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Counting the Cost of Restricting Casein Imports

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Casein—the principal protein in milk—is truly a versatile ingredient. It's in a wide array of products, from animal feed and pet foods to imitation cheese, dietary products, and coffee whiteners. It is also used in glues, paints, and cleaning agents.

Despite its widespread use, however, casein is not produced in the United States because producing nonfat dry milk (NFDM) at federally supported prices is more profitable. Nine countries accounted for 92 percent of the 231 million pounds imported by the United States in 1985 (table 1). New Zealand supplied almost half, while seven European countries provided 43 percent, with Ireland supplying about 28 percent of total U.S. imports.

Researchers at USDA's Economic Research Service (ERS) recently examined the impacts of restricting casein imports. The study was conducted in response to a Congressional request to determine whether imports of casein interfere with the Government's dairy price support program.

The ERS report revealed that casein import restrictions would mean lower Federal costs for dairy price supports—from 3 to 14 percent of 1985 program expenditures. Because casein is widely used in consumer and industrial products, however, both manufacturers and consumers would face higher costs. Consumers would also find they had fewer product choices.

The Versatile Ingredient

Casein accounts for roughly 3 percent of the weight of whole milk, and 80 percent of the total protein content. Whole milk is made up of fat, water, and nonfat milk solids. When the fat component of whole milk is skimmed off for making butter, the skim milk that remains includes casein, water, and other nonfat milk solids. This skim milk can be dried and made either into NFDM or casein.

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In the 1940's, only a small percentage of U.S. milk production went for casein, as its use was primarily in industrial products. In 1947, casein production totaled 36 million pounds, but fell to 3 million pounds in 1955, as the price of NFDM rose relative to casein. As a result, NFDM producers diverted milk supplies away from casein. This relative price relationship has continued to keep casein out of production in the United States.

While U.S. production was declining, the uses for casein were expanding worldwide. Developments in cosmetics and textiles in the late 1940's and early 1950's, as well as the introduction of dried casein lactate as a dietary supplement in 1953, marked the beginning of attempts to more fully use its unique characteristics. With growing demand, U.S. imports of casein rose from 21 million pounds in the mid-1940's to 75 million pounds about a decade later.

Water-soluble casein became available in 1955 and, by 1960, it was used in food products around the world. In the 1960's, development of casein's emulsifying and stabilizing qualities facilitated successful introduction of a powdered nondairy coffee whitener. By 1969, as much as one-quarter of the world's estimated annual production of 240 to 320 million pounds went into

coffee whiteners and other food. Other major edible uses included medical and dietary products, flavor enhancers, imitation whipped cream for desserts and baked goods, and filler for meat products, such as sausage and luncheon meats.

In the United States during the 1960's, casein was still primarily being used in industrial products, although over 20 million of the 107 million pounds used went into food. These food uses were limited to beverages, breakfast cereals, coffee whiteners, desserts and toppings, and dietetic products.

In the 1970's, U.S. manufacturers discovered even more uses for casein, and it became an important ingredient in baby foods, baked goods, confectionery products, processed meats, dry soups, and pet foods. By 1980, food uses accounted for an estimated 69 percent of the 138.9 million pounds used in the United States (table 2).

Impact of Restricted Imports Depends on Substitutes

To evaluate the impact of restricted imports of casein on the U.S. dairy industry, the ERS researchers identified major domestic casein uses and considered the availability and costs of alternative inputs. The principal alternatives to casein in food and



Casein can be found in a variety of products, from coffee whitener to pizza.

Table 1. New Zealand Supplies Almost Half of U.S. Casein Imports

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
	<i>Million pounds</i>															
New Zealand	63.0	37.9	29.7	31.4	33.5	14.7	56.0	96.3	84.3	92.1	76.8	76.8	85.2	68.4	94.7	102.0
Australia	34.3	31.8	27.3	23.9	18.3	10.0	33.4	23.1	22.9	21.7	17.9	18.4	16.5	18.8	15.3	12.1
Ireland	(²)	.9	4.4	13.6	7.3	5.7	3.3	4.3	9.2	14.8	24.0	19.9	40.2	35.9	39.2	64.9
France	11.2	8.3	8.7	10.3	22.9	5.2	.2	(²)	(²)	2.0	8.9	5.8	14.9	12.0	13.9	10.7
West Germany	.4	2.3	2.6	2.5	5.5	3.5	1.2	.4	.2	.2	.6	1.2	1.2	2.6	1.5	1.9
Netherlands	.2	1.7	4.6	1.8	2.7	2.3	1.1	.6	1.5	2.5	2.5	1.8	4.6	6.0	7.9	7.7
Others	26.2	23.1	28.1	29.3	22.7	17.0	16.9	19.5	19.0	17.5	21.5	3.9	14.2	15.8	19.8	32.1
Total	135.3	106.0	105.4	112.8	112.9	58.4	112.1	144.1	137.1	150.8	152.2	127.8	176.8	159.5	192.3	231.4

¹Includes casein and casein mixtures. ²Less than 100,000 pounds.

Source: U.S. Department of Commerce, Bureau of the Census.

feed include nonfat dry milk, soy products (flour, grits, isolates, and concentrates), and whey protein concentrate. Which of these can be used in various products depends on their technical properties and relative cost.

The main technical substitute for casein in powdered coffee whiteners, for example, is soy protein. Soy-based whiteners are currently marketed for people who must restrict their intake of dairy products. However, these products don't taste as good or mix as well with coffee. On the other hand, liquid coffee whiteners made from soy isolates have found wide consumer acceptance, although they do not have the shelf-life of their powdered counterparts.

Because coffee whiteners require long shelf-life and good flavor, it is likely that casein would continue to be used to assure those attributes. Since the proposals call only for restricted imports, casein from foreign countries would still be available. However, competition for these limited imports by manufacturers with no casein substitutes would bid up the price of casein to approximately the level where domestic production would become feasible.

Producers could then use the higher priced domestic casein.

Other foods provide examples of substitutions that could occur if casein imports were restricted. Producers of processed meat products, such as imitation sausage, stews, and soups, for instance, need an ingredient that can bind water in the product and keep fat from escaping to the surface. In many imitation dairy products, such as whipped desert toppings, an ingredient that prevents "weeping" of liquids is also desired. In most of these products, skim milk solids could be used; casein is used mainly for economic reasons.

Soy proteins could replace casein in certain of these uses. Complete replacement of dairy protein is possible in many cream fillings, icings, and whipping creams, but further research is apparently necessary to obtain an acceptable flavor.

Dietary products encompass specially formulated food and medical products low in cholesterol and lactose-free. Casein-based products provide a protein source easily tolerated by people with medical problems, such as intolerance of lactose in milk. Other products using casein include coatings and

binders for pills, weight-reduction formulations, protein powder formulas, and other special dietetic and infant food products. No substitutes can duplicate casein's role in the majority of these products.

With restricted imports and the resulting higher prices, manufacturers of a variety of casein-based products might use the more costly domestically produced casein if they felt they could recapture the higher ingredient cost.

In the industrial sector, for example, casein is an important component of glues and adhesives. Casein makes these products quick-setting, water-resistant, durable, able to adhere to different surfaces (such as paper on glass and aluminum foil to paper), and convenient. Casein is the main binding agent in adhesives, making them resistant to water and temperature extremes (important in bottle labeling) and stable when mixed with water.

Some manufacturers indicated that soy-based proteins and synthetics such as polyacrylate could be substituted for casein in glues and adhesives. But most manufacturers claimed that the resulting product

Table 2. Imports Supply the Needs of Growing Domestic Casein Uses

Year	Imports	Production	Change in stocks	Exports	Estimated domestic use				
					Total	Food	Feed	Industrial	Other
<i>Million pounds</i>									
1940	24.5	46.6	—	—	60.2	(¹)	(¹)	56.4	3.8
1950	54.6	18.5	+ .3	0.1	72.7	—	—	—	—
1955	74.5	3.1	—	.1	77.5	1.0	(¹)	(¹)	76.5
1960	92.2	.9	—	.1	93.0	4.7	—	—	—
1966	107.9	2.7	—	3.6	107.0	22.5	(¹)	79.5	5.0
1970	135.0	0	—	3.7	131.6	39.5	26.3	65.8	0
1971	106.0	0	—	2.5	103.5	32.1	—	—	—
1972	105.4	0	—	1.9	103.5	33.1	—	—	—
1973	112.8	0	—	1.9	110.9	36.6	—	—	—
1974	112.9	0	—	2.3	110.6	37.6	—	—	—
1975	58.4	0	—	.7	57.7	—	—	—	—
1976	112.1	0	—	1.1	111.0	72.9	—	—	—
1977	144.1	0	—	.9	143.2	65.9	—	—	—
1978	137.0	0	+6.6	1.2	129.3	72.4	30.4	26.6	0
1979	150.8	0	+2.1	.7	148.1	87.7	32.1	28.2	0
1980	152.2	0	+12.3	1.0	138.9	95.8	22.7	20.5	0
1981	127.8	0	-15.4	.9	142.2	100.6	22.9	18.8	0
1982	176.8	0	-2.6	.6	178.8	136.1	23.6	19.0	0
1983	159.5	0	-28.7	1.2	187.0	142.1	—	—	—
1984	192.3	0	-4.5	2.8	194.0	146.7	—	—	—
1985	231.4	0	+33.3	2.3	195.8	146.9	23.9	25.0	0

¹If any, included in other. — = Not available.

Sources of use data:

1940: USDA, *Dairy Situation*, DS-168, August 1945, p. 12.

1955: U.S. Tariff Commission, *Summaries of Trade and Tariff Information, Chemicals and Related Products*, TC Publication 239, November 1967, p. 58.

1966: Poarch, A.E., "Uses of Casein and Caseinates in the Industry in General and in the Food Industry," International Dairy Federation Seminar on Casein and Caseinates, Paris, 1967, p. 7.

1970: Hammonds, T. M., and Call, D.L., *Utilization of Protein Ingredients in the U.S. Food Industry, Part I—The Current Market for Protein Ingredients*, Cornell University, A.E., Res. 320, July 1970, p. 21.

1978-81: International Trade Commission.

1982: Census of Manufactures (partial).

would be inferior. In the past, however, when casein prices increased, many glue manufacturers have substituted soy protein.

Restricting Imports Means Higher Producer Costs

To estimate the costs associated with limiting foreign casein, ERS researchers considered the two methods of restricting imports permitted under Section 22 of the Agricultural Adjustment Act of 1935. The first method is a quota that would cut imports up to 50 percent from a specified base period. ERS researchers analyzed a quota

based on 50 percent of average imports during 1981-85.

If the import quota was 88 million pounds, most users with ready substitutes would shift out of casein into alternative proteins (table 3). All others would continue to use imported casein while bidding up the price of the available supply. However, casein use by these producers would eventually decline somewhat as consumer demand for some of their products would fall because of higher prices. Casein use by producers who could substitute skim milk would decline by about 57 million pounds.

The second method under Section 22 is an *ad valorem* tariff that would tax imported casein on the basis of its value. ERS researchers assumed this tariff would be set at 50 percent of the value. In 1985, this would have added 48 cents to the price of casein, which was about 96 cents a pound that year.

If a 50-percent tariff were imposed and the price of casein rose to \$1.44 a pound, many users would shift to other ingredients where possible. About 46 million pounds of casein would be replaced, leaving about 130 to 135 million pounds to be imported. Little

increase in the use of domestically produced skim milk solids would result because producers would shift mainly to lower priced soy protein or whey protein concentrate.

A Less Costly Dairy Program?

To support the prices of dairy products, USDA's Commodity Credit Corporation (CCC) purchases butter, NFDM, and cheese. Because a 50-percent tariff would not greatly increase commercial use of skim milk solids, the tariff would have little impact on CCC purchases. The CCC's cheese purchases would also be unaffected if the ingredient cost of casein in cheese analogs (cheese substitutes, imitation cheese, and cheese blends) rose by as much as 12 cents a pound. This would still leave prices of these products substantially below natural cheese. If analog prices rose by more than 12 cents, moving closer to the price of natural cheese, then there might be a small shift in consumer demand toward natural cheese, relieving the CCC of some purchases.

The effect of a quota of 88 million pounds also depends on the extent to which natural cheeses displace analogs and skim milk solids displace casein in products. If there is only a partial shift from analogs to natural cheese, due to a narrowing of the price gap, ERS researchers estimate 32 million pounds of casein would be replaced by the skim milk solids used to make products other than cheese. As a result, commercial disappearance of skim milk solids would increase by the equivalent of about 100 million pounds of NFDM (3.16 pounds of NFDM are required to replace 1 pound of casein in commercial use). CCC purchases would decline by this amount, reducing Government costs about \$84 million (based on the 1985 NFDM support price of 84 cents a pound), or 3 percent of 1985 dairy program costs, which totaled \$2.2 billion.

At the other end of the range of possibilities, natural cheese might replace all cheese analogs because of the latter's higher costs. In such a case, estimated sales of about 280 million pounds of analogs (1985 data) would be replaced by commercial sales of only about 240 million pounds of natural cheese. At the higher prices for natural

Table 3. Several Product Groups Depended Heavily on Casein in 1980¹

Use group	Million pounds
Group A—Alternatives to casein not available:	
Coffee whiteners (80 percent) ²	10.6
Dietary products	12.5
Desserts and toppings (72 percent)	3.7
Bakery (10 percent)	.7
Total	27.5
Group B—NFDM or skim milk can replace casein:	
Cheese analogs	44.7
Animal feed (20 percent)	3.7
Coffee whiteners (20 percent)	2.7
Desserts and toppings (28 percent)	1.5
Other foods	13.5
Total	66.1
Group C—Soy or other proteins can replace casein:	
Industrial	20.5
Bakery (90 percent)	5.9
Pet food	4.4
Animal food (80 percent)	14.6
Total	45.4

¹Based on International Trade Commission report. ²Percent in parentheses is estimated share of casein use in that product falling in that substitution category.

cheese, consumers will buy less though than they did of the analogs. With the boost in natural cheese demand, CCC costs could drop by about \$300 million. Thus, the range of possible reductions in Government costs is \$84 to \$300 million.

For Consumers, It Could Mean Higher Prices

A 50-percent *ad valorem* tariff would increase the ingredient cost of consumer products by \$66 million annually, given the continued use of 138 million pounds of casein.

A 50-percent quota would raise the price of casein to about \$2.49 a pound, compared with the 1985 price of 96 cents. Domestic skim milk solids would substitute for 32 million pounds of the displaced imported casein. The remainder would be replaced by other proteins. Considering these two facts, ingredient costs of consumer products would increase an estimated \$180 million. Those products for which soy proteins would be substituted for casein would see no significant price impact.

In addition to price, however, restricted imports would affect consumer choice. Since not all people have the same tastes, needs, and wants, consumer satisfaction usually increases as more products at reasonable prices are made available. A tariff or a quota that drives up the price of casein would increase prices for some products. In other cases, such restrictions could mean the elimination of products from the marketplace. Consumer choice would be constrained in either situation.

Cheese analogs are just one example. These products are now sold at lower prices than natural cheeses because imported casein costs substantially less than domestic skim milk solids. A quota or tariff would raise the ingredient cost of cheese analogs, thereby increasing retail prices and possibly limiting product availability.

Presumably a technical or cost advantage, or both, exists for products in which casein is presently being used. Therefore, an increase in its price or a limit on its availability would inevitably affect consumer choice. □