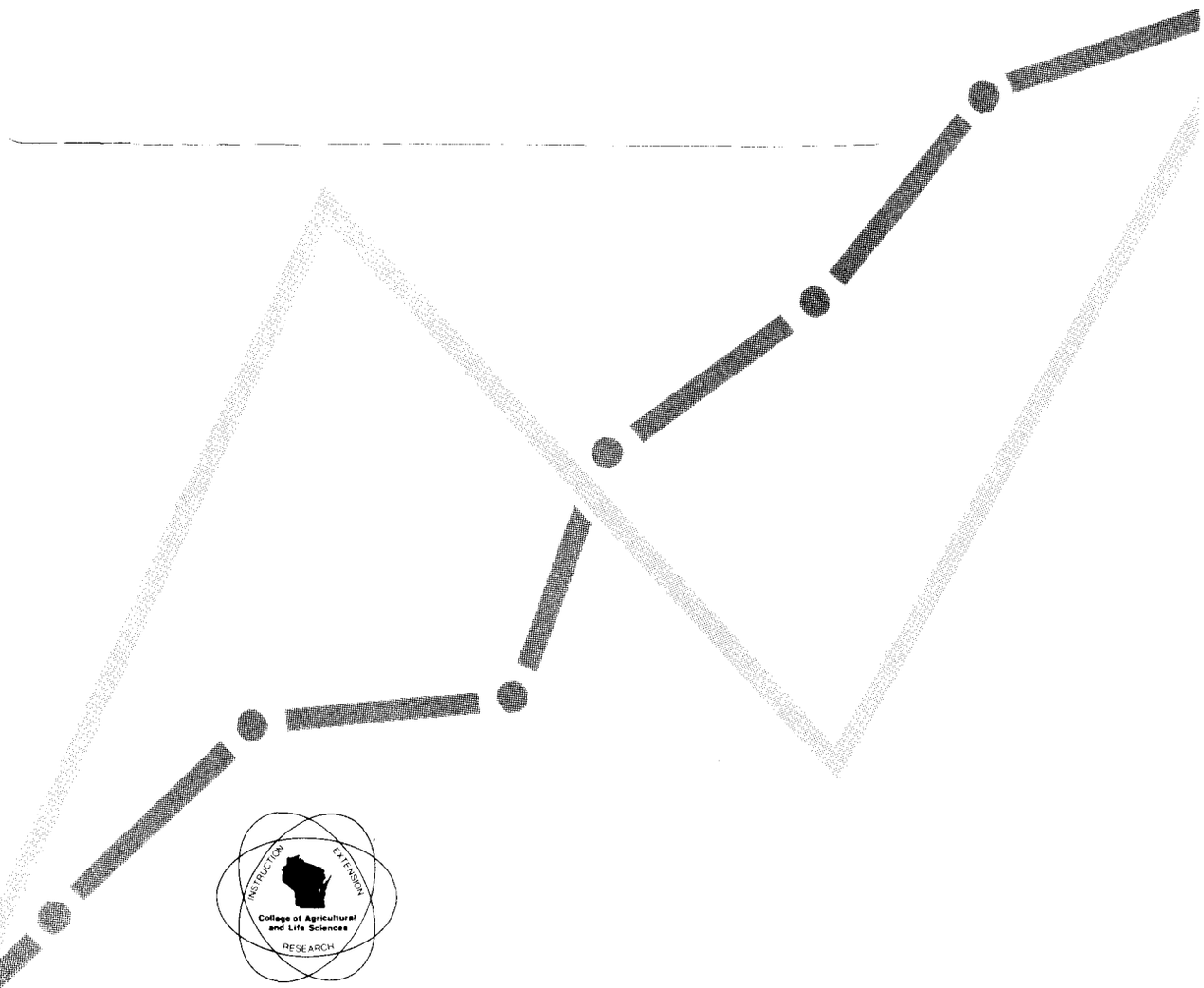
agricultural economics

STAFF PAPER SERIES



August 1976 No. 115

ANALYSIS OF THE EFFECTS OF ALTERNATIVE U.S. DAIRY IMPORT POLICIES*

by

Larry Salathe, W. D. Dobson and G. A. Peterson**

Presented at the
American Agricultural Economics Association
Annual Meeting, Pennsylvania State University
August 17, 1976

*This research was supported by the University of Wisconsin Agricultural Experiment Station Project 1788.

**Larry Salathe, W. D. Dobson and G. A. Peterson are Research Associate and Professors, respectively, in the Department of Agricultural Economics at the University of Wisconsin-Madison.

ABSTRACT

This paper was presented at the Annual Meeting, American Agricultural Economics Association, Pennsylvania State University, August 17, 1976.

Session Number 41 Session title: Impacts of Agricultural Trade on the U.S.

Larry Salathe, W.D. Dobson and G.A. Peterson, University of Wisconsin, Madison.

An Analysis of the Effects of Alternative U.S. Dairy Import Policies.

Wisconsin farm milk prices initally would fall by 16% if butter and cheese imports rose to 25% of U.S. requirements. Within four years, milk prices would recover. But this recovery would occur only after 10% of the State's dairy farmers were forced out of business by the larger imports.

Key Words: Dairy imports, Import-export Policy, Milk prices, Computer model.

ANALYSIS OF THE EFFECTS OF ALTERNATIVE U.S. DAIRY IMPORT POLICIES

Larry Salathe, W.D. Dobson and G.A. Peterson

U.S. trade officials in recent years have striven to reduce barriers--particularly those in the EEC (European Economic Community) countries--to exports of U.S. agricultural products. The results achieved by U.S. negotiators recently have been meager. Agricultural trade negotiations during the Kennedy Round which began in 1967, for example, did little to reduce barriers to expanded exports of U.S. farm products. And bilateral negotiations by U.S. officials with other countries since the Kennedy Round and recent negotiations in multinational forums (e.g., the 1976 Geneva "tariff cutting" talks) had achieved no agricultural trade expansion breakthroughs as of early 1976.

These failures have spawned proposals for different negotiating strategies, including the "selective goal" strategy of the Flanigan International Trade Report. This strategy would have the U.S. seek freer trade in a few agricultural products rather than across-the-board agricultural trade liberalization. Authors of the Flanigan report said that the U.S. should, if necessary, give up its dairy import quotas to gain freer access to foreign markets for feed grains and soybeans. Under a "full-market orientation" option examined in this 1973 Report, the U.S. would substantially expand feed grain and soybean exports while importing manufactured milk products containing 12 billion pounds of milk equivalent by 1980. The 12 billion pounds of milk equivalent represents about 10 percent of total U.S. milk consumption and the equivalent of 25 percent of U.S. manufactured milk product consumption. The Atlantic Council argued in 1973 that it would be reasonable for the U.S. to permit imports of dairy products to increase from the present 1.5 percent of domestic consumption to 10 percent of domestic consumption by 1980. Authors of the Flanigan and Atlantic Council reports contend that

economic adjustments that would be required of the U.S. dairy industry to accommodate dairy product imports equal to 10 percent of U.S. consumption would be small--almost imperceptible over a 10-year period, according to the Atlantic Council (p. 97).

The Flanigan and Atlantic Council reports aroused concern in the U.S. dairy industry in 1973-1974 for several reasons. First, dairy import quotas were thought to be the only major agricultural concession that the U.S. had to offer in trade negotiations and hence would be "on the table" to be exchanged for trade concessions from other nations. Second, the Administration temporarily lifted import quotas on some manufactured milk products during 1973, contributing to a 20% decline in U.S. average manufactured milk prices in 1974. The lifting of quotas was interpreted by some in the dairy industry as evidence that the U.S. government was implementing the recommendations of these reports. Third, many thought that the U.S. dairy industry would need to make major, painful economic adjustments if larger manufactured milk product imports were permitted.

Partly because of these concerns, the U.S. Congress directed USDA to make a study of the effects of expanding dairy imports in 1973. Among other things, this study, which USDA forwarded to Congress in 1975, examined effects of an "open U.S. market" policy which assumed no U.S. dairy import quotas or price support program. Under this policy, the U.S. would have imported the milk equivalent of 12.2 and 13.4 billion pounds of manufactured dairy products in 1975 and 1976, respectively, and smaller quantities in subsequent years. USDA estimated that every billion pounds of milk equivalent imported would reduce U.S. farm milk prices by about $.18 per hundredweight. Consequently, the assumed 1975 dairy product imports would have caused 1975 U.S. average farm milk prices to fall to a level about $2 (22%) below the $8.90 price that would have prevailed under present dairy import laws. USDA concluded that U.S. dairy farmers initially

would experience harsh economic conditions but that those who survived the depressed prices of the "open U.S. market" policy for two or three years would see their returns rise to levels about equal to those that would have prevailed under present dairy programs.

The Flanigan, Atlantic Council and USDA reports provide insights about the impact of larger dairy product imports. However, these earlier studies, especially the Flanigan and Atlantic Council reports, tell little about the nature of the adjustments that the domestic dairy industry would need to make if U.S. dairy imports were increased substantially. And the findings of the Flanigan, Atlantic Council and USDA reports conflict with respect to the amount of damage the domestic dairy industry would sustain if imports were increased sharply: USDA appears to conclude that the damage would be substantially greater than suggested in the Flanigan and Atlantic Council reports. Moreover, the earlier studies are primarily macro-studies dealing with the entire U.S. dairy industry or larger economic aggregates. Therefore, they show little about how larger imports would affect the dairy industry of major milk producing states such as Wisconsin, where economic damage from dairy imports could be most severe.

This study (1) focuses mainly on evaluating the impact of larger U.S. dairy product imports on the dairy economy of Wisconsin, (2) examines economic adjustments that would take place in the Wisconsin and U.S. dairy economies following an expansion of U.S. dairy imports and (3) helps to reconcile conflicting findings with respect to the extent that the U.S. dairy economy would be depressed by larger dairy imports. Therefore, the study provides additional information on the questions which were neglected in the previous studies.

Objectives

Specific objectives of the study were to examine the economic effects on the Wisconsin dairy industry of: (1) Increasing U.S. manufactured milk product

imports to an amount equal to 25% of domestic consumption of these products during 1969-1973, and (2) Increasing U.S. manufactured milk product imports during 1975-1980 to the levels considered by USDA in its study of the effects of the "open U.S. market" policy. This policy involved hypothetical U.S. dairy imports of 12.2, 13.4, 10.5, 9.2, 8.0 and 6.7 billion pounds of milk equivalent for 1975, 1976, 1977, 1978, 1979 and 1980, respectively.

Model Used in Study

A computerized, recursive simulation model which measures the impact of alternative manufactured milk import policies on farm milk prices, milk production, farm numbers, labor used in dairy farming, wholesale butter prices, wholesale cheese prices, and retail milk, cheese and butter prices was employed in the study. Most components of the model relate to the Wisconsin dairy industry, but the model also has equations linking it to the U.S. manufactured milk industry, USDA's manufacturing milk price support program and the Chicago federal milk order. Written in FORTRAN IV, the quarterly model contains 42 basic equations.

The macro flowchart (Figure 1) describes the sequence of calculations performed by the model. In using the model, base period (t_o) values for variables such as farm milk prices, milk production per cow, cow numbers, and farm wage rates for Wisconsin and butter and cheese stocks for the U.S. were first read into the computer (Block 1 of Figure 1). Next values were read or developed for exogenous variables such as population, transportation costs, and disposable income (Block 2). The sequence for the remaining calculations is as indicated on the flowchart. Note that the manufactured milk product import policy variables are manipulated in Block 5 of the model and the last values computed by the model for a given quarter are those for farm prices of Grade A milk, Grade B milk, and the Wisconsin average farm price for all milk (Block 8).

Key Characteristics of Model. Under the model, Wisconsin milk production

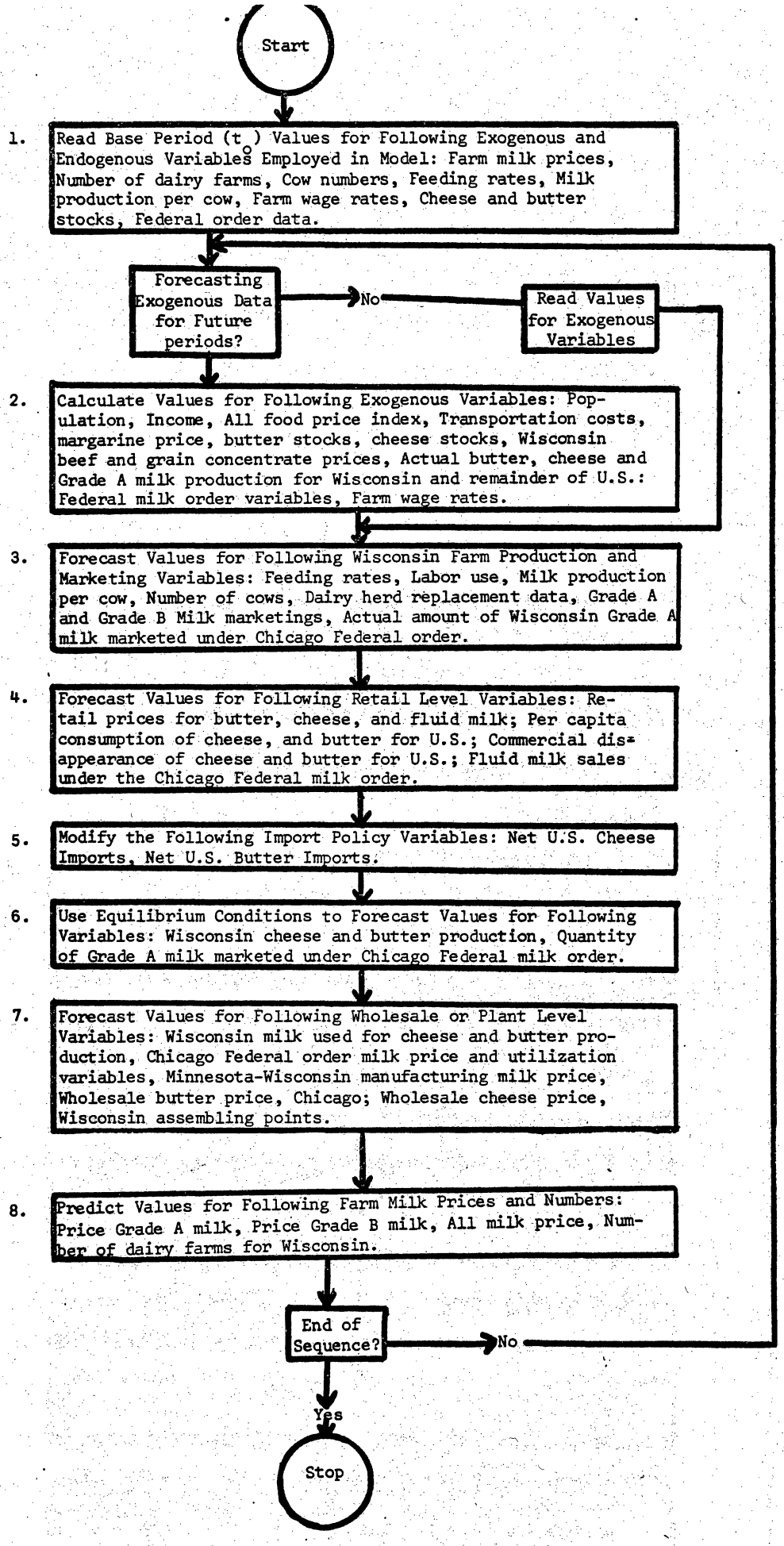


Figure 1. Macro Flow Chart

($TMMW_t$) is forecasted as the product of milk production per cow (MPC_t) and the number of milk cows (NCW_t). MPC_t, in turn, is a function of grain fed per cow ($AGFC_t$), MPC_{t-1}, and seasonal variables (DM1, DM2, DM3). $AGFC_t$ is determined by the grain-lagged milk price ratio ($PGR_t/WAMP_{t-1}$), $AGFC_{t-1}$, and seasonal variables. NCW_t is a function of the grain concentrate-lagged milk price ratio ($PGR_t/WAMP_{t-1}$), the culled cow-lagged milk price ratio ($PCC_t/WAMP_{t-1}$) and seasonal variables.

Retail prices of butter (RPB_t), and cheese (RPC_t) and fluid milk ($RPFM_t$) are determined in the model by wholesale prices of these products for the previous quarter, a transportation cost variable ($ITRC_t$) and seasonal variables. Thus the retail price forecasting equations reflect the passing along to retail customers the higher prices caused by increases in transportation cost during the current quarter and wholesale price increases that occurred during the previous quarter. Per capita consumption of butter ($PCCB_t$) and cheese ($PCCC_t$) were determined by own price, disposable income variables and, in the case of butter, the price of margarine deflated by the all food price index ($RPMG_t/AFPI_t$).

The key model component which forecasts the impact of dairy product imports is based on the concept of a product balance sheet. Thus, supplies of manufactured milk products (cheese and butter) consist of beginning inventories (stocks held by private firms plus those held by USDA in connection with the price support program), domestic production and imports. Product disposition consists of domestic consumption, exports, and ending stocks. When net imports of butter and cheese increase under the model, total supplies increase causing a reduction in wholesale prices. This in turn generates a reduction in domestic production of manufactured dairy products in Wisconsin and other states, and a displacement of domestically produced butter and cheese by the imported products. In the model, cheese and butter production in Wisconsin and the other states decline in the same proportion when such a displacement occurs.

Wisconsin farm Grade A milk prices (PGA) are determined by price formulas

similar to those used to compute produce blend prices under the Chicago federal milk order. Grade B milk prices (PGB) are determined by changes in wholesale cheese prices, wholesale butter price changes, lagged grade B milk price and seasonal variables. The all milk price ($WAMP_t$) which influences Wisconsin milk production for the succeeding quarter, is a weighted average of the Grade A and Grade B milk prices.

Validation of Model. The model was validated by determining how well it would reproduce the actual time paths of 17 variables for 1969-1973 (Table 1). In the validation run, the model reproduced actual values for number of cows (NCW), milk production per cow (MPC), number of dairy farms (NDF), price of grade A milk (PGA), labor used in milk production (LPMW), retail cheese price (RPC), cheese production in Wisconsin (CPW), cheese disappearance for the U.S. (USDC), and the retail price of fluid milk (RPFM) with an average absolute error of less than 3%. The average absolute error also was moderately small (3% to 5%) for all other variables except those relating to butter prices and butter production, which averaged from 7% to 11%. However, since the errors in the butter price and production forecasts did not introduce large errors into the predictions for other variables, it was decided that the simulation model was suitable to use for examining the effects of alternative manufacturing milk import policies.

Results

Findings with Respect to Objective No. 1. In connection with the first objective, the model was employed to simulate the effects of larger dairy imports on the Wisconsin dairy industry during 1969-1973. The experiment simulated increasing butter and cheese imports to 12.5% of U.S. domestic producting during 1969 and to 25% of U.S. production during 1970 through 1973. Government manufactured milk product purchases for price support purposes were set equal to zero in the model during the experiment. Hence, a type of open-market policy where dairy

Table 1. Size of average absolute percentage error in forecasts generated by simulation model during 1969-1973 validation run.

Year and Quarter		Absolute Error by Variable[a] (Percentages)																
		NCW	MPC	AGFC	PGA	PGB	PMGA	NDF	LPMW	WWHC	RPC	CPW	USDC	CWHB	RPB	BPW	USDB	RPFM
1969	1	.24	1.31	2.05	.29	1.24	1.08	.88	2.21	.51	.45	4.44	3.80	.29	.50	3.89	5.00	3.03
	2	.12	.75	3.92	3.17	4.42	2.88			2.68	.07	3.39	3.64	3.91	.49	1.68	2.49	3.50
	3	.23	1.67	.55	4.08	4.73	2.76			3.69	3.17	1.50	1.43	.20	3.30	3.91	4.25	4.21
	4	.40	.62	2.00	3.17	3.15	4.00			1.64	3.37	.30	.25	6.17	.96	8.35	8.26	1.01
1970	1	.43	1.14	.03	.46	1.16	3.35	.24	1.45	1.46	2.38	.15	.13	8.05	3.64	2.97	3.74	1.35
	2	.31	.16	2.81	8.97	13.41	4.96			11.83	.08	5.35	5.99	16.26	6.90	10.61	17.94	1.52
	3	.77	.15	.57	.34	4.54	5.69			4.98	7.47	2.16	2.06	21.23	13.05	14.67	16.69	3.67
	4	.17	.15	1.40	1.97	5.11	1.69			1.77	3.45	1.50	1.29	18.03	16.04	20.55	21.37	2.74
1971	1	.48	.87	2.57	3.47	1.90	4.71	1.31	1.80	.58	2.56	4.11	3.85	3.29	13.14	4.04	6.80	3.66
	2	.70	.02	2.10	2.14	3.11	4.28			1.85	.10	1.37	1.49	3.71	3.31	6.47	9.77	.70
	3	.99	.62	3.13	1.86	4.24	4.61			7.31	1.06	.93	.90	4.46	3.75	3.70	4.41	.71
	4	.67	1.33	1.39	3.58	7.21	2.24			4.95	5.69	3.89	3.47	14.82	5.24	11.47	12.20	.45
1972	1	.85	1.13	1.34	2.46	7.55	4.03	2.29	5.17	9.11	1.53	3.97	3.69	11.51	8.83	6.08	8.42	.72
	2	.71	1.06	1.52	.22	.95	2.70			.84	5.71	.69	.78	5.50	8.99	5.93	9.64	.92
	3	.74	2.15	4.68	2.27	2.40	2.29			.78	1.03	2.56	2.54	1.92	4.08	14.00	15.00	2.42
	4	.48	.60	3.03	6.29	13.35	.95			14.64	1.04	7.03	5.33	20.40	1.35	6.12	5.78	1.19
1973	1	.33	2.03	6.95	.67	5.06	.81	.64	NA[b]	2.98	9.38	4.88	4.39	29.81	4.88	12.08	16.80	1.60
	2	.67	1.98	8.10	4.09	6.27	3.70			5.73	1.60	1.91	1.99	5.09	22.51	28.66	35.55	.81
	3	2.16	.64	17.76	4.87	3.06	3.28			2.56	3.74	3.51	3.24	5.72	14.28	4.98	4.64	4.57
	4	2.78	3.17	13.84	2.73	2.95	3.42			6.32	4.78	3.15	2.69	40.01	4.44	16.96	12.67	14.50
Sample Average		.71	1.13	3.99	2.86	4.79	3.17	1.07	2.66	4.31	2.93	2.84	2.65	11.02	7.48	9.36	11.07	2.66

[a]Variables appearing in table are defined as follows: NCW = number of milk cows, Wisconsin; MPC = average milk production per cow, Wisconsin; AGFC = amount of grain fed per cow, Wisconsin; PGA = average price received by Wisconsin farmers for Grade A milk; PGB = average price received by Wisconsin farmers for Grade B milk; PMGA = percentage of all milk marketed by Wisconsin farmers that is Grade A milk; NDF = number of dairy farms, Wisconsin; LPMW = amount of labor used for producing milk, Wisconsin; WWHC = wholesale cheese price, Wisconsin assembly points; RPC = average retail price for processed American cheese, U.S.; CPW = amount of cheese produced in Wisconsin plants; USDC = commercial disappearance of cheese, U.S.; CWHB = wholesale butter price, Chicago; RPB = average retail butter price, U.S.; BPW = amount of butter produced in Wisconsin plants; USDB = commercial disappearance of butter, U.S.; RPFM = average retail fluid milk price, Chicago.

[b]NA = Data for computing percentage error in LPMW not available at time of study.

imports would be near the levels recommended in the Flanigan and Atlantic Council reports was simulated.

The results suggest that the increased imports would have depressed farm milk prices, butter prices, and cheese prices sharply during 1970, the first year that imports were increased to the 25% level (Table 2). Grade B milk prices, wholesale butter prices, and wholesale cheese prices for 1970, for example, were 14%, 30% and 12% lower than comparable values obtained for 1970 during the validation run. In absolute terms the 14% decline in the grade B milk price represents a reduction in farm milk prices from $5.08 to $4.37 per hundredweight for 1970. Retail cheese and butter prices for 1970 would have fallen by 8% and 23%, respectively, compared to values obtained for 1970 during the validation run. After 1970, lower milk, butter, and cheese production, increased milk, butter and cheese consumption brought about by lower retail prices, and higher Class I utilization would have pushed farm milk prices, butter prices and cheese prices back up to near where they would have been in the absence of the increase in imports. In 1973, for example, Grade A and Grade B milk prices under the high dairy import scenario were approximately at the same level as in the validation run. However, the economic adjustments that would ultimately cause prices to recover could be harsh. Specifically, the number of dairy farms in Wisconsin in 1973 under the hypothetical high import program would have been about 5,600 (10%) less than under present dairy import programs.

Results concerning Objective No. 2. This part of the study examined the effects on the Wisconsin dairy economy of U.S. imports equal to 12.2 and 13.4 billion pounds of milk equivalent in 1975 and 1976, respectively, and lesser quantities ranging downward to 6.7 billion pounds of milk equivalent in 1980. As mentioned earlier, these import levels are the same as those examined by USDA in the 1975 study of an "open U.S. market" dairy import policy. This particular pattern of manufactured milk imports reflects the assumption that exports to the U.S. could not be sustained at the 12 to 13 billion pound level because milk surpluses available

Table 2. Values obtained for 17 variables during simulation experiment involving U.S. butter and cheese imports equal to 12.5% of U.S. production in 1969 and 25% of U.S. production in 1970-1973.

Variable[a]	1969	1970	1971	1972	1973	Average
	(Percent of Values for 1969-73 Validation Run)					
Number of milk cows (NCW)	99.2	96.7	94.0	91.5	89.6	94.2
Milk production per cow (MPC)	98.8	95.3	92.6	93.3	95.7	95.1
Grain fed per cow (AGFC)	96.8	89.8	86.7	89.7	93.9	91.4
Price Grade A Milk (PGA)	93.8	87.3	91.1	96.7	101.5	94.1
Price Grade B milk (PGB)	94.1	86.0	90.9	97.4	103.5	94.4
Percent of Milk Marketed as Grade A (PMGA)	100.2	100.8	99.9	97.5	94.3	98.5
Number dairy farms (NDF)	96.3	92.0	90.6	89.7	90.0	91.7
Labor used in milk production (LPMW)	96.3	89.7	88.9	89.6	91.4	91.2
Wholesale butter price (CWHB)	81.0	69.6	71.9	77.9	93.0	78.7
Wholesale cheese price (WWHC)	95.5	87.3	93.0	99.5	105.1	96.1
Cheese production (CPW)	94.5	82.5	78.9	80.2	83.2	83.9
Butter production (BPW)	81.7	73.2	66.3	65.1	68.7	71.0
Retail butter price (RPB)	87.7	76.8	80.8	85.0	94.0	84.9
Retail cheese price (RPC)	97.0	92.0	95.1	99.5	102.9	97.3
Disappearance of cheese (USDC)	101.0	102.6	101.5	100.2	99.3	100.9
Disappearance of butter (USDB)	112.0	122.4	120.4	115.7	106.0	115.3
Retail price fluid milk (RPFM)	99.2	98.3	98.9	99.3	100.0	99.1

[a] See footnote "a" in Table 1 for a more complete definition of variables.

for export from EEC countries would decline in the late 1970's. To permit comparisons with present programs, a benchmark simulation run for 1975-1980 was made which represented prices and production for Wisconsin under a scenario calling for a continuation of present dairy import policies. Forecasts of exogenous variables required for the benchmark run were obtained from regression analyses and economic outlook specialists.

The farm milk price reduction predicted for Wisconsin under the "open U.S. market" scenario was moderately less than that forecast for the U.S. as a whole by USDA. The decline to 84% of the 1975 benchmark value forecasted for Wisconsin (Table 3) represents in dollar terms a decline from $8.26 to about $6.90 per hundredweight. Thus, the model forecasted that for each billion pounds of milk equivalent imported in 1975 the Wisconsin all milk price would have been reduced by about $.11 per hundredweight. The comparable reduction (expressed as 78% of benchmark value in Table 3) in the "all milk wholesale" price forecast by USDA was from $8.94 to about $6.94 per hundredweight. It is apparent that the price reductions forecast for 1975 by the two studies were of roughly similar size. Also the pattern of price recovery predicted by the two studies was similar. The moderately faster recovery forecast for Wisconsin farm prices occurs partly because Wisconsin milk production falls to a lower level and rebounds less by 1980 than milk production for the U.S. as a whole (Table 3).

Wisconsin dairy farm numbers were forecasted by the model to be 4,100 (9.2%) lower by 1980 under the simulated "open U.S. market" policy than under present dairy programs. USDA forecasted a similar percentage reduction in farm numbers under the hypothetical program of expanded dairy imports. The Agency predicted that U.S. dairy farm numbers would decline by an additional 17,300 (8.5%) by 1980 under the "open U.S. market" policy as compared to what would have happened under present import and price support programs.

Table 3. Milk prices and production for Wisconsin and U.S. under "Open U.S. market" scenario.

Year	Present Study		USDA Study	
	Wis. All Milk Price	Wis. Milk Production	U.S. All Milk Wholesale Price	U.S. Milk Production
	(Percent of Benchmark Values)			
1975	84.0	94.2	78.0	96.7
1976	90.5	86.2	88.0	91.6
1977	102.1	85.0	95.4	92.6
1978	102.4	87.6	99.0	93.0
1979	102.4	90.0	101.7	93.4
1980	103.3	91.5	104.9	93.8

Summary and Implications

The findings of this study suggest that the Wisconsin dairy industry would face some fairly harsh short-run adjustment problems if U.S. manufactured dairy product imports were increased to about 25% of U.S. domestic requirements. Farm milk prices would fall by 14% to 16% during the first year that imports were at the higher level. After operating for three or four years under higher imports, Wisconsin farm milk prices would recover to levels near those that would exist under present dairy import programs. However, this price recovery would occur partly because substantial numbers of Wisconsin dairy farmers would be forced out of business. The model forecasts that within three to five years after imports reached the 25% level, the number of dairy farms in Wisconsin would fall 9% to 10% below the number that would exist under present dairy import quota programs. Thus results of this study are more consistent with USDA's finding that initially an "open U.S. market" policy would substantially depress the domestic dairy industry than with findings of the Flanigan and Atlantic Council reports that effects on the U.S. dairy industry of adopting such a policy would be almost imperceptible.

References

Atlantic Council Report on Agricultural Policy and Trade Negotiations, Changing U.S. Agricultural Policies in 1973--the Relationship to Trade Negotiations, December 1973.

Council on International Economic Policy, Report Prepared at the Request of Peter Flanigan, Assistant to the President for International Economic Affairs, Agricultural Trade and the Proposed Round of Multilateral Negotiations, U.S. Government Printing Office, Washington, D.C., April 30, 1973.

U.S. Department of Agriculture, The Impact of Dairy Imports on the U.S. Dairy Industry, ERS, Ag. Econ. Rep. 278, January 1975.