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## **Implicit Tariffs on Imported Dairy Product Components in the United States**

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The majority of the dairy products imported by the United States are intermediate products used in food processing. As such, they are demanded for their components such as milk fat and protein. The implications of the U.S. tariff structure for import demand must be viewed in terms of the tariffs' effects upon the relative prices of imported milk components. In this article we examine the implications of the current tariff structure and proposed changes under the Doha Round of international trade negotiations at the World Trade Organization. We show that implicit *ad valorem* equivalent tariffs (AVEs) on components vary substantially under the current tariff schedule. Proposed changes under the Doha Round would lead to not only a reduction in the level of implied tariffs on components, but also a reduction in dispersion. This would help to reduce the possibility of distortions due to significant differences in component prices across intermediate dairy products.

Keywords: dairy, Doha Round, milk components, tariff structure, United States

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## **Introduction**

The cornerstones of U.S. dairy policy have been high internal support prices coupled with import protection; these have effectively insulated U.S. dairy markets from global competition. Under the Uruguay Round trade agreement, quotas and other forms of import protection were replaced by tariff-rate quotas (TRQs) for many products, in order to improve market access. TRQs involve a low tariff on within-quota imports and a higher tariff on over-quota imports.

In any given year the United States can be either a net importer or net exporter of dairy products. When international prices are high relative to domestic prices the United States is likely to be in a net export position; when the opposite applies it is likely to be a net importer. The impact of changes in U.S. tariffs is obviously of relevance only to the latter case, when the United States imports more than it exports. In 2004 world prices for most dairy products were below U.S. domestic prices and the United States was a net importer. In that year imports on a fat solids basis were roughly 5.5 percent of total domestic use; on a protein solids basis the proportion was 8.0 percent. Imports of protein solids were higher than of milk fat solids since some high protein products are not subject to a TRQ (i.e., milk protein concentrates and caseins). As a result the fill rates for tariff-rate quota products (proportion of the quota actually imported) were high, ranging from 96.8 to 98.7 percent for butter and dry dairy products, and 64.4 to 99.6 percent for nine cheese categories. The exception was dried skim milk, which had a fill rate of just 13.8 percent. The fill rate for TRQs can be less than 100 percent, even when international prices are low, because of technical and administrative factors (see de Gorter, 2001).

Most U.S. dairy imports are intermediate products used in further processing, rather than finished dairy products. Products like casein or anhydrous milk fat are imported for processing into dairy or other food products. Import demand for such intermediate products is increasingly related to their component characteristics – how much milk fat or protein each contains, for example. Intermediate products can face very different levels of tariffs, and this variation affects the implicit import prices of components. A high level of implied protection on the components in one product could cause importers to switch to other products whose components have lower tariffs and implicit prices. This effect has already been apparent through the growth of imported milk protein concentrates (MPCs) for use in cheese processing and imported milk fats in food preparations. Under the Doha Round of multilateral trade negotiations, new tariff-reduction formulas are being discussed to increase market access. Changes in implicit tariffs at the component level could have significant implications for import demand.

This article examines the current structure of tariff protection for U.S. dairy imports on both a product and a component basis using the methodology developed by

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Tellioglu (2006). This article also examines how this tariff structure might change under a new trade agreement. We first outline an approach to deriving component prices and implicit tariffs from the component content of specific imported intermediate products, their world prices, and tariffs. We then modify the approach to take account of the fact that some products contain components that have little market value. For example, most processors purchase skim milk powder for its protein content, not for the lactose and minerals it contains. In fact, cheese processors that use skim milk powder must remove the lactose during processing. The implicit price for protein must be adjusted to reflect this. Next we apply a method for dividing applied tariffs for dairy products into component-level tariffs. The component-level tariffs are then converted into *ad valorem* equivalents (AVEs) to aid comparisons. We develop a tariff profile for protein and milk fat and compare AVEs across competing products. Finally, we examine the impact of proposed reductions in tariffs under the Doha Round on the component tariff profile.

Several analysts have observed that the analysis of trade liberalization in the dairy sector requires that the special characteristics of the sector be taken into account. Nicholson and Bishop (2001) discuss some of the special characteristics of dairy trade models. Buccola and Iizuka (1997) and Lenz, Mittelhammer, and Shi (1994) examine the aggregate characteristic of milk and develop hedonic pricing models to derive values for milk components. However, no previous studies have discussed possible changes in dairy trade patterns when effective tariffs on key milk components are taken into account.

## **Methodology for Analyzing Component Prices and Tariffs**

Our main aim is to examine the tariff structure for U.S. dairy imports using milk components. To simplify the analysis we examine groupings of products that share similar characteristics (same end use, common percentage of components, etc.). Five classes are defined: cheese products, milk fat products, protein and whey products, dried milk high fat (dried milk HF) products, and dried milk low fat (dried milk LF) products.

Cheese products contain a similar balance between protein (21-23 percent) and milk fat (28-35 percent) (Chandan, 1997). Imported cheese is used mainly as a finished food product, not as an intermediate product used for its protein or milk fat content. As its name suggests, products in the milk fat group are characterized by a high percentage of milk fat – 90 percent on average. Other components (i.e., protein, other solids, moisture) are negligible. This justifies the creation of a single group containing spray butter, buttercream, buttermilk, and anhydrous milk fat, among other products. Products in the protein and whey group are characterized by a relatively

high protein level in comparison to other groups. The group contains casein, caseinates, milk protein concentrates (MPCs), and various whey products, including whey protein concentrates (WPCs) in both liquid and dried forms.

Dried milk products, other than those included in the protein and whey group, are organized into two different groups based on fat content. Dried milk products containing significant amounts of fat (10 percent or more) are termed dried milk HF (e.g., dried sour cream). Those containing negligible amounts of fat (less than 10 percent) are termed dried milk LF (e.g., skim milk powder). The reason for identifying two groups on the basis of fat content relates to the method for computing component tariffs, which is explained later.

All five groupings are subdivided by their TRQ status (i.e., quota, QT, and over quota, OQ). World prices, component prices, and tariff rates are computed on the basis of QT and OQ status. *Ad valorem* equivalent tariffs are computed to permit comparisons across products, components, and TRQ status.

### **General Methodology**

As stated earlier, our objective is to examine the tariff structure of U.S. dairy imports on both a product and a component basis. A methodology is developed to compute market prices and tariffs on a component basis using the unique dairy component content of specific dairy products. For example, we are interested in deriving the market prices and tariffs for protein in products such as milk protein concentrates and casein, and the milk fat prices and tariffs for butter and anhydrous milk fat imports.

The specifics of the methodology developed by Tellioglu (2006) are contained in the technical annex. The methodology first begins with deriving the component prices for each dairy product by using the world price and the component content of the individual products. Thus, for cheese imports, we can derive both a milk fat and a protein price based on the world price of cheese and the percentages of fat and protein in cheese. Next, *ad valorem* tariffs are derived on a component basis by first dividing the fixed tariffs for dairy products using the ratio of the values of the components to world prices, and then converting to component AVEs by dividing these computed tariff shares by the world prices. This results in *ad valorem* equivalent tariffs for milk fat, protein, and other solids components which, when summed, equal the tariff for the dairy product.

The general methodology presented cannot always be applied directly to all dairy products. For example, cheese has value due to its unique combination of casein protein and milk fat. Skim milk powder, on the other hand, has market value mainly because of the protein it contains, not due to the lactose, even though lactose accounts for over 60 percent of its volume. The general methodology is adapted to such real world considerations in the section “Modifications to Reflect Market Realities” in the

technical annex. To ensure that these modifications are clear, an example is also supplied in the technical annex.

## **Analysis of the Current Tariff Structure**

We now apply our methodology to all five product groups in order to compute prices and tariffs under the current tariff schedule. As discussed earlier, each product group is further divided into QT and OQ subgroups based on its TRQ status. All nonquota HTS lines are eliminated, since imports in 2004 were negligible. Table 1 contains means, ranges, and coefficients of variation (CVs) for estimated world prices, total AVE tariffs, component prices, and component AVE tariffs. The CV (ratio of standard deviation to the mean) is used as a measure of dispersion.

As might be expected under the TRQ system, the QT tariffs for the components are much lower than the OQ tariffs. Tariffs on finished and intermediate products are higher than the implicit tariffs on individual components. Component AVE tariffs for groups other than cheese are highly variable for OQ products. For example, the CV for protein ranges from 36 to 60 percent, and the CV for milk fat ranges from 31 to 65 percent. Since, as noted above, many dairy products are imported for their components, it is likely that the variability in the implicit tariff will have an impact on importers' decisions on component sourcing.

The world prices of cheese products show substantial variation. For example, for QT products, prices range from \$2,000 to \$19,500 per ton, and for OQ cheese products the range is from \$2,000 to \$16,000 per ton; the respective CVs are 65 and 51 percent. The AVE tariffs for cheese, for both QT and OQ, are moderate with a wide degree of variation. These results are reflected in the protein and milk fat prices and AVEs.

World prices for QT and OQ milk fat products have moderate ranges. The QT range is from \$1,762 to \$2,077 per ton, and the OQ range is from \$2,035 to \$3,000 per ton (the CVs of world prices are 8 and 15 percent, respectively). With regard to component AVEs, the QT milk fat AVEs are relatively low, with a mean of 9 percent and a range of 6 to 10 percent (CV of 27 percent). In contrast, the mean for the OQ milk fat AVEs is 58 percent with a range from 35 to 77 percent (CV of 31 percent).

Many HTS lines in protein and whey have no or low fixed tariffs. For those subject to tariffs the AVEs are highly variable. The component AVEs for QT protein range from 4 percent to 98 percent with a mean of 51 percent, whereas the OQ protein AVEs range from 42 percent to 70 percent with a mean of 56 percent. Component prices have moderately narrow ranges in this group (the QT protein price range is from \$818 to \$1,366 per ton, and the OQ protein price range is from \$9,329 to \$9,617 per ton).

The dried milk groups show the highest variation in world prices for products and components, and relatively large variation in the OQ tariffs at both the component and product levels. In the dried milk HF group, more moderate OQ and QT component tariffs are applied than in the cheese, milk fat, and protein and whey groups. However, the component tariff range is still wide. The dried milk HF group has low milk fat and protein QT AVEs, with means of 4 percent and 3 percent, respectively. The mean milk fat and protein OQ AVEs are significantly higher than the QT AVEs for this group: 24 and 12 percent, respectively.

**Table 1** Summary of Descriptive Statistics for All Product Groups, 2004

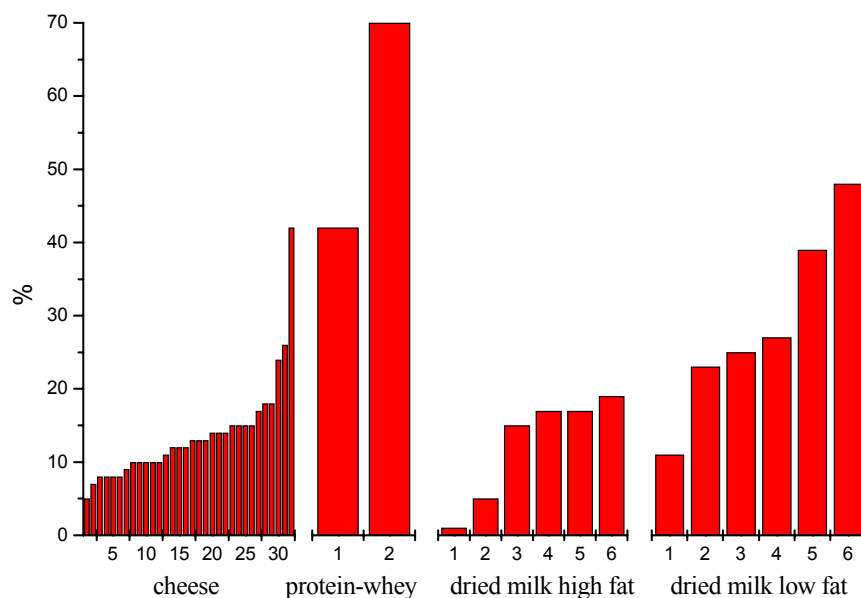
			World Price	Total AVE	Protein Price	Milk Fat Price	Protein AVE	Milk Fat AVE
			(\$/ton)	(%)	(\$/ton)	(\$/ton)	(%)	(%)
Cheese	QT	average	4,926	17	8,895	8,891	5	7
		range	(2,000-19,500)	(6-166)	(3,747-33,621)	(3,744-33,621)	(3-9)	(4-12)
		CV	65%	169	64%	64%	29	27
	OQ	average	5,831	39	10,377	10,375	14	20
		range	(2,000-16,000)	(13-220)	(3,534-27,586)	(3,534-27,586)	(5-42)	(8-63)
		CV	51%	93	50%	50%	51	51
Milk fat	QT	average	1,924	9	NA	2,030	NA	9
		range	(1,762-2,077)	(6-10)	NA	(1,762-2,373)	NA	(6-10)
		CV	8%	27	NA	15%	NA	27
	OQ	average	2,535	58	NA	2,982	NA	58
		range	(2,035-3,000)	(35-77)	NA	(2,035-4,000)	NA	(35-77)
		CV	15%	31	NA	26%	NA	31
Protein and whey	QT	average	343	147	1,092	NA	51	NA
		range	(307-378)	(0.09-2.85)	(818-1,366)	NA	(4-98)	NA
		CV	15%	133	36%	NA	130	NA
	OQ	average	2,405	63	9,473	NA	56	NA
		range	(1,408-3,401)	(43-82)	(9,329-9,617)	NA	(42-70)	NA
		CV	59%	43	2%	NA	36	NA
Dried milk high fat	QT	average	2,994	8	6,362	6,362	3	4
		range	(927-10,630)	(1-18)	(1,384-24,401)	(1,384-24,401)	(0.1-8)	(1- 8)
		CV	143%	90	159%	159%	113	74
	OQ	average	3,689	38	7,152	7,152	12	24
		range	(1,194-11,067)	(15-61)	(2,095-25,404)	(2,095-25,404)	(1-19)	(14 -55)
		CV	106%	39	127%	127%	60	65
Dried milk low fat	QT	average	2,172	2	16,274	NA	2	NA
		range	(941-3,667)	(1-4)	(4,408-33,743)	NA	(1-3)	NA
		CV	48%	43	68%	NA	42	NA
	OQ	average	4,043	31	54,924	NA	29	NA
		range	(1,083-10,600)	(12-52)	(8,947-233,329)	NA	(11-48)	NA
		CV	82%	44	160%	NA	46	NA

Note: QT, OQ, CV, and AVE denote quota, over quota, coefficient of variation, and *ad valorem* equivalent, respectively.

The dried milk LF group's average protein AVE tariff for QT is similar to that of the dried milk HF group, but protein price ranges are huge. For example, the protein price for OQ ranges from \$8,947 to \$233,329 per ton. This is due to the variation in the world prices of the intermediate products concerned. This translates into significant variation in the protein AVE tariffs (the dried milk LF group's OQ protein AVEs have a CV of 46 percent, for example).

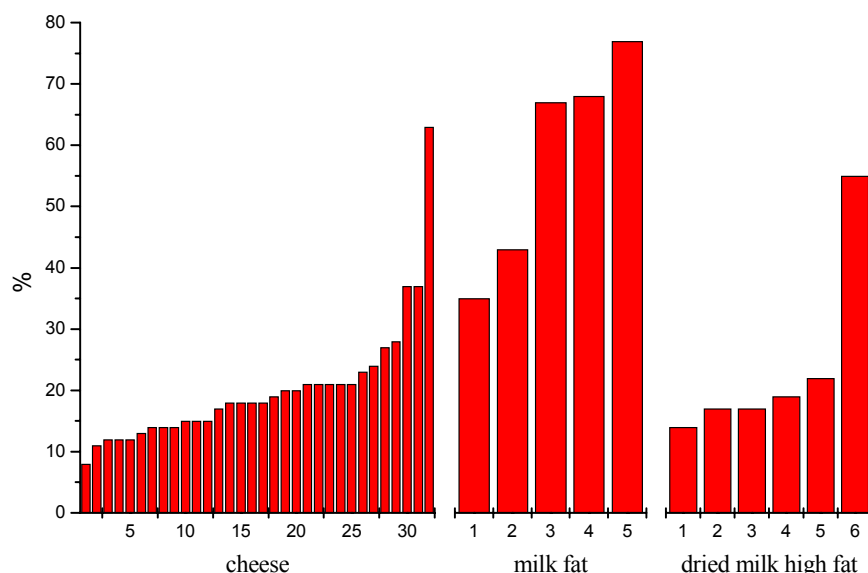
Figures 1 and 2 show the component AVE tariffs across different product groups. From figure 1 the large amount of variation in OQ protein tariffs across cheese, protein and whey, dried milk HF, and dried milk LF groups can be appreciated. Depending on how protein is sourced, an importer could face an implicit tariff as low as one percent or as high as 70 percent. AVE tariffs range from one to 19 percent for protein sourced from the dried milk HF product group but from 42 to 70 percent for protein sourced from whey products. The results for OQ milk fat tariffs shown in figure 2 show a broadly similar pattern to those for protein. Current implicit over-quota tariffs on imported protein and milk fat are highly variable.

**Figure 1** Protein AVE comparison between product groups, OQ, 2004.





**Figure 2** Milk fat AVE comparison between product groups, OQ, 2004.



The substantial variability in implicit component tariffs is likely to affect importers' decisions. There are many combinations of component AVE tariffs and prices within each component group. In order to minimize costs, importers are likely to choose intermediate products that provide components with the lowest landed price (combination of price and AVE tariff). The protection that is apparently provided to domestic dairy producers by the existing structure of tariffs on intermediate products may be undermined by the ability of importers to vary the pattern of imports to obtain components at the lowest cost.

## Analysis of Doha Tariff-Reduction Proposals

Tariff reductions for agricultural products are being addressed in the current Doha Round of WTO negotiations. Discussions have focused on the application of reduction percentages to a number of bands, defined on the basis of existing tariff levels. In addition, there may be tariff caps (maximum allowable rates) imposed by the end of the implementation period. At the time of writing the modalities of a final agreement were still uncertain. Consequently, we employ a particular set of assumptions to illustrate the potential impact of the type of approach being discussed at the WTO on U.S. dairy tariffs. Our focus is on how this approach might affect the structure of tariffs at the component level and how components would be sourced by importers should international dairy prices be below those in the U.S. market.

We base our analysis on the formula proposed by Ambassador Crawford Falconer, Chair of the WTO Agricultural Negotiating Committee (WTO, 2006). This formula would reduce tariffs as follows:

- *ad valorem* equivalent greater than zero and less than or equal to 20 to 30 percent – reduction of 20 to 65 percent;
- *ad valorem* equivalent greater than 20 to 30 percent and less than or equal to 40 to 60 percent – reduction of 30 to 75 percent;
- *ad valorem* equivalent greater than 40 to 60 percent and less than or equal to 60 to 90 percent – reduction of 35 to 85 percent; and
- *ad valorem* equivalent greater than 60 to 90 percent – reduction of 42 to 90 percent.

Based on this formula, we define two scenarios:

**Scenario 1:** A least aggressive tariff-reduction scenario employing the widest tariff bands with the lowest reduction percentages. For example, a band of zero to 30 percent with a cut of 20 percent, and a band of 30 to 60 percent with a cut of 30 percent. The other bands are defined for this scenario in a similar fashion.

**Scenario 2:** A most aggressive tariff-reduction scenario employing the narrowest tariff bands and the highest reduction percentages. For example, a band of zero to 20 percent with a tariff cut of 65 percent, and a band of 20 to 40 percent with a cut of 75 percent. Again, the same combinations (narrowest band, highest reduction percentage) are used for the rest of this scenario. The parameters for the two scenarios are summarized in table 2.

**Table 2** Tariff Reduction Scenarios for OQ Products, Developed Countries

Scenario 1: Least Aggressive Scenario		Scenario 2: Most Aggressive Scenario	
Bands (%)	Reduction percentages	Bands (%)	Reduction percentages
0-30	20	0-20	65
30-60	30	20-40	75
60-90	35	40-60	85
>90	42	>60	90

Note: There is no tariff cap for the least aggressive scenario and a tariff cap of 75 percent for the most aggressive scenario.

Based on these two scenarios, we estimate new component AVEs. Product-based AVE tariffs are ranked to determine which band they belong to. The reduction percentages shown in table 2 are then applied to the product-based AVE tariffs (i.e., total Uruguay Round AVEs). Finally, new component AVE tariffs are estimated using the methodology described earlier.

Table 3 contains the means, ranges, and CVs for the new, reduced AVEs. As might be expected, average product-level and component-level tariffs decline under both reduction scenarios. With the exception of protein from the dried milk HF group, the relative variation in tariffs as measured by the coefficient of variation also declines. The relative variability in tariffs is lowest under the most aggressive reduction scenario (scenario 2). Although the relative dispersion of component tariffs decreases, an F test applied to normalized tariff variances indicates that the reduction is not statistically significant for 6 of the 21 cases. Consequently, we can conclude that the linear tariff-reduction approach has a limited impact on the tendency for the tariff profile to create incentives to vary the pattern of imports when milk components are considered. The reduction formulas do not eliminate the issues identified earlier with respect to the sourcing of imported components.

**Table 3** Different Reduction Scenario Statistics Comparison, for All OQ Product Groups, 2004

		Uruguay Round		Least Aggressive Reduction		Most Aggressive Reduction	
		Protein AVE (%)	Milk fat AVE (%)	Protein AVE (%)	Milk fat AVE (%)	Protein AVE (%)	Milk fat AVE (%)
Cheese	average	14	20	10	14	3	4
	range	(5-42)	(8-63)	(4-24)	(6-37)	(2-4)	(3-6)
	CV	51	51	39	39	20	19
Milk fat	average	NA	58	NA	38	NA	7
	range	NA	(35-77)	NA	(24-50)	NA	(6-9)
	CV	NA	31	NA	28	NA	13
Protein and whey	average	56	NA	37	NA	7	NA
	range	(42-70)	NA	(29-46)	NA	(6-7)	NA
	CV	36	NA	31	NA	8	NA
Dried milk high fat	average	12	24	9	17	3	5
	range	(1-19)	(14-55)	(1-13)	(11-36)	(0.4-4)	(3-6)
	CV	60	65	60	58	67	22
Dried milk low fat	average	29	NA	21	NA	6	NA
	range	(11-48)	NA	(9-34)	NA	(4-7)	NA
	CV	46	NA	39	NA	20	NA

Note: OQ, AVE, and CV denote over quota, ad valorem equivalent, and coefficient of variation, respectively.

Despite this limited effect, as component AVEs are reduced, particularly under the most aggressive reduction scenario, a more consistent pattern of protection is created. There is a tendency for the AVE tariffs at the component level to become less diverse. An importer would face less variability in implied tariffs on milk fat or protein across intermediate products. This would be likely to contribute to a more predictable trading environment.

## **Summary and Conclusions**

The impact of tariffs on intermediate products can be difficult to predict, particularly when such products can be divided into components from which other products are made. Most imported dairy products are used in further processing, and their demand is increasingly related to component characteristics. Imported dairy products can face very different tariff levels, and the implicit tariffs on components can be highly variable. Shifts in import patterns may result if changes in tariffs affect the relative prices of components obtained from various intermediate products.

In this article, we examined the existing tariff profile for U.S. dairy imports and two scenarios for tariff reductions based on proposals made in the Doha Round negotiations. The focus on tariffs on a component basis highlights some of the potential consequences of the current Doha Round of WTO negotiations for the U.S. dairy industry.

Current implicit tariffs for milk fat and protein vary substantially among and within dairy product groups. This variation has implications for the sourcing of ingredients. Food manufacturers seeking to minimize costs will tend to base their purchasing decisions on the lowest component price (inclusive of tariffs) rather than the lowest product price. Import protection for products such as butter and skim milk powder can be circumvented by importing other products whose fat or protein content faces lower implicit tariffs.

Proposed changes in tariffs under the Doha Round negotiations seem likely to both lower the average implicit tariff on components and reduce tariff dispersion. Importers would face less variation in component prices, and the incentives to switch among products based on differences in implicit component tariffs would be reduced. Product and component tariff profiles under a Doha Round agreement would be more consistent than under the existing tariff schedule.

Although the net trade position of the United States in dairy products can change depending on the levels of domestic and international prices, imported sources of protein are generally cheaper than domestic sources. Imported OQ skim milk powder is an exception. Doha Round tariff-reduction rates are unlikely to make imported OQ skim milk powder cost competitive either with other imported protein sources or with domestic sources. Importers already have cheaper options through non-TRQ products

such as milk protein concentrate and casein. Domestic sources of milk fat are generally cheaper than imported sources under the current tariff schedule, but a larger number of imported sources of fat would become cost competitive with Doha Round tariff reductions.

In conclusion, the results of this inquiry suggest that tariff-reduction formulas could have unanticipated impacts on imported intermediate products. The users of imported dairy products may be able to find new lower cost options for obtaining ingredients as a result of changes in tariffs, when international product prices are below those in the United States. It will only be possible to determine the likely effects of the current negotiations by examining changes in implied tariffs at the component level if and when a final agreement is reached.

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