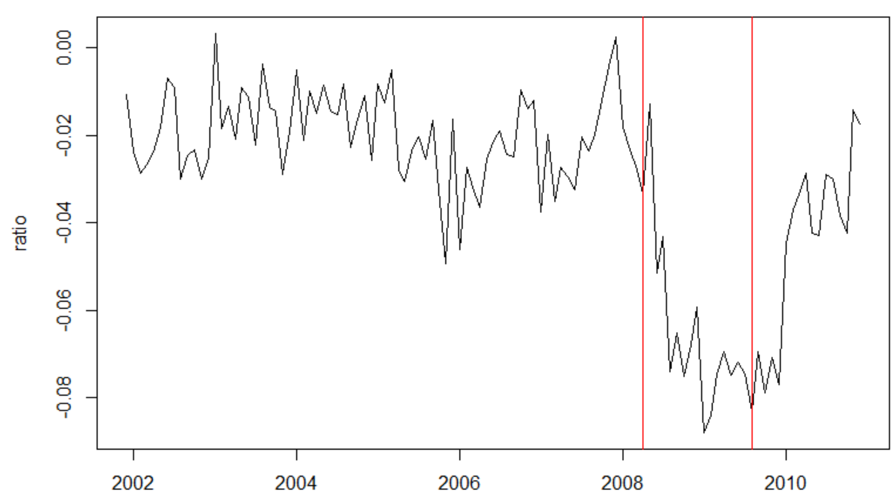
Source: GTIS, Informa Economics

Denmark – Greece

The RPSG model for the ratio of Denmark to Greece feta cheese export prices provides one of the clearest examples of the impacts of GI restriction on non-GI holding countries. Before the ECJ ruling on feta, Denmark and Greece's feta prices were cointegrated and had exhibited a historically stable relationship. In April, 2008, however, the relationship changed dramatically. During the 12 months following the break, Danish feta cheese export prices fell 12% relative to Greece's. Grecian feta export prices, on the other hand, increased by 10%.

The RPSG model found a second structural break in the price series in August 2009, which is likely due to other market shocks. Accordingly, the duration of the market shock appears to have been limited to less than 18 months. It is important to note, however, that the Export Forecast Models found lingering effects on Denmark's export of feta cheese beyond the second breakpoint indicated by the RPSG model.

Exhibit 40: Structural Breaks in the Natural Log of Denmark's and Greece's Feta Export Price Ratio

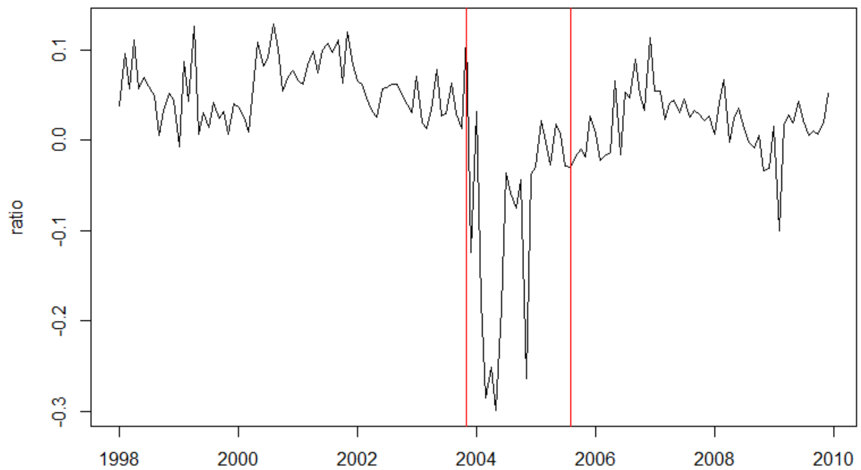


Source: Informa Economics IEG

United Kingdom – Greece

While the UK was a relatively minor exporter of feta cheese before the ECJ ruling, it nevertheless suffered substantial price depreciation of its export due to the ruling. Between the two structural breaks in the relative price found in November, 2003 and August, 2005, the United Kingdom's feta export price fell by 53% relative to baseline forecasts. During the same time period, Greece's export price increased by 11%, according to the model. Based on the structural breaks, the market shock lasted approximately 21 months.

Exhibit 41: Structural Breaks in the Natural Log of the United Kingdom's and Greece's Feta Export Price Ratio

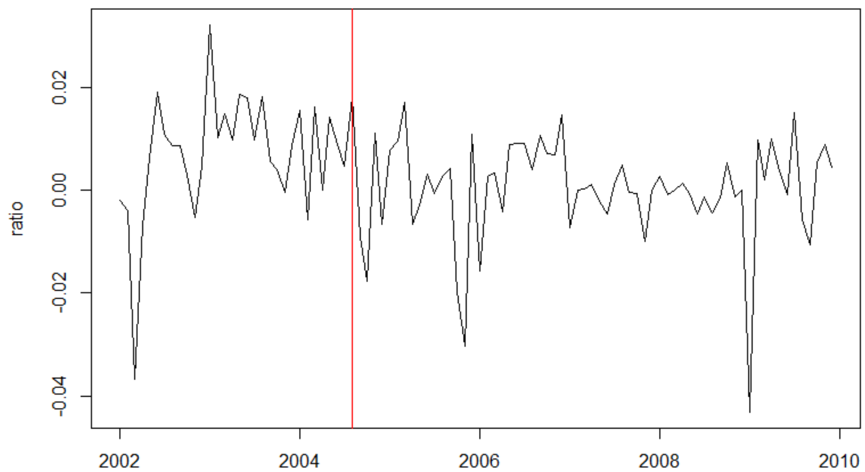


Source: Informa Economics IEG

France – Greece

In a case similar to that of Germany's parmesan export price, the relative price model examining France and Greece feta price exports finds a single break in the series. The break occurs in August, 2004, which is earlier than expected but is still within the time period where a structural break could have occurred[31]. For the 12 months following the structural break, France's feta price remained 3% lower than Greece's (Exhibit 42).

Exhibit 42: Structural Breakpoints in the Natural Log of France's and Greece's Feta Export Price Ratio



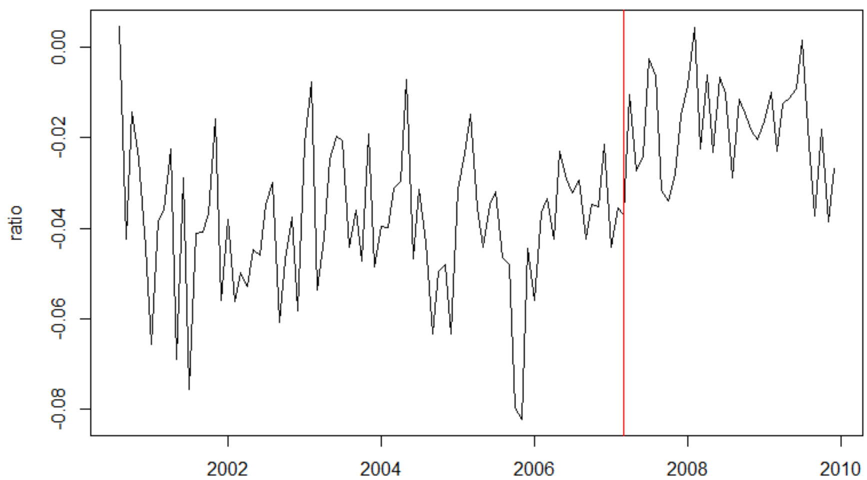
Source: Informa Economics IEG

[31] Feta cheese was granted PDO status in 1996 and a court case before the ECJ upheld the status in 2005. It is, therefore, plausible that a break in the relative prices could have occurred between 1996 and 2005, not only during the implementation phase from 2005 to 2010 that was granted by the 2005 ECJ ruling. Additional support for this argument is provided by the 2004 ECJ ruling that upheld parmesan's PDO status. The feta cheese market, watching the proceedings from the parmesan court case may have reacted to the news by assuming feta's PDO status would, eventually, be upheld as well.

Germany – Greece

The final model in the RPSG analysis is the relative price of Germany's feta exports and Greece's feta exports. While results from the model are quite robust, the results differ strongly from expectations. The RPSG model for comparing German and Grecian feta export prices finds a single structural break in March, 2007. During the 12 months following this break, Germany's export price increased 13% (Exhibit 43) compared with baseline while Greece's feta export prices stayed the same.

Exhibit 43: Structural Breaks in the Natural Log of German and Grecian Feta Export Prices Ratio



Source: Informa Economics IEG

It is important to stress that the finding of increased German export prices does not indicate granting PDO status to the term "feta" had a positive impact on the German cheese industry. On the contrary, as was shown earlier in this section, the export volume of German feta cheese fell dramatically after the ECJ ruling on feta's PDO status. Such change in export volume clearly delineates a negative impact to the country. The most plausible rationale for the increase in German export prices is that the price change was modeled on re-exports of feta produced in Greece. The transition costs associated with re-export could easily lead to German prices rising relative to Grecian prices.

(c) Aggregate Price Impacts

The individual results of the RPSG model reveal interesting implications for each of the European cases. For application to the current study of estimating the probable impacts granting GI protections to European cheeses would have in the US, we average the price impacts across the model results presented earlier. The average price impact on a single country being forced to adhere to the regulations implicit in granting PDO/PGI protections to European cheeses was -14% (Exhibit 44). Accordingly, this average price decrease is incorporated into Informa Economics IEG's equilibrium displacement model.

Exhibit 44: Price Impacts from Relative Price of a Substitute Good Models

Relative Price Model	Price Impact
Germany Feta/Greece Feta	13%
Denmark Feta/Greece Feta	-12%
France Feta/Greece Feta	-3%
United Kingdom Feta/Greece Feta	-53%
Germany Parmesan/Italy Parmesan	-30%
Denmark Parmesan/Italy Parmesan	-2%
Average	-14%

Note: Numbers may not add due to rounding.
Source: Informa Economics IEG

XII. APPENDIX B – DERIVATION OF THE EQUILIBRIUM DISPLACEMENT MODEL (EDM)

For the Equilibrium Displacement Model in this study, it is assumed that:

1. The quantity of cheese supplied to the market is determined by the price received by producers (P^S).
   - $Q^S = f(P^S) = S$
2. The quantity of cheese demanded by the market is determined by the price paid by consumers (P^D) and a change in overall demand for cheeses if they are labeled under new unfamiliar names (E).
   - $Q^D = f(P^D, E) = D$
   - The change in cheese demanded is driven by American consumers' reduced willingness-to-pay for what would be the unfamiliar American-produced cheeses as compared with GI cheeses employing the familiar terms. Consumers still demand American-produced cheeses but only at prices lower than GI cheese prices.
3. The quantity of cheese supplied to the market is equal to the quantity of cheese demanded.
   - $Q^S = Q^D = Q$
4. The price of cheese both received by producers and paid by consumers is equal to the market price.
   - $P^S = P^D = P$

In order to find changes in price and quantity, the quantity equations must be differentiated:

- Demand:
  - Since the shift in demand is assumed to be driven by a reduction in willingness to pay, E is related to P and must be differentiated accordingly.
  - $dQ = \frac{\partial D}{\partial P} dP + \frac{\partial D}{\partial P}\frac{\partial P}{\partial E} dE$
- Supply:
  - $dQ = \frac{\partial S}{\partial P} dP$

To find relative changes, we convert to elasticities where:

- The elasticity of demand is denoted as η and is equal to $\frac{\partial D}{\partial P}\frac{P}{Q}$.
- Percent change in price is denoted $dlnP$ and is equal to $\frac{dP}{P}$.
- Percent change in quantity is denoted $dlnQ$ and is equal to $\frac{dQ}{Q}$.

- The relative change in willingness to pay due to labeling is denoted δ and is equal to $\frac{\partial P}{\partial E}\frac{E}{P}\frac{dE}{E}$.

<u>To derive the equation for estimating the relative change in demand:</u>

- Divide both sides of the differentiated demand equation by Q, and multiply by $\frac{P}{P}$ and $\frac{E}{E}$.
    1) $\frac{dQ}{Q} = \frac{\partial D}{\partial P}\frac{P}{Q}\frac{dP}{P} + \frac{\partial D}{\partial P}\frac{P}{Q}\frac{\partial P}{\partial E}\frac{E}{P}\frac{dE}{E}$
    2) $\boldsymbol{dlnQ = \eta * dlnP - \eta * \delta = \eta(dlnP - \delta)}$**,** or
    3) *The change in quantity of cheese demanded is equal to the own-price demand elasticity of cheese times the change in price less the consumer willingness-to-pay.*

<u>To derive the equation to estimate the relative change in supply:</u>

- The elasticity of supply is denoted as ε and is equal to $\frac{\partial S}{\partial P}\frac{P}{Q}$.
- Divide both sides of the differentiated supply equation by Q, and multiply by $\frac{P}{P}$.
    1) $\frac{dQ}{Q} = \frac{\partial S}{\partial P}\frac{P}{Q}\frac{dP}{P}$
    2) $dlnQ = \varepsilon * dlnP$, or
    3) *The change in quantity of cheese supplied is equal to the own-price supply elasticity times the change in price.*

Agribusiness Consulting
Agribusiness intelligence | informa

Informa Agribusiness Consulting
2121 K Street, NW
Suite 300
Washington, DC 20037

T +1 202 899 6937
E info@informa.com
W www.agribusinessintelligence.com