
September 2001

DAIRY INDUSTRY

Estimated Economic Impacts of Dairy Compacts



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Abbreviations

IRCM97	Dairy Sector Interregional Competition Model for 1997
IRCM99	Dairy Sector Interregional Competition Model for 1999
IRCM00	Dairy Sector Interregional Competition Model for 2000
NEDC	Northeast Interstate Dairy Compact
OMB	Office of Management and Budget
USDA	U.S. Department of Agriculture
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children



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United States General Accounting Office
Washington, DC 20548

September 14, 2001

The Honorable Herbert Kohl
United States Senate

Dear Senator Kohl:

U.S. dairy farmers produced about 167.7 billion pounds of unprocessed, raw farm milk in 2000. The amount of raw milk produced is influenced by federal and state dairy programs that affect minimum prices processors of dairy products must pay farmers for raw milk. These programs were established because of concern that dairy farmers lack the market power to substantially influence the prices that they are paid for raw milk, compared with the market power of processors and manufacturers of dairy products and retailers that sell these products to consumers. Minimum prices are based on, and vary according to, how the raw milk is to be used; minimum prices set for raw milk to be used for making drinking milk (fluid milk) are higher than those for milk used for manufacturing cheese, butter, and other dairy products. About 70 percent of the raw milk produced in the United States is regulated under the U.S. Department of Agriculture's (USDA) federal milk marketing order program. Some states, such as California and Maine, and portions of other states are not covered by the federal program but instead by state programs.

The 1996 farm bill established another pricing program—the Northeast Interstate Dairy Compact (NEDC)—which is administered by a commission that sets a minimum price for raw milk to be used for and sold as fluid milk in the six New England states—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.¹ The NEDC works in conjunction with federal and state dairy programs to establish an alternative minimum price for raw milk to be used for and sold as fluid milk in the Compact states. When the monthly NEDC minimum price exceeds the federal marketing order or state minimum price, the NEDC price becomes the minimum price. When the monthly federal marketing order or state minimum price exceeds the NEDC price, the federal or state

¹The Federal Agriculture Improvement and Reform Act of 1996 (P.L. 104-127, Apr. 4, 1996). The act conditioned the six states' implementation of the Compact on the Secretary of USDA's finding that there was a compelling public interest in the Compact region to establish the Compact. This finding was made on August 8, 1996.

price becomes the relevant minimum price. The NEDC's minimum pricing requirement became effective in July 1997, when the Compact commission set \$16.94 as the minimum price for a hundredweight of raw milk used for and sold as fluid milk.² Since then, the NEDC's price has usually been higher than the federal price. Proponents of the NEDC assert that the Compact is necessary to ensure the continued viability of dairy farming in New England and, thus, an adequate local supply of fluid milk. However, opponents counter that the NEDC causes retail prices in the Compact states to increase, harming consumers in those states. They also counter that the NEDC leads to lower milk prices paid to dairy farmers in other regions, harming those farmers.

Legislation authorizing the NEDC is scheduled to expire at the end of September 2001, and the Congress is currently considering proposed legislation that would not only reauthorize and expand the NEDC but also establish additional interstate dairy compacts.³ Consequently, you asked us to provide information on the potential economic impacts of different compact alternatives. Specifically, you asked for information on

- the intraregional impacts (that is, the impacts within the six NEDC states) of the NEDC on dairy sector indicators such as (1) retail milk prices, (2) milk producer income, (3) dairy farm structure, (4) milk production, and (5) milk consumption;
- the impact of the NEDC on the costs to the federal government of its milk price support and nutrition assistance programs;⁴ and
- the interregional impacts (that is, impacts on other milk-producing regions) of the current NEDC, an expanded NEDC, and an expanded

²A hundredweight of milk is 100 pounds of milk, which equates to approximately 11.6 gallons. Thus, the Compact's price of \$16.94 per hundredweight equates to about \$1.46 per gallon of milk.

³The Dairy Consumers and Producers Protection Act of 2001 (H.R. 1827, May 14, 2001, and S. 1157, June 29, 2001) would authorize 6 additional states to join the NEDC; establish a southern compact consisting of 17 states; and establish a Pacific Northwest compact and an Intermountain compact, each consisting of 3 states. Had these compacts existed in 2000, about 61 percent of the raw milk produced in the country would have been produced in states belonging to one of these compacts.

⁴The milk price support program, administered by the USDA's Commodity Credit Corporation, indirectly ensures a minimum price for milk by purchasing cheese, nonfat dry milk, and butter from manufacturers at specified prices. The nutrition assistance programs, administered by USDA's Food and Nutrition Service, include the Food Stamp Program; the Special Supplemental Nutrition Program for Women, Infants, and Children; and the School Breakfast and Lunch Programs.

NEDC in conjunction with a southern compact on selected farm-level and wholesale-level indicators, such as prices, production, and revenue.⁵

To address the first objective, we sought, but did not find, a comprehensive economic model to estimate the Compact's intraregional impacts while holding constant other factors that affect the indicators. Further, time and resource constraints limited our ability to develop our own model or series of models to address the Compact's impact on some or all of the indicators. As a result, we analyzed federal, state, and other data on these indicators, covering a period of time before and after the NEDC's minimum pricing requirement became effective, to determine any changes in historic trends. We also reviewed available studies regarding the NEDC's potential intraregional impacts on these indicators. For the second objective, we analyzed information from USDA, the NEDC commission, and the six NEDC states. To address the third objective, we used an interregional dairy competition model developed by economists at the University of Wisconsin-Madison. This economic model is useful for estimating the impacts of different dairy policy options, such as compacts, on such indicators as milk production, farm revenue, and wholesale commodity prices in various regions of the country. In employing this model, we used 1999 data on such indicators as milk production, demand, and prices because they were the most recent, final data available at the time of our review. Using preliminary data for 2000, we also conducted some limited modeling to estimate the impacts of compacts in that year. In addition, we consulted with leading dairy economists from across the country and USDA officials on our use of the model and related assumptions, such as how milk production and purchases of different dairy products respond to price changes. Finally, we reviewed available studies of the potential interregional impacts of dairy compacts. Appendix I provides more detail on our scope and methodology. Appendix II provides information on the University of Wisconsin-Madison dairy model and the related assumptions that we used.

⁵For purposes of our analysis, the expanded NEDC includes the Compact's current member states plus Delaware, Maryland, New Jersey, New York, and Pennsylvania. The southern compact includes Alabama, Arkansas, Georgia, Kansas, Kentucky, Louisiana, Missouri, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. As of the end of February 2001, these states had enacted laws authorizing their entry into such compacts should the Congress establish them. While West Virginia has also enacted such a law, we did not include that state in our analysis because of modeling difficulties. These difficulties are discussed in app. II.

Results in Brief

It is likely that the Northeast Compact has affected dairy sector indicators within the six New England states, but determining the extent to which it has done so is difficult. Dairy sector indicators changed to varying degrees after July 1997, when the Compact commission's price became effective. Retail milk prices in selected cities and towns within New England increased by as much as 20 cents per gallon in July 1997. Although there is general agreement that the Compact was a factor in these increases, there is disagreement over what portions of the increases can be attributed to the Compact because other factors, such as consumer demand and the costs of processing and marketing fluid milk, also affect retail prices. Regarding milk producer income, according to the Compact commission, farmers supplying raw milk to be used for and sold as fluid milk in the NEDC states were paid about \$146 million from July 1997 through June 2001. This figure represents the difference between the Compact price and the minimum federal price. Some portion of this amount is likely attributable to the Compact, but it is also likely that dairy farmers would have received some portion even without the Compact because, depending on market conditions, wholesale milk processors often pay more than the minimum federal or state prices to purchase raw milk. Finally, for the remaining indicators that we examined, there was little difference in historic trends before and after the Compact's minimum price was established: The number of farms continued to decline, milk production continued to increase, and fluid milk consumption continued to decline. The data showed similar trends for the rest of the United States.

According to USDA, while the Northeast Compact has not increased the federal government's net costs for its milk price support program, it may have increased the government's costs for one of its nutrition assistance programs—the Food Stamp Program. The 1996 farm bill requires that the Compact commission compensate USDA for any increased costs to the milk price support program resulting from the Compact. As of the end of fiscal year 2000, the Compact had compensated USDA a total of about \$3.2 million. Regarding nutrition assistance programs, USDA is not certain whether the Compact's impact on increased retail milk prices in the six Compact states was sufficiently large to cause national retail milk prices to increase, which could raise Food Stamp Program benefit levels, thus increasing the federal government's costs. Concerning USDA's other major nutrition assistance programs, the Compact commission directly reimburses the six NEDC states for the estimated cost of increased milk purchased under some of these programs. At the end of fiscal year 2000, this compensation totaled about \$4.5 million, including about \$3.8 million

to cover the estimated increased costs to the Special Supplemental Nutrition Program for Women, Infants, and Children.

We estimate that for 1999 the impacts of different dairy compact alternatives on farm-level prices, production, and revenue in other regions of the country would have increased as compacts increased in size and accounted for a greater portion of the nation's milk supply. The Northeast Compact, which accounts for about 3 percent of the nation's milk supply, had a minimal impact on farm-level prices, production, and revenue in 1999. An expanded Northeast Compact would have accounted for approximately 18 percent of the nation's milk supply in 1999, and we estimate that the interregional impacts of this Compact would have been a little larger but still small in that year. An expanded Northeast Compact in conjunction with a southern compact would have accounted for about 27 percent of the nation's milk supply, and its impacts would have been somewhat larger. The estimated impacts vary from region to region, and greater impacts are estimated to occur in those regions with higher levels of milk production and a larger share of raw milk being used to manufacture products such as butter and cheese. This is the case in the Upper Midwest (which includes most of Minnesota and Wisconsin and portions of five other states), where 80 percent of the milk produced is used for manufactured dairy products. For example, we estimate that the three dairy compact alternatives mentioned above would have reduced 1999 farm-level revenue in the Upper Midwest, which we estimate would have been about \$4.5 billion in the absence of any dairy compact, by between \$4 million and \$133 million. Table 1 summarizes our estimates of how this revenue would have been affected by the three compact alternatives.

Table 1: Reduction in 1999 Farm-Level Revenue in the Upper Midwest Under Three Compact Alternatives

Dollars in millions

Compact alternative	Reduction in 1999 farm-level revenue	
	Dollars	Percentage
Northeast Compact	\$4 to 9	0.09 to 0.20
Expanded Northeast Compact	13 to 24	0.29 to 0.53
Expanded Northeast Compact and a southern compact	26 to 133	0.57 to 2.93

Source: GAO's analysis using the University of Wisconsin-Madison dairy model.

In 2000, national average farm-level milk prices were lower than they were in 1999, resulting in a larger difference between the NEDC's and USDA's minimum prices. Consequently, one would expect that the NEDC would have greater economic impacts than in years when USDA's minimum prices were high. Nevertheless, using preliminary data available for 2000, our estimates of the impacts of the three compact alternatives are similar to those in 1999. In addition, our review of the available studies of the interregional impact of dairy compacts indicated that our estimates are comparable to those estimated by other agricultural economists.

We provided a draft of this report to USDA officials and the Executive Director of the Northeast Compact commission to obtain their comments. In general, these officials stated that we conducted a comprehensive assessment of the impacts of dairy compacts. However, the Executive Director expressed some concern about the model we used to estimate interregional impacts.

Background

Of the approximately 167.7 billion pounds of raw milk produced in the United States in 2000, about 55.5 billion pounds were processed into fluid milk products—such as whole, 2-percent, 1-percent, and skim milk; flavored milks; and buttermilk—that yielded approximately \$22 billion in retail sales. The rest of the raw milk was used to produce manufactured products, such as butter, cheese, ice cream, powdered milk, and yogurt. In the United States, a complex pricing system has evolved that affects prices paid for raw milk used to produce processed milk (fluid drinking milk) and manufactured dairy products, such as cheese and butter. Various milk regulators—USDA, some states, and the Northeast Dairy Compact—establish minimum prices that must be paid for raw milk to help stabilize the milk supply. In addition to USDA, the states, and the NEDC, other entities affect milk prices, including cooperatives, which may provide services to farmers such as collecting farmers' milk; milk processors, which convert raw milk to fluid milk; manufacturers of dairy products; and retailers, which stock and sell dairy products to consumers. Each of these groups contributes to the value of fluid milk and dairy products sold at the retail level, and each receives a portion of the difference between the prices that farmers receive and the retail price.

Federal and State Dairy Programs

USDA's milk marketing and milk price support programs, as well as some states' dairy programs, are intended to ensure an adequate supply of milk by establishing milk prices and other milk marketing rules, which, in turn, are intended to stabilize milk marketing conditions and thus assist

individual farmers as well as consumers. In effect, these programs ensure that farm prices do not fall below a minimum level and provide a safety net for individual farmers who lack the market power of other entities, such as wholesale milk processors.

Currently, about 70 percent of the milk produced in the United States is regulated under the federal milk marketing order program created in 1937 and administered by USDA. Under this program, on the basis of national dairy market information, USDA sets the minimum prices that must be paid by processors for raw fluid grade milk in specified marketing areas, or orders.⁶ These prices vary by the type of dairy product for which the milk is used; the minimum price for raw milk used for fluid drinking purposes also varies by location. Even though USDA sets minimum prices for raw milk, buyers of milk can and sometimes do pay farmers prices in excess of the established minimums—prices known as “over-order premiums.” Market forces play a role in determining any such premiums.

Under the federal milk marketing order program, USDA has a classified pricing system for setting minimum prices, on a monthly basis, for milk that is based upon its intended use, as shown in table 2.⁷ Federal milk marketing order class prices are determined by using product price formulas that compute milk component values based on wholesale dairy product prices. For example, Class III formulas use monthly average butter, cheese, and dry whey prices to determine values for butterfat, protein, and other solids, respectively. Class IV formulas use monthly average butter and nonfat dry milk prices to determine values for butterfat and nonfat solids, respectively. The Class II price is determined by adding an amount—a Class II differential—to the Class IV price, while the Class I price is determined by adding a Class I differential to the higher of the Class III or IV price. Class I prices can vary from one milk marketing order to another.

⁶The federal milk marketing order program currently in place consists of 11 geographic orders, each covering multiple states or portions of states. For example, the Northeast order includes the following states or portions thereof: Connecticut, Delaware, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. It also includes the District of Columbia. Maine is not part of the order. Instead, Maine has its own commission that regulates milk prices.

⁷The 1996 farm bill required USDA to revise its milk marketing order program. Among other things, USDA collapsed its 31 orders into 11, increased the number of milk classes from three to four, and changed its formulas for setting minimum prices. These changes took effect in January 2000.

Table 2: USDA’s Milk Classes Used for Setting Milk Prices

Class	Usage
Class I	Fluid milk for drinking purposes
Class II	Soft manufactured products, such as cream products, cottage cheese, ice cream, and yogurt
Class III	Cream cheese, other spreadable cheeses, and hard cheese
Class IV	Butter and dried milk products such as nonfat dry milk

Source: USDA.

Dairy farmers selling raw milk within a federal milk marketing order receive an average, or “blend,” price that is the weighted average of the prices of Class I through IV milk, with the weights determined by the amount of milk sold for each class of use in each marketing order. The average price farmers receive, therefore, depends in part on the extent to which the total raw milk supply in a specific order is used to make fluid milk as opposed to the three classes of manufactured products.

Dairy farmers located in one milk marketing order sometimes ship their milk to another order to obtain a higher price. Depending on the amount of milk shipped, a producer may qualify for a receiving order’s blend price. If the producer meets the receiving milk marketing order’s blend price requirements, not only can the milk shipped qualify for the blend price—all of that producer’s milk can qualify for the blend price. However, farmers must consider whether the cost of transporting a sufficient amount of milk to qualify for the receiving order’s blend price outweighs the benefit of receiving a higher blend price.

Some states, such as California, Maine, Nevada, New York, Pennsylvania, and Virginia, have established their own minimum farm-level milk pricing programs that cover all or portions of their states. These states have established commissions or boards to perform functions similar to those of USDA. For example, Virginia’s milk commission, created in 1934, establishes monthly producer prices to ensure dairy farmers an adequate return on their investment and to preserve market stability. Similarly, Nevada’s dairy commission, established in 1955, sets minimum prices for raw milk sold to processing facilities located within that state.

The federal milk price support program, established in 1949, also influences farm-level prices. This program supports farm-level prices by providing a standing offer from USDA to purchase butter, cheese, and nonfat dry milk at specified prices. The prices offered for these dairy products are intended to provide sufficient revenue so that dairy product manufacturers can pay farmers, on average, a legislatively mandated

support price. This program is intended to make the support price a floor price for raw milk used for manufacturing purposes, and it is unlikely that manufactured product prices will fall below the floor for very long. Because the price for raw milk used for fluid purposes is based, in part, on the price of raw milk used for manufacturing purposes, the price support program influences the price that farmers receive for raw milk used for fluid purposes as well.

Dairy Compacts

In addition to the federal and state milk marketing order programs that set minimum milk prices, in 1996, the Congress authorized the Northeast Interstate Dairy Compact for the six New England states. The Compact supplements the federal milk marketing order and state programs by setting the monthly minimum price to be paid for raw milk used for fluid milk marketed in the six-state area.⁸ In July 1997, the Compact set a minimum price of \$16.94 per hundredweight for raw milk used for Class I, or fluid milk, and that minimum price has not changed. In months when the federally set minimum price for Class I milk for the Northeast Milk Marketing Order falls below the Compact price, the Compact price takes effect.⁹ In other months, when the federally set Class I price is higher than the Compact Class I price, the federally set Class I price takes effect. Since the Compact was established, federally set minimum prices for the area of the Compact that is subject to federal milk marketing regulation have ranged from \$13.50 to \$20.50 per hundredweight but have usually been below the Compact price of \$16.94 per hundredweight.

In those months when the Compact Class I price is higher than the federally set Class I price, processors having sales of fluid milk in the six NEDC states are required to pay a monthly over-order obligation per hundredweight equal to the difference between \$16.94 and the federally set Class I price. Processors multiply the monthly over-order obligation by the volume of their total fluid milk sales in the six NEDC states in

⁸Raw milk sold in the Compact states for manufacturing purposes is not eligible for the minimum price set by the Compact commission.

⁹Prior to January 2000, USDA's New England Milk Marketing Order established the minimum federal milk prices in those New England areas that fell under federal milk marketing regulations. In January 2000, USDA reorganized its milk marketing orders, collapsing the then-existing 31 orders into 11. The new Northeast Milk Marketing Order assumed responsibility for setting minimum milk prices in those New England areas that fall under federal milk marketing regulations.

hundredweight by this difference and pay this amount to the commission that administers the Compact. After deducting administrative fees and other expenses, the commission distributes the balance of the proceeds in accordance with the amount of milk produced that was actually used for fluid milk, as opposed to cheese or other manufactured products. The commission makes disbursements to farmer cooperatives and milk handlers, located both within and outside the NEDC states, who then make individual payments to farmers based on their production. Thus, dairy farmers from other states, such as New York, that supply raw milk used to make fluid milk that is sold in the Compact states also benefit from the Compact's minimum prices.

The 1996 farm bill provided the Compact with considerable flexibility to establish regulations to carry out its intended purpose. The legislation authorized the establishment of a commission composed of delegates from the six NEDC states to administer the Compact. The state delegates are appointed by each of their respective states and include farmer, milk processor, and consumer representatives. In addition to being empowered to establish Compact prices, the commission may investigate costs associated with producing and selling milk; examine the economic forces affecting producers, including trends in production, consumption, and the financial conditions of dairy farmers; and prepare and provide periodic reports to the states regarding its efforts. While the commission is required to report annually to USDA, USDA is not required to investigate or report on the commission's efforts.

States in other regions of the country, including some southern states, are considering the adoption of similar compact arrangements. The proposed Dairy Consumers and Producers Protection Act, a bill that was introduced in the Congress in May 2001, if enacted, would reauthorize the NEDC. The bill would also allow additional states to enter the NEDC.¹⁰ In addition, it would establish a southern dairy compact consisting of 17 states, as well as a Pacific Northwest dairy compact and an Intermountain dairy compact, each consisting of 3 states.¹¹ The proposed bill, like the 1996 farm

¹⁰The proposed expanded NEDC would also include Delaware, Maryland, New Jersey, New York, Ohio, and Pennsylvania.

¹¹The proposed southern compact would include Alabama, Arkansas, Florida, Georgia, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Nebraska, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The proposed Pacific Northwest compact would include California, Oregon, and Washington. The proposed Intermountain compact would include Colorado, Nevada, and Utah.

bill, would provide the compact commissions with broad flexibility to carry out their objective of ensuring the continued viability of the dairy industry in their states. Therefore, it cannot be known in advance whether commissions for these new compacts would regulate milk pricing in their respective states in a manner similar to the way that the NEDC commission has regulated milk pricing.

Other Factors Affecting Milk Prices

In addition to federal and state programs and the NEDC, other entities affect prices paid for milk at the wholesale and retail levels. For example, about 83 percent of all raw milk produced in the United States is marketed through dairy cooperatives that are owned by farmer-members. Cooperatives perform services for their members and buyers of milk such as (1) transporting milk among different milk producing areas, (2) scheduling milk deliveries, (3) testing milk, and (4) paying members for their marketings.¹² Costs for these services are paid by processors and dairy product manufacturers that purchase milk from the cooperatives at prices above federally specified minimum prices and then process or manufacture, package, and distribute fluid milk and manufactured dairy products to retailers. The costs that processors and manufacturers incur in purchasing raw milk from farmers or cooperatives and in processing or manufacturing, packaging, and distributing fluid milk and manufactured dairy products are included in prices charged to retailers for these products. Finally, the prices that retailers set for selling milk and dairy products are affected by the retailers' operating costs, such as labor, rent, and utilities; their strategies for pricing milk and manufactured dairy products; and the demand for those products.¹³

Isolating the Intraregional Impacts of the NEDC Is Difficult

Although dairy sector indicators that we examined changed after the NEDC's milk pricing regulations took effect in July 1997, it is difficult to determine how much of the change is attributable to the Compact. Such a determination is difficult because the Compact's impact on these indicators cannot be easily isolated from the effects of other factors. For example, while retail milk prices increased by 15 to 20 cents per gallon in July 1997, and there is general agreement that the Compact contributed to these increases, the lack of an economic model that fully accounts for the

¹²Some cooperatives also process milk and sell the products directly to retailers or consumers.

¹³A detailed discussion of factors affecting milk prices is included in our report entitled *Dairy Industry: Information on Milk Prices and Changing Market Structure* (GAO-01-561, June 15, 2001).

influences of other factors, such as costs for processing fluid milk, makes it difficult to determine how much of that price increase can be attributed to the NEDC. Similarly, while the Compact has resulted in payments being made to dairy farmers that reflect the difference between USDA's marketing order minimum prices and the NEDC's minimum price, it is difficult to determine whether some portion or all of these payments would have been made to dairy farmers anyway, depending on market conditions. Although economic reasoning suggests that the Compact would be likely to cause increased milk production and reduced fluid milk consumption in the six NEDC states, analyses of relevant data on dairy farm structure, milk production, and milk consumption show little change in historic trends after the Compact's implementation.

Retail milk prices increased by as much as 20 cents per gallon immediately following the NEDC's establishment—which is an amount comparable to the immediate increase in the minimum farm-level price for raw milk to be used for and sold as fluid milk in the six New England states when the NEDC's price regulations became effective. For example, the NEDC minimum price of \$1.46 per gallon was 18 cents higher than USDA's June 1997 Class I price for Boston of \$1.28 per gallon and 26 cents higher than USDA's July 1997 Class I price of \$1.20 per gallon. While this might appear to be a substantial increase, when compared with USDA's average Class I price of \$1.41 per gallon during the prior year, the NEDC price did not actually represent such a large increase. However, without a model of farm-to-retail price transmission that accounts for how quickly and how fully farm-level price changes are passed on to wholesale and retail levels, we cannot estimate how much of the retail price change was due to the Compact.

Furthermore, while retail milk prices in Boston and other selected cities in the NEDC states remain at the higher levels experienced since the Compact took effect, national average retail prices have also increased, but at rates lower than in the NEDC states. Even so, it is not certain what portion of the retail price increase in the NEDC states is attributable to the Compact, given that both the retail and farm-level prices for milk have fluctuated since July 1997. Some portion of the price increase could also be due to other factors, such as changes in the costs for processing or retailing milk, marketing strategies, or consumer demand. In addition, it is difficult to estimate the extent to which fluid milk processors would have paid more than the minimum farm-level price for milk without the NEDC; that is, we do not know the extent to which the NEDC price substituted for market-driven over-order premiums. Several studies analyzing the NEDC's impact on retail milk prices concluded that the NEDC has

increased prices.¹⁴ However, the amount of the increase attributed to the NEDC varies from study to study, depending on assumptions made by the different researchers and the time periods that they examined. For example, estimates ranged from a low of 2.7 cents to as much as 20 cents per gallon.

Data on farm income are limited, and while dairy farmers have received NEDC payments,¹⁵ it is unclear to what extent these payments replaced market-driven over-order premiums that farmers might have been paid in the absence of the Compact. We estimate that through calendar year 2000, the NEDC payments made to dairy farmers in the six NEDC states totaled about \$99 million, assuming that all dairy farmers located in these states had their milk processed at fully regulated NEDC plants.¹⁶ The NEDC payments that an average dairy farmer in one of the six states would have received would have fluctuated widely from month to month and from year to year, however, depending on the difference between USDA's Class I price and the Compact price of \$16.94 per hundredweight and the percentage of milk used for fluid milk in the NEDC states. For example, in 1998 the average NEDC over-order producer price payment was 67 cents per hundredweight. This would have provided dairy farmers supplying raw milk used to produce fluid milk sold in the NEDC states about 25 cents per hundredweight, based on the percentage of raw milk used for fluid milk. We estimate that these payments provided the average dairy farmer in the six NEDC states about \$3,892 above the minimum amount that the farmer would have received in 1998 had USDA's Class I price of \$16.78 been in

¹⁴Office of Management and Budget, *The Economic Effects of the Northeast Interstate Dairy Compact*, Feb. 1998; Daniel A. Lass, Mawunyo Adanu, and P. Geoffrey Allen, "Impacts of the Compact on Fluid Milk Retail Prices," *The Northeast Interstate Dairy Compact: Milk Market Impacts*, Research Report 73, Agricultural Experiment Station, University of Vermont, Mar. 2000; Kenneth Bailey, "Report on the Operation and Performance of the Northeast Interstate Dairy Compact," Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, July 2000; testimony by Ronald W. Cotterill on *The Impact of the Northeast Dairy Compact and Market Channel Pricing Strategies on the Performance of the New England Dairy Industry*, before the U.S. Senate Committee on the Judiciary, July 25, 2001; and Ronald W. Cotterill and Andrew W. Franklin, *The Public Interest and Private Economic Power: A Case Study of the Northeast Dairy Compact*, Food Marketing Policy Center, Department of Agricultural and Resource Economics, University of Connecticut, May 2, 2001.

¹⁵An NEDC payment is the payment attributable to the difference between USDA's minimum Class I price and the Compact price.

¹⁶A fully regulated NEDC plant is one that is physically located within one of the six NEDC states and that receives, processes, or packages milk or dairy products.

effect.¹⁷ In 2000, the average NEDC over-order producer price payment was \$2.14 per hundredweight. This amount would have provided a farmer supplying raw milk used to produce fluid milk sold in the NEDC states about 91 cents per hundredweight, based on the percentage of raw milk used for fluid milk. These payments provided an average dairy farmer in the six NEDC states about \$15,301 above the minimum amount that the farmer would have received in 2000 had USDA's Class I price of \$14.80 been in effect. These estimates are comparable to data developed by the Compact commission, which indicate that dairy farmers in the six NEDC states and New York received over-order payments totaling about \$146 million from July 1997 through June 2001. In particular, the NEDC data indicate that about 4,200 dairy farmers, including 1,300 in New York, received average annual payments of about \$9,800. Whether these payments were sufficient to alter the financial health of dairy farmers supplying raw milk used to produce fluid milk sold in the NEDC states is difficult to determine, however. USDA data are inconclusive as to whether the Compact had a positive impact on NEDC dairy farmer income, while NEDC analyses conclude that the Compact stabilized and enhanced farmer income.

A limited number of studies have been conducted on the Compact's impact on farm income. In its 1998 report, the Office of Management and Budget (OMB) estimated a 6- to 8-percent increase in farm income from July through December 1997. In addition, an economist at the University of Vermont modeled the effect on Vermont dairy farmers of establishing a floor for Class I prices and concluded that stabilizing prices by having a price floor could have a positive impact on dairy farmer income.¹⁸

The NEDC's impact on farm structure is unclear. The number of dairy farms decreased, and the average size of herds increased, both prior to and following the NEDC's establishment in both the Compact states and the rest of the country. For example, the number of licensed dairy farms in the six NEDC states decreased by 32 percent between 1992 and 2000, from 4,079 to 2,772, while the number of licensed dairy farms in the rest of the

¹⁷USDA's Class I price was greater than the NEDC price in 4 months of 1998. In calculating the average annual NEDC over-order payment for 1998, the NEDC payment for those months was zero. Therefore, the difference between the average annual NEDC and USDA price is not equal to the average annual NEDC over-order payment.

¹⁸Rick W. Wackernagel, "Potential Economic Impacts of the Northeast Interstate Dairy Compact on Vermont Dairy Farms," *Agricultural and Resource Economics Review*, Apr. 1998.

country decreased by 37 percent during the same period, from 127,456 to 80,253. Regarding herd size, the average herd in the six NEDC states increased 36 percent, from 58 to 79 milk cows, between 1992 and 2000. In the rest of the United States, the average herd increased 57 percent during the same period, from 56 to 88 milk cows. According to USDA, this decline in the number of farms, along with the increase in herd size, most likely reflects fundamental changes in dairy farming caused by such factors as technological and genetic advances.

Although economic reasoning suggests that higher farm-level milk prices would result in increased raw milk production, we have no basis on which to estimate the specific impact that the Compact has had on milk production in the six NEDC states. Data on milk production show an increase in total milk produced and milk produced per dairy cow, but these trends began prior to the Compact's establishment, making it difficult to estimate the specific impact of the NEDC. Farmers in the NEDC states increased their total milk production by 2.9 percent, from 4.5 billion pounds in 1993 to 4.7 billion pounds in 2000, while farmers in the rest of the nation increased production by 10.3 percent, from 148 billion pounds to 163.3 billion pounds during the same period. The average amount of milk produced per cow in the NEDC states increased by about 11.6 percent during the same period, from 15,633 pounds to 17,440 pounds. Milk production per cow in the rest of the United States increased by about 15.9 percent during this period, from 15,726 pounds to 18,226 pounds. Studies of the NEDC's impact on milk production, including OMB's study and an analysis by researchers at the University of Vermont, estimated that the Compact has resulted in a slight increase in milk production in the NEDC states.¹⁹

We cannot estimate the specific impact that the Compact has had on fluid milk consumption in the six NEDC states, in part because we cannot estimate how much of the retail price change since July 1997 has been due to the Compact. Data on fluid milk consumption show a decrease in per capita milk consumption, which reflects trends both within the NEDC states and in the rest of the country that began prior to the NEDC's establishment. Per capita consumption of fluid milk was higher in USDA's New England Milk Marketing Order than in some other USDA marketing

¹⁹Charles F. Nicholson, Budy P. Resosudarmo, and Rick W. Wackernagel, "Impacts of the Compact on New England Milk Supply," *The Northeast Interstate Dairy Compact: Milk Market Impacts*, Research Report 73, Agricultural Experiment Station, University of Vermont, Mar. 2000.

orders prior to the Compact. Even so, consumption of fluid milk had been slowly declining, both in that marketing order and in the rest of the country, as the consumption of other fluid beverages increased and as the population aged. For example, annual per capita milk consumption for the New England Milk Marketing Order declined by 4 percent from 1993 to 1999, or from about 233 to 223 pounds. Similarly, annual per capita milk consumption for all the other USDA marketing orders declined 6 percent from 1993 to 1999, or from about 214 to 202 pounds. In its 1998 study, OMB's analysis of the NEDC's impact on fluid milk consumption during the last half of calendar year 1997 showed a 0.5-percent decline; while in a July 2000 study, an economist at Pennsylvania State University estimated that the NEDC had no appreciable impact from mid-1997 through 1999.²⁰

Additional details about the intraregional impacts of the NEDC are included in appendix III.

The NEDC Has Not Increased Net Federal Costs for the Milk Price Support Program, but Its Impact on a Major Nutrition Assistance Program Is Less Certain

According to USDA, the NEDC has not resulted in a net increase in the federal government's costs for its milk price support program, while it is not certain whether it has affected federal costs for one of its major nutrition assistance programs. The Compact commission must, by law, compensate USDA for any estimated increase in costs to its price support program that are caused by the Compact, and the NEDC commission has done so. Regarding its nutrition assistance programs, USDA estimates that federal costs to its largest nutrition assistance program—the Food Stamp Program—could have increased but federal costs for its other nutrition assistance programs have likely not increased.

As required by the 1996 farm bill, when the rate of increase in milk production in the NEDC states exceeds the rate of increase in national milk production, the Compact commission must compensate USDA for any additional costs to the milk price support program that result, and the commission has done so.²¹ According to USDA officials, the NEDC did not result in a rate of increase in production greater than the national rate of

²⁰OMB's Feb. 1998 study; and Kenneth Bailey, *Report on the Operation and Performance of the Northeast Interstate Dairy Compact*, Pennsylvania State University, Department of Agricultural Economics and Rural Sociology, July 2000.

²¹Neither the NEDC commission nor USDA must determine if the increase in the rate is attributable to the NEDC.

increase in 1997, during the first 6 months of the Compact. USDA calculated that in 1998, milk production in the NEDC states was 1.8 percent greater than the average of the prior 2 years, compared with a national increase of 1.3 percent. The NEDC compensated USDA \$1.8 million for this higher rate of increase in production. USDA calculated that in 1999, milk production in the six states was 3.6 percent greater than the average of the prior 2 years, compared with a national increase of 3.2 percent. The NEDC compensated USDA \$1.4 million for this higher rate of increase in production. USDA calculated that milk production in the six NEDC states increased by 0.1 percent in 2000, compared with a national increase of 5.1 percent. Thus, compensation was not required.

USDA is not certain whether the Compact has affected federal costs for the Food Stamp Program, which is USDA's largest nutrition assistance program. According to USDA, if (1) retail milk prices in the NEDC states increased sufficiently to increase national average retail milk prices, and (2) the Compact was the cause of the full amount of the price increases in the NEDC states, then the Compact might have increased federal Food Stamp Program costs because program benefits are sensitive to the national average retail milk price.²² Benefit levels and federal Food Stamp Program funding have increased since July 1997, because of, among other things, increased national average retail milk prices. However, according to USDA, it is difficult to establish the Compact's impact on retail milk prices in the six NEDC states, and thus it is difficult to establish the Compact's role in affecting national average retail milk prices. If the Compact would have caused benefit levels to increase to the next dollar, USDA estimates that the Compact increased annual federal program costs by about \$60 million. If the Compact did not cause benefit levels to increase to the next dollar, any increased retail milk prices caused by the Compact would have been absorbed by program participants in the NEDC states.

Regarding USDA's other major nutrition assistance programs, such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the National School Breakfast and Lunch Programs, USDA has concluded that federal costs have not increased as a result of the NEDC. Federal WIC program costs have not increased because WIC is a

²²Food Stamp Program benefits are indexed to the cost of the Thrifty Food Plan—a nutritious low-cost model diet plan. Milk represents about 10 percent of the value of the plan. Maximum program benefit levels are rounded down to the nearest dollar of the plan's value.

discretionary grant program. Federal school breakfast and lunch program costs have not increased because the level of federal reimbursements is based on the average price of a large variety of food items, which is relatively insensitive to changes in the retail price of milk.²³ Because federal funding for WIC and school breakfast and lunch programs have not increased, those state or local agencies or organizations that provide program benefits or program participants have had to absorb any increase in retail milk prices caused by the NEDC. Although the 1996 farm bill does not require the Compact to do so, the commission compensates the six states for the increased milk costs incurred by the WIC and school programs that are estimated to be attributable to the NEDC. Through December 2000, the NEDC provided state WIC programs a total of \$3.8 million, and the schools a total of \$662,606.

Should compacts be expanded to include additional states, smaller increases in retail milk prices within the compact states would be necessary to increase the national average retail milk price and, hence the level of Food Stamp Program benefits and federal funding. For example, USDA estimates that should retail milk prices increase by about 20 cents per gallon—an amount similar to the immediate increase in the NEDC states when the commission established an NEDC price—within a compact of states that represents 50 percent of the nation’s fluid milk sales, monthly food stamp allotments would be forced up by, on average, \$1 to \$2. USDA estimates that these increases in monthly food stamp allotments would increase annual Food Stamp Program costs by \$60 to \$120 million. Nonfederal costs to its other major nutrition assistance programs, including WIC and the school programs, could also increase should compacts be expanded. While two studies analyzed the NEDC’s impact on USDA’s nutrition assistance programs, the studies relied on a limited amount of data on retail milk prices in the six NEDC states, and their results are inconclusive.²⁴

Additional details about the NEDC’s impact on USDA’s milk price support and nutrition assistance programs are included in appendix IV.

²³National School Lunch Program and School Breakfast Program reimbursements are indexed to the consumer price index for food-away-from-home for urban consumers.

²⁴OMB’s Feb. 1998 study; and Qingbin Wang, Zooyob Anne, Catherine Halbrendt, Charles Nicholson, and Jaimie Sung, “Impacts of the Compact on the WIC Program: Evidence From Boston and Hartford,” *The Northeast Interstate Dairy Compact: Milk Market Impacts*, Research Report 73, Agricultural Experiment Station, University of Vermont, Mar. 2000.

Estimated 1999 Interregional Impacts of Various Compact Alternatives Increased as Compacts Grew in Size

Our estimates of the interregional impacts of dairy compacts in 1999 on such measures as farm-level prices, milk production, and farm revenue range from minimal to somewhat larger, depending on the size of the compact and the assumptions that we used to run the economic model. The NEDC states account for only about 3 percent of the milk produced in the nation, and we estimate that in 1999 it had little to no impact in other regions of the country on farm-level prices or milk production and, hence, on farm revenue. An expanded NEDC would account for approximately 18 percent of the milk produced in the nation, and we estimate that in 1999 it would have had a larger but still relatively small impact on farm-level prices, milk production, and farm revenue in other regions of the country. An expanded NEDC, in conjunction with a southern compact, would account for approximately 27 percent of the quantity of milk produced in the nation, and we estimate that in 1999 it would have had a somewhat larger impact on farm-level prices, milk production, and revenue in other regions of the country. These estimates are comparable to other economists' estimates of the interregional impacts of dairy compacts of different sizes.

In general, if dairy farmers located within a compact region received higher farm-level milk prices than they would otherwise have received, they would respond by increasing their raw milk production. Moreover, these higher farm-level milk prices would likely lead to higher fluid milk retail prices in the compact region—prices that would lower consumer purchases of fluid milk in that region. These two effects in the compact region—greater raw milk production and lower consumer fluid milk purchases—would increase the national supply of raw milk that was available for the manufacture of other dairy products, such as cheese, butter, and nonfat dry milk. In turn, this increase in the national supply of milk for manufacturing purposes would result in lower farm-level prices for raw milk to be used for manufacturing purposes. Because minimum Class I prices are based on the prices paid for raw milk to be used for manufacturing purposes, farmers in noncompact regions would receive lower farm-level prices for all classes of milk and, thus, lower blend prices. Other things being equal, dairy farmers in noncompact regions would respond to lower farm-level prices by reducing their milk production.²⁵ These two effects in noncompact regions—lower farm-level prices and reduced production—would cause farm revenue there to fall. This impact

²⁵This reduction in production by dairy farmers in noncompact regions would keep the farm-level price for milk from falling further.

would be particularly significant for dairy farmers in regions such as the Upper Midwest, where most milk is used for manufacturing purposes. Farmers in noncompact regions who ship their milk to compact regions may be eligible to receive the compact region's farm-level price for that milk, which could offset the loss in revenue associated with lower farm-level prices for milk. If the compact price is sufficiently high, any increased transportation or shipping costs could be offset.

To assess the likely interregional impacts of each compact alternative or scenario, we derived an initial set of estimates that represents the impact of that alternative in 1999, given an initial set of assumptions.²⁶ We then changed key assumptions to analyze how sensitive our initial estimates were to such changes. In general, these sensitivity analyses demonstrated that our initial estimates were not very sensitive to changes in the key assumptions. (For a more detailed description of our initial and subsequent sets of assumptions, see app. II.) Accordingly, we present our estimates of the impacts of the different compact scenarios as ranges that include our initial set of estimates and the results of our sensitivity analyses. In addition, we present these estimates as changes from our 1999 baseline estimates, which represent the estimated values of farm-level and wholesale-level dairy indicators in that year in the absence of any dairy compact—our “no-compact scenario.”

Our estimates apply only to 1999, and they may not represent the interregional impacts of compacts in all years. In particular, these estimates are based on data for the period prior to USDA's milk marketing order regulatory reforms in January 2000, which have affected some dairy sector indicators, such as farm-level milk prices. Furthermore, farm-level milk prices in 1999 were higher than they were in some other years, and we anticipate that, other things being equal, compacts have less of an impact in years when farm-level prices are relatively high.²⁷ In addition,

²⁶These assumptions pertain to the (1) responsiveness of milk production to changes in farm-level milk prices, (2) responsiveness of demand to changes in wholesale-level dairy commodity prices, (3) level of market-driven over-order premiums, (4) ability of milk to be shipped between regions, (5) amount of the compact over-order producer price payment, and (6) amount of transportation costs.

²⁷We included data from 2000 as one of our sensitivity analyses; however, we did not use 2000 as a base year for estimating the interregional impacts because complete data for that year are not yet available. Furthermore, modeling the impacts of compacts using 2000 data could produce estimates that are less reliable than estimates derived from 1999 data because the dairy industry was in the process of adjusting to USDA's January 2000 milk marketing order reforms.

although our estimated impacts of compacts on noncompact regions for both 1999 and 2000 are relatively small, the impacts on some individual dairy farmers, such as small producers with marginal profitability, in noncompact regions could be significant.

Finally, as in any modeling effort, there is some uncertainty about a model's structure and the data and assumptions used. In addition, the model that we used was limited in its ability to distinguish between shipments of bulk raw milk and packaged fluid milk into regions that import milk to meet their demand because the model is an annual model, and such shipments are frequently seasonal. (See app. II for a discussion of this as well as other modeling limitations.) Despite this uncertainty and limitation, we believe that the process for developing our estimates was rigorous and that the model is comprehensive and sound. Given these conditions, our estimates should be interpreted as indicative of the order of magnitude of changes in farm and wholesale economic values, rather than as precise estimates.

Appendix V provides more detailed information about our estimates of the impacts of the three compact alternatives on 1999 farm-level prices, production, and revenue in noncompact regions, as well as on national average wholesale-level prices and national wholesale-level production and expenditures.

Interregional Impacts of the NEDC in 1999 Were Small

We estimate that the NEDC resulted in small economic impacts in noncompact regions in 1999. Specifically, we estimate that the largest reductions in farm-level revenue under the NEDC compared with the no-compact scenario occurred in California and the Upper Midwest region: from \$4 million to \$11 million and from \$4 million to \$9 million, respectively.²⁸ Table 3 provides our estimates of the extent to which the NEDC reduced farm-level revenue—that is, the value of all milk sold by

²⁸In the University of Wisconsin-Madison dairy sector model, the Upper Midwest region is represented as Minnesota, North Dakota, and Wisconsin.

dairy farmers—in these two regions and in all noncompact regions combined.²⁹

Table 3: Estimated Reduction in 1999 Farm-Level Milk Revenue in Noncompact Regions as a Result of the NEDC

Dollars in millions

Region	Estimated farm-level revenue under the no-compact scenario	Estimated revenue reduction with the NEDC	
		Dollars	Percentage
California	\$3,954	\$4 to 11	0.10 to 0.28
Upper Midwest	4,533	4 to 9	0.09 to 0.20
All noncompact regions	18,513	11 to 29	0.06 to 0.16

Source: GAO analysis using the University of Wisconsin-Madison dairy model.

These estimated impacts on farm-level revenue were small because dairy farmers in the NEDC states produced only about 3 percent of the nation’s milk supply. As a result, any increased supply of milk that was available for manufacturing purposes in 1999 from NEDC farmers was small compared with the nation’s total milk supply for manufacturing purposes. Therefore, the impact on farm-level prices and milk production, and hence on farm revenue, for producers outside the compact region was also small. For example, we estimate that, as a result of the NEDC, farm-level prices in all noncompact regions remained unchanged or fell by no more than 2 cents per hundredweight, or less than 0.20 percent, while milk production for all noncompact regions combined fell by less than 0.06 percent.

We estimate that, in 1999, the NEDC’s impact on the national average wholesale prices of manufactured dairy products was also minimal. For

²⁹For modeling purposes, the NEDC compact scenario is represented as being part of the University of Wisconsin-Madison dairy sector model’s northeast region. This region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. If the northeast region states that are not part of the NEDC were modeled as being in a noncompact region, our estimate of the NEDC’s impact on all noncompact regions combined would be a little larger than we report, except to the extent that NEDC payments to New York farmers who sell raw milk used for and sold as fluid milk to processors in New England affect the lower prices that non-NEDC producers in the northeast region receive for the remainder of their milk.

example, we estimate that the wholesale prices per hundredweight for American cheese were 3 to 9 cents lower and for butter about 3 to 23 cents lower than they would have been under the no-compact scenario.³⁰ These estimated differences, even at the upper ends of these ranges, represent about 0.06 and 0.19 percent, respectively, of our estimated 1999 wholesale American cheese and butter prices under the no-compact scenario.

Interregional Impacts of an Expanded NEDC in 1999 Would Also Have Been Relatively Small

We estimate that, in 1999, the interregional impacts of an expanded NEDC that included five additional states would have been a little larger than the impacts of the NEDC, but still small. Specifically, we estimate that, compared with our analyses using the no-compact scenario, dairy farm revenue in 1999 would have been reduced the most in the Upper Midwest region—by \$13 million to \$24 million.³¹ Table 4 provides our estimates of the extent to which an expanded Northeast Compact would have reduced farm-level revenue in the Upper Midwest and in all noncompact regions combined.³²

Table 4: Estimated Reduction in 1999 Farm-Level Milk Revenue in Noncompact Regions as a Result of an Expanded NEDC

Region	Estimated farm-level revenue under the no-compact scenario	Estimated revenue reduction in farm-level revenue with an expanded NEDC	
		Dollars	Percentage
Upper Midwest	\$4,533	\$13 to 24	0.29 to 0.53
All noncompact regions	18,513	30 to 96	0.16 to 0.52

Source: GAO analysis using the University of Wisconsin-Madison dairy model.

³⁰This equates to 0.03 to 0.09 cents per pound lower for American cheese and 0.03 to 0.23 cents per pound lower for butter.

³¹In one of the sensitivity analyses, farm-level revenue in California decreased by \$33 million, or by 0.8 percent. In general, however, our estimated impacts were smaller in California than in the Upper Midwest region.

³²For modeling purposes, the expanded NEDC is represented as being the University of Wisconsin-Madison dairy sector model's northeast region, which is roughly comparable to USDA's Northeast Milk Marketing Order.

As under the NEDC scenario, we estimate that the impact of an expanded NEDC would have been relatively small because dairy farmers in the 11 states included in the expanded Compact produced only about 18 percent of the nation's milk supply. As a result, any increased supply of milk that would have been available for manufacturing in 1999 from those farmers, although a little larger than with the NEDC, would have still been small compared with the nation's total milk supply for manufacturing. Therefore, the impact on farm-level prices and milk production, and hence on farm revenues, for producers outside the expanded Compact region would have been small. For example, under the expanded NEDC scenario we estimate that, compared with our no-compact scenario, farm-level prices in noncompact regions would have fallen by no more than 6 cents per hundredweight or less than 0.5 percent, while milk production for all noncompact regions combined would have been lower by about 0.21 percent or less.

We estimate that, in 1999, the impact of an expanded NEDC on the national average wholesale prices of manufactured dairy products would have been a little larger than the impact of the NEDC, but still relatively small. For example, we estimate that the wholesale prices per hundredweight for American cheese would have been about 18 to 41 cents lower and for butter 46 to 88 cents lower than under our no-compact scenario.³³ These differences, even at the upper ends of these ranges, represent less than 0.3 and 0.7 percent, respectively, of our estimated 1999 wholesale American cheese and butter prices under the no-compact scenario.

Interregional Impacts of an Expanded NEDC Combined With a Southern Compact in 1999 Would Have Been Somewhat Larger

We estimate that, in 1999, the interregional impacts of an expanded NEDC in conjunction with a southern compact—a total of 23 states—would have been somewhat larger than the impact of our other compact scenarios. Specifically, under this scenario and using the same assumption about fluid milk trade between regions as used in the previous scenarios, compared with our no-compact scenario we estimate that dairy farm revenue in 1999 would have been reduced the most in California and in the Upper Midwest and Mideast regions: \$26 million to \$118 million, \$26 million to \$63 million, and \$21 to \$43 million, respectively.^{34,35} Table 5

³³This equates to about 0.18 to 0.41 cents per pound lower for American cheese and 0.46 to 0.88 cents per pound lower for butter.

³⁴In the University of Wisconsin-Madison dairy sector model, the Mideast region is represented as Indiana, Michigan, Ohio, and West Virginia.

provides our estimates of the extent to which an expanded NEDC in conjunction with a southern compact would have reduced farm-level revenue for milk in these regions and for all noncompact regions combined, in 1999.³⁶

Table 5: Estimated Reduction in 1999 Farm-Level Milk Revenue in Noncompact Regions as a Result of an Expanded NEDC Combined With a Southern Compact

Dollars in millions

Region	Estimated farm-level revenue under the no-compact scenario	Estimated revenue reduction with an expanded NEDC and a southern compact	
		Dollars	Percentage
California	\$3,954	\$26 to 118	0.66 to 2.98
Upper Midwest	4,533	26 to 63	0.57 to 1.39
Mideast	1,792	21 to 43	1.17 to 2.40
All noncompact regions	14,805	124 to 268	0.84 to 1.81

Source: GAO analysis using the University of Wisconsin-Madison dairy model.

The estimated impact of the expanded NEDC in conjunction with a southern compact is relatively larger because dairy farmers in the states included in these compacts produced about 27 percent of the nation's milk supply. As a result, any increased supply of milk that would have been available for manufacturing purposes in 1999 from farmers in these states would have been somewhat larger than under the previous scenarios. Therefore, the impact on farm-level prices and milk production, and hence on farm revenues, for producers outside the compact regions would have

³⁵For one sensitivity analysis, in which we increased transportation costs for milk by 25 percent, our model produced an anomalous result: an increase in dairy farm revenue in California. Because our initial estimate and the results of all the other sensitivity analyses show farm revenue losses in California, we are omitting this result in reporting that California was one of the regions with the largest estimated declines in farm-level revenue.

³⁶For modeling purposes, the expanded NEDC in conjunction with a southern compact is represented as being part of the University of Wisconsin-Madison dairy sector model's Northeast, Appalachia, Southeast and Central regions. The Central region includes seven states, two of which are compact and five of which are noncompact states. If the five noncompact states in the Central region were modeled as being part of a noncompact region, our estimate of the impact of an expanded NEDC in conjunction with a southern compact on noncompact regions would be a little larger than we report, except to the extent that producers in these states might receive compact payments from selling raw milk used for and sold as fluid milk to processors in compact states that might offset the lower prices that producers in these states would receive for the rest of their milk. Noncompact regions include the remaining eight IRCM regions.

been somewhat larger. For example, we estimate that farm-level prices in noncompact regions could have fallen by as much as 36 cents per hundredweight or about 2.6 percent compared with our no-compact scenario, while milk production for all noncompact regions combined could have fallen by as much as 0.75 percent.

We estimate that, in 1999, the impacts of an expanded NEDC in conjunction with a southern compact on the national average wholesale prices of manufactured dairy products would have been somewhat larger than the impacts of our other scenarios. For example, compared with the estimated wholesale prices under our no-compact scenario, we estimate that the prices per hundredweight would have been about 62 cents to \$1.41 lower for American cheese and between 21 cents higher and \$6.53 lower for butter.³⁷ At the upper end of these ranges, these differences represent about 1.0 percent and 5.5 percent, respectively, of our estimated 1999 wholesale American cheese and butter prices under our no-compact scenario.

For the expanded NEDC plus a southern compact scenario, we found that our estimates of interregional impacts were sensitive to our assumption about how much milk can be shipped between noncompact and compact regions. In particular, our estimated impacts for 1999 of an expanded NEDC in conjunction with a southern compact on noncompact regions would have been greater if we had used a more restrictive assumption that limits the amount of milk that can be shipped from noncompact into compact regions.³⁸ Specifically, we estimate that using a more restrictive

³⁷This equates to about 0.62 cents to 1.41 cents per pound lower for American cheese and between 6.53 cents per pound lower and 0.21 cents per pound higher for butter.

³⁸In our initial estimates, we assumed that USDA milk marketing order regulations apply to milk movements between noncompact and compact regions. This assumption allows milk to move between compact and noncompact regions with relatively few restrictions, subject to USDA and compact requirements regarding when, and under what circumstances, processors must pay exporting as opposed to importing marketing order or compact minimum blend prices. In this sensitivity analysis, we used a more restrictive trade assumption. Under this assumption, we restricted the amount of milk that can move into a compact region to the amount of milk produced within a 100-mile radius surrounding a compact region. We performed this analysis because our data are aggregated at the regional level as opposed to being at the milk plant or dairy farm level. Therefore, our data on transportation costs of shipping milk are average cost data and do not apply to individual shipments. As a result, initial results may allow for more movement of milk between noncompact and compact regions than would actually occur. This sensitivity analysis shows the extent to which our estimates would be different if the movement of milk was more restricted.

assumption increases our estimate of how much farm-level prices, milk production, and farm revenues in noncompact regions would have fallen in 1999 under this scenario compared with under our no-compact scenario. Table 6 shows our estimated reductions in farm revenues for raw milk in California and the Upper Midwest and Mideast regions, and all noncompact regions combined under our restricted fluid milk trade assumption compared with under our no-compact scenario.³⁹

Table 6: Estimated Reduction in 1999 Farm-Level Milk Revenue in Noncompact Regions as a Result of an Expanded NEDC Combined With a Southern Compact Under a More Restrictive Fluid Milk Trade Assumption

Dollars in millions

Region	Estimated farm-level revenue under a no-compact scenario	Reduction in revenue as a result of an expanded NEDC and a southern compact using a more restrictive fluid milk trade assumption	
		Dollars	Percentage
California	\$3,954	\$70 to 145	1.77 to 3.67
Upper Midwest	4,533	103 to 133	2.27 to 2.93
Mideast	1,792	34 to 45	1.90 to 2.51
All noncompact regions	14,805	257 to 374	1.74 to 2.53

Source: GAO analysis using the University of Wisconsin-Madison dairy model.

We also estimate that the impact in 1999 of an expanded NEDC in conjunction with a southern compact on the national average wholesale prices of some manufactured dairy products would have been greater under the more restrictive fluid milk trade assumption than without that restrictive trade assumption. For example, under the more restrictive trade assumption, we estimate that the price per hundredweight for American cheese would have been about \$1.27 to \$1.86 lower than under our no-compact scenario.⁴⁰ However, for butter we estimate that the impact with the restrictive trade assumption would have been smaller than the estimated impact without the restrictive trade assumption. Under the

³⁹We present our estimates of the interregional impacts under a more restrictive trade assumption only for the expanded NEDC in conjunction with a southern compact scenario because this more restrictive trade assumption had no effect on our estimates under our other compact scenarios.

⁴⁰This equates to about 1.27 to 1.86 cents per pound lower for American cheese.

restrictive trade assumption, we estimate that the price per hundredweight for butter would have changed from 7 cents higher to \$2.80 lower than under our no-compact scenario.⁴¹ At the upper end of these ranges, these differences represent about 1.3 and 2.3 percent, respectively, of our estimated 1999 wholesale prices for American cheese and butter under our no-compact scenario.

Using Farm-Level Prices for 2000 as Opposed to 1999 Has a Limited Influence on the Estimated Impacts of Compacts

As noted previously, the farm-level prices that we used in our model can affect our estimates of the impacts of compacts on dairy sector indicators such as farm-level revenue. In 1999, the national average blend price was \$14.09 per hundredweight of milk; in 2000, the national average blend price was \$12.11 per hundredweight of milk. With lower farm-level prices in 2000 than in 1999, the difference between a compact price in our model and the federal milk marketing order Class I minimum price was larger in 2000 than in 1999.⁴² As a result, the increase in milk production and decrease in fluid milk purchases that would have likely occurred within a compact region in 2000 would be expected to be greater than when farm-level prices were higher, as they were in 1999. This situation, in turn, would imply a greater increase in the supply of milk available for manufacturing dairy products in 2000, which, other things being equal, would lead to lower farm-level prices, reduced milk production, and lower farm-level revenue in noncompact regions.

However, on the basis of preliminary data for 2000, we estimate that the impacts of our three compact scenarios, which are based on our initial set of assumptions, are generally similar to our initial estimates for each scenario in 1999. Even though our estimates are generally similar, when we impose our more restrictive fluid milk trade assumption on our scenario of an expanded NEDC in conjunction with a southern compact, our estimates of the impact on the Upper Midwest are slightly greater for 2000 than for 1999. The similarities between our 2000 and 1999 estimates suggest that other factors may be affecting our estimates for 2000.

⁴¹This equates to about 0.07 cents per pound higher to about 2.8 cents per pound lower for butter.

⁴²That is, the difference will be larger as long as the compact price is expressed as a fixed amount per hundredweight, such as \$16.94 per hundredweight of milk as used by the NEDC, rather than as a fixed amount above any USDA milk marketing order Class I price.

In those years when noncompact farm-level prices are lower than compact farm-level prices, a factor offsetting the potentially larger interregional impacts of compacts is the ability to market noncompact region milk in compact regions for use as fluid milk. Farmers in noncompact regions whose milk is marketed in compact regions for use as fluid milk may be eligible to receive the compact regions' farm-level blend price for that milk. When noncompact region farm-level blend prices are low, the gain to farmers from shipping milk to compact regions is greater than when noncompact region prices are high. This gain can partially offset the larger negative impact that compacts can have on revenue in noncompact regions when farm-level prices are low because of the increased supply of milk available for manufacturing purposes. Table 7 provides our estimates of the impacts of the compact scenarios on 2000 farm-level revenue in the Upper Midwest region and all noncompact regions.⁴³

Table 7: Estimated Reduction in 2000 Farm-Level Milk Revenue in the Upper Midwest and in All Noncompact Regions Under the Compact Scenarios

Dollars in millions	Estimated reduction in 2000 farm-level revenue			
	Upper Midwest		All noncompact regions	
	Dollars	Percentage	Dollars	Percentage
Compact scenario				
NEDC	\$5	0.13	\$15	0.09
Expanded NEDC	17	0.44	67	0.41
Expanded NEDC and a southern compact	18	0.46	111	0.84
Expanded NEDC and a southern compact using a more restrictive fluid milk trade assumption	185	4.74	307	2.33

Source: GAO analysis using the University of Wisconsin-Madison dairy model.

Appendix VI contains our estimates of the interregional impacts of compacts on 2000 farm-level and wholesale-level dairy sector indicators.

⁴³We did not conduct sensitivity analyses on our 2000 estimates because of the preliminary nature of the 2000 data used to develop the estimates and because of potential data unreliability caused by dairy industry reactions to USDA's milk marketing order regulatory reforms.

Other Economic Analyses of Interregional Dairy Compacts Have Produced Similar Estimates

We reviewed other studies of the interregional impacts of the NEDC and larger dairy compacts and found that the results are comparable with ours, even though they used different methodologies. In a 1999 analysis, USDA estimated that the impact of the NEDC on farm-level prices and dairy farm revenue in noncompact regions during the years 2000 through 2005 would have been minimal.⁴⁴ For example, USDA estimated that in 2000 the NEDC would either have no impact on producer prices in noncompact regions or reduce producer prices by about 1 cent per hundredweight of milk, or by about 0.07 percent, depending on the noncompact region of the country. An analysis conducted by researchers at the University of California, Davis, also estimated that the NEDC reduced producer prices in noncompact regions by about 2 cents per hundredweight of milk, or by about 0.15 percent, on the basis of 1999 data.⁴⁵ The researchers concluded that the NEDC had such a small impact because the NEDC states produced such a small portion of the nation's milk supply. They also estimated that if the Compact had been expanded to include additional states that produced 9 percent of the nation's milk supply, producer prices in noncompact regions would have fallen by about 5 cents per hundredweight, or by about 0.35 percent. An analysis conducted by a researcher at Pennsylvania State University of an expanded NEDC in conjunction with a southern compact that produced 27 percent of the U.S. milk supply also concluded that compacts have a relatively small impact.⁴⁶ Using a range of assumptions about milk prices and data for 1997, the researcher projected that in 2000, the compact would decrease producer prices in noncompact regions by 4 to 14 cents per hundredweight, or by about 0.3 to 1 percent. Researchers at the University of Wisconsin-Madison, using a 1997 version of the Interregional Dairy Competition Model that we used in our analysis, also estimated that the NEDC had a

⁴⁴USDA Agricultural Marketing Service analysis provided to the Subcommittee on Livestock and Horticulture, Committee on Agriculture, U.S. House of Representatives, June 14, 1999.

⁴⁵Joseph V. Balagtas and Daniel A. Sumner, "The Effect of the Northeast Dairy Compact on Producers and Consumers, with Implications of Compact Contagion," Department of Agricultural and Resource Economics, University of California, Davis, 2001.

⁴⁶Kenneth W. Bailey, "Evaluating the Economic Impacts of Regional Milk Pricing Authorities: The Case of Dairy Compacts," *Agricultural and Resource Economics Review*, Vol. 29, No. 2, Oct. 2000, pp. 208-219.

small impact on producer prices.⁴⁷ This analysis estimated that farm-level prices would fall from 5 to 10 cents per hundredweight under an expanded NEDC scenario; 13 to 15 cents per hundredweight under a southern compact scenario; and 14 to 28 cents per hundredweight under a combined expanded NEDC and southern compact scenario. In an analysis of the impact of compacts prepared for the International Dairy Foods Association, one researcher estimated that the NEDC reduced farm-level revenue in noncompact regions in 2000 by about \$29 million, while an expanded 29-state compact would reduce farm-level revenue in noncompact regions by about \$374 million.⁴⁸

A more detailed discussion of these studies is included in appendix VII.

Concluding Observations

By affecting the minimum prices that dairy farmers within the Compact region receive for their raw milk, the NEDC may have enhanced dairy farmer income in the six NEDC states, and other states such as New York, that supply raw milk used for and sold as fluid milk in the NEDC states. It is not certain, however, whether the NEDC will help ensure the continued vitality of dairy farming in the New England dairy region. Data indicate that the number of dairy farms in the six states continued to decrease following the NEDC's establishment in July 1997. With regard to retail prices, the NEDC contributed to increased retail fluid milk prices within the six states, although the extent of its contribution is uncertain. Even so, available evidence and analyses indicate that the NEDC has had little impact on dairy farmers or consumers in noncompact regions.

Proposals are pending before the Congress for larger compacts. Our analysis shows that as the share of the U.S. milk supply covered by compacts increases, the estimated interregional impacts on farm-level prices and revenue increase as well. Furthermore, these estimated impacts could be different under new marketing conditions. Our estimates of the interregional impacts of compacts are based primarily on data from before January 2000, when USDA's regulatory reforms took effect. Data since

⁴⁷Tom Cox, Bob Cropp, and Will Hughes, "Interregional Analysis of Interstate Dairy Compacts," Department of Agricultural and Applied Economics, College of Agricultural and Life Sciences, University of Wisconsin-Madison, Marketing and Policy Briefing Paper No. 69, July 1999.

⁴⁸Allen Rosenfeld, *The Impacts of the Proposed Expansion of Dairy Compacts on Dairy Farm Revenue in Noncompact States*, M&R Strategic Services, Washington, D.C., May 2001. The International Dairy Foods Association represents dairy food manufacturers.

January 2000 indicate that the dairy industry is in the process of adjusting to these substantial changes. Equally as important, our estimates of the interregional impacts are based on three compact scenarios, the largest of which includes fewer than the number of states currently being considered for inclusion in dairy compacts. A thorough understanding of the impacts of these other potential compacts on dairy sector indicators cannot be developed until sufficient data become available following the dairy industry's adjustment to regulatory reform.

Agency Comments and Our Response

We provided USDA and the Executive Director of the NEDC with a draft of this report for review and comment. On September 5, 2001, we met with USDA's Chief Economist, Dairy Programs, Agricultural Marketing Service, and other officials from USDA's Agricultural Marketing Service, Economic Research Service, Farm Service Agency, Food and Nutrition Service, National Agricultural Statistics Service, and the Department's Office of the Chief Economist to obtain their oral comments. USDA officials stated that they recognized the difficulty of undertaking a study of this nature and said that our work represents a reasonable effort to estimate the intraregional and interregional impacts of dairy compacts. They provided a number of technical corrections and suggestions, which we incorporated as appropriate.

We also discussed the draft report with the NEDC Executive Director, who stated that we had dealt with the issues in a constructive and comprehensive manner. The NEDC Executive Director also provided us with written comments. While concurring with our estimate of the interregional impacts of the NEDC, the Executive Director expressed concern that the University of Wisconsin-Madison dairy model did not measure the benefits that New York dairy farmers receive when they supply milk to the NEDC states. We concur that the model does not measure the impacts of compacts on noncompact states that are within the same region as compact states. As the model is designed, New York and the NEDC states, as well as several other states, are included in the same (Northeast) region. The NEDC Executive Director's written comments and our detailed responses appear in appendix VIII.

We performed our work between September 2000 and September 2001 in accordance with generally accepted government auditing standards. Appendix I contains a detailed description of our scope and methodology.

We are sending copies of this report to the Senate Committee on Agriculture, Nutrition, and Forestry; the House Committee on Agriculture; other appropriate congressional committees; the Secretary of Agriculture; the Executive Director of the NEDC; the Director, OMB; and other interested parties. We will also make copies available to others upon request.

Please contact me at (202) 512-3841 if you or your staff have any questions about this report. Another GAO contact and key contributors to this report are listed in appendix IX.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Lawrence J. Dyckman". The signature is fluid and cursive, with the first name being the most prominent.

Lawrence J. Dyckman
Director, Natural Resources
and Environment

Appendix I: Objectives, Scope, and Methodology

In May 2000, Senator Herbert Kohl requested that we examine the economic impacts of the Northeast Interstate Dairy Compact (NEDC) and other potential compacts on a variety of dairy sector indicators. Specifically, because legislation authorizing the Compact is to expire on September 30, 2001, and the Congress is considering legislative alternatives for reauthorizing the NEDC and authorizing other states to enter into such compact arrangements, Senator Kohl asked us to provide information on

- the intraregional impacts of the NEDC (that is, within the six NEDC states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) on dairy sector indicators such as (1) retail milk prices, (2) milk producer income, (3) dairy farm structure, (4) milk production, and (5) milk consumption;
- the impact of the NEDC on the costs to the federal government of its milk price support and nutrition assistance programs;¹ and
- the interregional impacts of the NEDC, an expanded NEDC, and an expanded NEDC in conjunction with a southern compact (that is, on noncompact milk-producing regions) on selected indicators such as farm-level and wholesale-level indicators such as prices, production, and revenue.²

NEDC's Intraregional Impacts

To determine the intraregional impacts of the NEDC, we sought, but did not find, a readily usable economic model that comprehensively estimates these impacts while holding constant other factors that also affect the selected dairy sector indicators. Further, due to time and resource constraints, we were not able to develop a model or series of models to estimate these impacts. As a result, we analyzed federal, state, and other

¹The U.S. Department of Agriculture's (USDA) milk price support program indirectly ensures a minimum price for milk. Under the program, USDA offers to purchase cheddar cheese, nonfat dry milk, and butter at specified prices. USDA's nutrition assistance programs include the Special Supplemental Nutrition Program for Women, Infants, and Children; the School Breakfast and Lunch Programs; and the Food Stamp Program.

²For purposes of our analysis, the expanded NEDC includes the Compact's current member states plus Delaware, Maryland, New Jersey, New York, and Pennsylvania. The southern compact would include Alabama, Arkansas, Georgia, Kansas, Kentucky, Louisiana, Missouri, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. As of the end of February 2001, these states had enacted laws authorizing their entry into such compacts should the Congress establish them. While West Virginia has also enacted such a law, we did not include that state in our analysis because of modeling difficulties. App. II provides a discussion of our model.

data on these indicators, for a period of time before and after the NEDC's minimum pricing regulations became effective, to determine any changes in historic trends in the NEDC states. In each case, we also obtained these data for the rest of the United States so that we could compare trends in New England with those in the rest of the country. We also reviewed available studies on the NEDC's potential impacts on the indicators.

Specifically, to determine the impacts on retail milk prices, we obtained and analyzed retail milk price data from (1) A.C. Nielsen, a private data collection and analysis company, for the Boston market as well as for other major U.S. cities for November 1996 through September 2000;³ (2) the departments of agriculture in Connecticut, Maine, and New Hampshire for November 1996 through October 2000; and (3) the International Association of Milk Control Agencies for those states that have independent milk pricing agencies for January 1994 through November 2000. We also reviewed available economic analyses of the NEDC's impact on retail milk prices and interviewed USDA's Agricultural Marketing Service and NEDC officials to obtain their views on the NEDC's impact on retail milk prices.

To examine the intraregional impacts of the NEDC on milk producer income, we compared USDA's Economic Research Service balance sheet and income statement data from 1991 through 1999 for a representative composite dairy farmer in the Service's northeastern region with data for a farmer located outside the northeastern region. The Economic Research Service's northeastern region includes Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. States outside the northeastern region include all states with the exception of these 11 states and Alaska and Hawaii. The Service was not able to provide data for a representative composite farmer in the six NEDC states alone because the sample size was not sufficiently large to produce reliable balance sheet and income data. The Economic Research Service develops these data through surveys of sampled farm operations. It collects data on operating costs—such as feed, equipment purchases, and product distribution—as well as data on returns, such as income received from sales of field crops and livestock. The Service uses information obtained from sampled farms to estimate the

³We obtained these data in the course of our work on *Dairy Industry: Information on Prices for Fluid Milk and the Factors That Influence Them* (GAO/RCED-99-4, Oct. 8, 1998) and *Dairy Industry: Information on Milk Prices and Changing Market Structure* (GAO-01-561, June 15, 2001).

average costs of milk production in the United States and in various regions in the country. Costs can vary significantly from farm to farm because of differences in farm location, size, and production practices. As a result, the costs and returns for an individual farm can vary considerably from the average. In addition to using Economic Research Service data to estimate the impact of the NEDC on farm income, we also estimated the average payment a licensed dairy farmer in one of the six NEDC states may have received between July 1997 and the end of calendar year 2000 as a result of the NEDC. To do this, we used (1) monthly NEDC balance sheets that reflect the total amount of milk eligible for the NEDC milk price and NEDC over-order producer price payment amounts available for dairy farmers, (2) USDA's National Agricultural Statistics Service milk production data for the six NEDC states, and (3) American Farm Bureau Federation data on the number of licensed dairies in the six states. To determine the average payment, we estimated what proportion of the milk eligible for the NEDC milk price could be attributed to a licensed NEDC dairy farmer's milk. We also reviewed available economic analyses of the potential impacts of the NEDC on dairy farmer income. Last, we obtained data developed by the NEDC commission on amounts distributed to farmers as a result of the Compact, and its assessment of the Compact's impact on farmer income.

To determine the intraregional impacts of the NEDC on dairy farm structure, we obtained National Agricultural Statistics Service data on the total number of cows in the NEDC and the rest of the United States, as well as state-by-state data on the number of farms having at least one milk cow between 1992 and 2000. We obtained data from the American Farm Bureau Federation on the number of licensed dairies in the United States, by state, between 1992 and 2000. We also reviewed information on factors that affect the structure of dairy farms, and interviewed officials from the Agricultural Marketing Service, the Economic Research Service, the National Agricultural Statistics Service, and the NEDC commission to obtain their views of the Compact's impacts on farm structure.

To determine the intraregional impacts of the NEDC on milk production, we reviewed National Agricultural Statistics Service data on the average amount of milk produced by state and the average amount of milk produced per dairy cow between 1993 and 2000. We also reviewed available economic analyses of the impacts that the NEDC may have had on milk production. In addition, we interviewed officials from the Agricultural Marketing Service, the National Agricultural Statistics Service, and the NEDC to obtain their views on the NEDC's impact on milk production.

To examine the intraregional impacts of the NEDC on milk consumption, we reviewed Agricultural Marketing Service data on the total amount of sales of packaged fluid milk products in federal milk marketing orders and California between 1996 and 1999. Such sales are representative of the consumption of fluid milk products and account for about 93 percent of fluid milk sales in the United States. In addition, we reviewed data on factors affecting milk consumption and available economic studies of the NEDC's impact on milk consumption.

NEDC's Impacts on Federal Programs

To examine the impacts of the NEDC on the costs of the federal government's milk price support program, we reviewed USDA Farm Service Agency analyses of estimated amounts of milk production in the six NEDC states compared with the rest of the United States. We also reviewed USDA and Compact data on payments made to USDA by the NEDC. In addition, we interviewed Farm Service Agency and NEDC officials to obtain information on payments made by the NEDC. To examine the intraregional impacts on nutrition assistance programs, we interviewed USDA Food and Nutrition Service officials and obtained that agency's analyses of the potential impact of the NEDC on its programs. We also interviewed officials responsible for each of the six states' Special Supplemental Nutrition Program for Women, Infants and Children and school nutrition programs. Finally, we reviewed available economic analyses of the estimated impact of the NEDC on nutrition assistance programs.

Compacts' Interregional Impacts

To examine the interregional impacts—that is, the economic impacts in other regions of the country—of the NEDC, an expanded NEDC, and an expanded NEDC in conjunction with a southern compact, we conducted policy simulations using the University of Wisconsin-Madison's Dairy Sector Interregional Competition Model calibrated to reflect the dairy industry in 1999 (IRCM99). We contracted with the University to have Dr. Thomas L. Cox, Professor of Agricultural and Applied Economics and a primary developer of the model, conduct the policy simulations. Working with Dr. Cox and consulting with other prominent dairy economists from different regions of the country, we developed a set of parameters for use in simulating different compacts' impacts on dairy sector indicators.

We modeled three different compacts—the NEDC, an expanded NEDC, and an expanded NEDC in conjunction with a southern compact—consisting of an increasing number of states. The states in the NEDC are Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and

Vermont. The states that we assumed to be included in the expanded NEDC are these six states and Delaware, Maryland, New Jersey, New York, and Pennsylvania. The states that we assumed to be included in the expanded NEDC in conjunction with a southern compact are the above 11 states and Alabama, Arkansas, Georgia, Kansas, Kentucky, Louisiana, Missouri, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. The above states included in an expanded NEDC and a southern compact were selected because they had enacted legislation, as of the end of February 2001, that authorized their entry into a dairy compact should the Congress establish one. While West Virginia had also enacted such legislation as of the end of February 2001, we did not include that state in a southern compact for the purposes of our analysis because of the difficulties associated with accounting for that state's milk production in compact versus noncompact regions of the country. Furthermore, because West Virginia produces a relatively small amount of milk in comparison with other states included in compact regions, the effect of excluding West Virginia is negligible.

The agricultural economists and other dairy experts with whom we consulted concerning model specifications and assumptions include the following:

- Kenneth W. Bailey, Associate Professor, Department of Agricultural Economics and Rural Sociology, the Pennsylvania State University;
- Joseph V. Balagtas, Research Assistant, Department of Agricultural and Resource Economics, University of California, Davis;
- Scott Brown, Research Assistant Professor, Food and Agricultural Policy Research Institute, the University of Missouri;
- Harold M. Harris, Jr., Professor, Department of Agricultural and Applied Economics, Clemson University;
- Harry Kaiser, Professor, Department of Applied Economics and Management, Cornell University;
- Richard L. Kilmer, Professor, Food and Resource Economics, the University of Florida;
- Leigh Maynard, Assistant Professor, Department of Agricultural Economics, the University of Kentucky;
- Neil Pelsue, Extension Associate Professor, Department of Community Development and Applied Economics, the University of Vermont;
- William A. Schiek, Economist, Dairy Institute of California;
- Mark Stephenson, Senior Extension Associate, Department of Applied Economics and Management, Cornell University;
- Daniel Sumner, Professor, Agricultural and Resource Economics Department, University of California at Davis;

- Cameron S. Thraen, Associate Professor, Agricultural, Environmental, and Development Economics, the Ohio State University; and
- Christopher Wolf, Assistant Professor, Department of Agricultural Economics, Michigan State University.

In addition, we consulted with several agricultural economists at USDA, including economists in the Office of the Chief Economist and the Economic Research Service.

Our process for developing the assumptions that we used to model the interregional impacts of dairy compacts included reviewing economic literature to identify estimates of (1) regional supply elasticities, (2) wholesale demand elasticities, (3) and transportation costs. We also obtained data on market over-order premiums and compact over-order producer prices. Finally, we interviewed USDA and other officials to obtain information on regulations governing milk shipments among federal marketing orders and noncompact and compact regions.

After identifying assumptions for modeling the three different compact scenarios, we developed an initial estimate of the economic impacts of the different compacts. We then conducted sensitivity analyses by varying the values of our key assumptions. We provided our preliminary estimates to several agricultural economists to obtain their views, and incorporated many of their comments in subsequent modeling before developing our final range of estimates. Our final estimates of the impacts of the different compact scenarios are presented as ranges that include our initial estimates as well as estimates from our sensitivity analyses. (A detailed discussion of the model and assumptions, data, and data sources used is included in app. II.)

In addition to modeling the interregional impacts of the different compact scenarios, we reviewed economic analyses that have been conducted on the potential interregional impacts of dairy compacts. We present these reviews in appendix VII.

Appendix II: Methodology for Estimating the Interregional Impacts of Dairy Compacts

This appendix describes our methodology for estimating the interregional impacts of three compact scenarios: the six-state NEDC, an expanded NEDC, and an expanded NEDC in conjunction with a southern compact. To estimate the interregional impacts, we contracted with the University of Wisconsin-Madison to use the Dairy Sector Interregional Competition Model (IRCM), which is an interregional spatial market equilibrium model of the U.S. dairy sector. This model is useful in estimating the impacts of different dairy policy options, such as dairy compacts. Dr. Thomas L. Cox, Professor of Agricultural and Applied Economics at the university and a primary developer of the model, conducted the policy simulations for us. This appendix describes

- the structure of the IRCM and how it estimates the interregional impacts of dairy compacts,
- data and data sources used for conducting policy simulations of different compact scenarios,
- how we calibrated a baseline for 1999,
- details of each scenario that we modeled,
- parameter values for our baseline and initial estimates,
- how we varied key assumptions to test the sensitivity of our initial estimates, and
- the limitations of the model.

The results of our different policy simulations and sensitivity analyses are presented in appendixes V and VI.

IRCM Structure

The IRCM is a hedonic spatial equilibrium model of the U.S. dairy sector that can be used to estimate the impacts of policy or program changes, such as the establishment of compacts.¹ The model allocates the production and consumption of raw milk and nine other different dairy commodities among 12 regions of the country and solves for the trade flows of these commodities among those regions to achieve a spatial equilibrium. Using nonlinear programming techniques, the model solves to ensure an efficient regional distribution of the different dairy commodity

¹A hedonic model is one that separates products, such as farm milk, fluid milk, and manufactured dairy commodities, into their components or characteristics. Milk and dairy commodities are composed of different amounts of milk fat, protein, and carbohydrates. The IRCM incorporates these components using a vertical markets approach that transforms the primary product—raw milk—into fluid milk and manufactured dairy commodities.

resources, given the demand for and supply of those resources at various prices.

On a more technical basis, the model solution maximizes the sum of producer and consumer welfare minus processing, transportation, and U.S. Department of Treasury costs.² The model defines aggregate wholesale dairy product demand and farm-level milk supply functions as follows:

$$(1a) \quad D_i = \sum_{k=1}^K \int_0^{z_{ik}} p_{ik}^d(\mathbf{q}) d\mathbf{q}$$

and

$$(1b) \quad S_i = \int_0^{w_i} p_i^s(\mathbf{q}) d\mathbf{q}$$

where $p_i^s(w_i)$ is the price-dependent supply function for milk in the i -th region, with $\partial p_i^s / \partial w_i > 0$, $i = 1, \dots, J$, and $p_{ik}^d(z_{ik})$ is the price-dependent demand function for the k -th dairy product consumed in the i -th region, with $\partial p_{ik}^d / \partial z_{ik} < 0$, $i = 1, \dots, J$, $k = 1, \dots, K$. Equation (1a) is the sum of the areas under the K demand curves in the i -th region. This can be interpreted as a measure of consumer benefits generated by the K commodities in the i -th region. Equation (1b) is the area under the supply curve, a measure of milk production cost in the i -th region. The term $(D_i - S_i)$, consumer benefits minus total production costs in the i -th region, minus transportation costs, is a measure of net social benefits to farmers and consumers in each region. Federal government costs are then subtracted.³ Two steps are used to create an IRCM that models the impact of compacts in 1999: IRCM99. First, the model is calibrated to 1999 data so that baseline estimates of key dairy sector measures of prices, production,

²These last costs are incurred by the federal government through USDA's milk price support program. Under this program, USDA purchases manufactured dairy commodities—such as cheese, butter, and nonfat dry milk—at specified prices, thereby indirectly supporting farm-level prices of milk used to manufacture these commodities.

³For a more complete technical description of the optimization process, see T.L. Cox and J.P. Chavas, "An Interregional Analysis of Price Discrimination and Domestic Policy Reform in the U.S. Dairy Sector," *American Journal of Agricultural Economics*, 83 (1): 89-106.

consumption, and trade flows can be obtained on a regional basis. Second, simulation analyses are performed to estimate the impacts of the different compact scenarios.

In the IRCM99, milk production and dairy product consumption in the country are divided into 12 regions that are based on the current 11 USDA federal milk marketing orders and California. In addition, the IRCM99 accounts for net private stocks, net government stocks/removals, and U.S. imports and exports.⁴ Table 8 compares the IRCM99 regions, the corresponding USDA marketing orders or states before January 2000, states included in the IRCM99 regions, and states that had enacted legislation as of February 2001 authorizing entry into any congressionally authorized dairy compact.⁵

Table 8: USDA's Marketing Orders Before January 2000, States in the IRCM99 Regions, and States That Had Authorized Entry Into a Compact by February 2001

IRCM99 regions (and pricing points)	Federal milk marketing orders before January 2000	States included in the IRCM99 regions	States that had enacted legislation authorizing entry into a compact as of February 2001
Northeast (Boston)	New England, New York-New Jersey, Mid-Atlantic	Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
Appalachia (Charlotte)	Carolina, Tennessee Valley, Louisville-Lexington-Evansville	Kentucky, North Carolina, South Carolina, Tennessee, Virginia	Kentucky, North Carolina, South Carolina, Tennessee, Virginia
Florida (Tampa)	Upper Florida, Tampa Bay, Southeast Florida	Florida	^a
Southeast (Atlanta)	Southeast	Alabama, Arkansas, Georgia, Louisiana, Mississippi	Alabama, Arkansas, Georgia, Louisiana, Mississippi

⁴U.S. dairy exports are assumed to face a perfectly elastic demand schedule at 1999 world prices; that is, the model assumes that the United States exhibits “small country effects” with respect to world dairy exports. This assumption is made because U.S. exports are a small share of world dairy trade.

⁵In January 2000, USDA reorganized its milk marketing orders and reconfigured the then-existing 31 orders into 11. The significance of this is that much of the dairy sector indicator data compiled before January 2000 are organized into these 31 orders, which do not necessarily correspond to the 11 orders. USDA also revised its formulas for setting the minimum prices that processors must pay for milk.

**Appendix II: Methodology for Estimating the
Interregional Impacts of Dairy Compacts**

IRCM99 regions (and pricing points)	Federal milk marketing orders before January 2000	States included in the IRCM99 regions	States that had enacted legislation authorizing entry into a compact as of February 2001
Mideast (Cleveland)	Michigan Upper Peninsula, southern Michigan, East Ohio-West Pennsylvania, Ohio Valley, Indiana	Indiana, Michigan, Ohio, West Virginia	West Virginia
Upper Midwest (Chicago)	Chicago Regional, Upper Midwest	Minnesota, North Dakota, Wisconsin	^a
Central (Kansas City)	Iowa, Nebraska-West Iowa, Eastern South Dakota, Central Illinois, Southern Illinois, East Missouri, Southwest Plains, Eastern Colorado, Greater Kansas City	Colorado, Illinois, Kansas, Missouri, Nebraska, Oklahoma, South Dakota	Kansas, Missouri
Southwest (Dallas)	Texas, New Mexico-West Texas	New Mexico, Texas	^a
Western (Salt Lake City)	Southwest Idaho-Eastern Oregon, Great Basin, Western Colorado	Idaho, Montana, Nevada, Utah, Wyoming	^a
Pacific Northwest (Seattle)	Pacific Northwest	Oregon, Washington	^a
Arizona-Las Vegas (Phoenix)	Central Arizona	Arizona	^a
California (San Francisco)	^b	California	^a

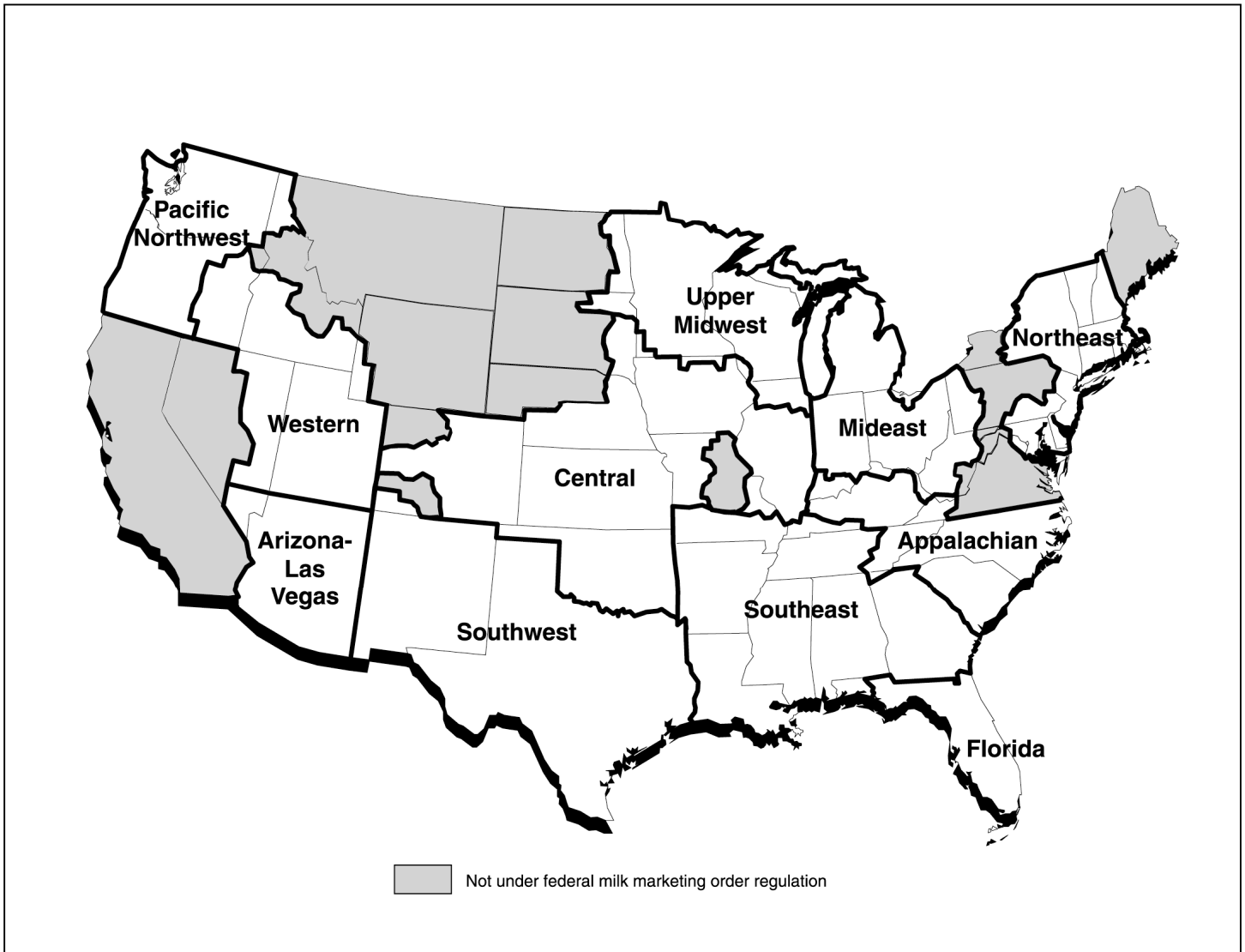
^aNo states in this region had enacted legislation as of Feb. 2001 authorizing entry into a compact.

^bCalifornia's milk is not regulated under a USDA milk marketing order. Rather, the state regulates milk processed and sold in that state.

Source: University of Wisconsin-Madison.

Figure 1 shows USDA's marketing orders, the corresponding IRCM99 regions, the corresponding states included in the IRCM 99 regions, and states that had enacted legislation authorizing entry into a compact as of February 2001. With respect to modeling the impact of compacts, the states that have enacted legislation are part of four different federal milk marketing orders and their corresponding IRCM99 regions. Because of this, both compact and noncompact states are included in some IRCM99 regions when modeling some compact alternatives. This can influence the interpretation of modeled results. For example, some states that have enacted legislation authorizing entry into a dairy compact, such as West Virginia, which is part of the Mideast Marketing Order, produce only a small portion of the milk produced by dairy farmers in that marketing order and hence, estimating the effect of West Virginia's participation in a compact, would be difficult.

Figure 1: USDA's Milk Marketing Orders



Source: USDA's Agricultural Marketing Service.

IRCM99 solves for regional prices and production levels for farm-level raw milk on the basis of three milk components: milk fat, protein, and carbohydrates (primarily lactose). The model also solves for regional wholesale-level price, supply, demand, and trade flows for the following dairy products: (1) fluid milk, (2) soft dairy products, (3) American cheese, (4) Italian cheese, (5) other cheese, (6) butter, (7) frozen dairy products,

(8) other manufactured dairy products (a residual product category), and (9) nonfat dry milk. The model uses a fixed component composition that converts farm milk into fluid milk and different types of manufactured dairy commodities, as shown in table 9.

Table 9: IRCM99 Dairy Product Fixed Component Composition

Dairy commodity	Milk component		
	Milk fat (percentage)	Protein (percentage)	Carbohydrates (percentage)
Fluid milk	2.0	3.3	4.7
Soft dairy products	11.4	4.9	4.2
American cheese	33.2	24.6	1.5
Italian cheese	22.7	20.8	2.4
Other cheese	28.1	25.7	2.4
Butter	81.1	0.9	0.1
Frozen dairy products	9.5	3.5	4.9
Other manufactured products	0.5	12.1	52.0
Nonfat dry milk	0.7	35.6	52.1

Source: University of Wisconsin-Madison.

The regional supply of milk components (milk fat, protein, and carbohydrates) must be greater than or equal to the regional utilization of these milk components by the processing sector to ensure regional component supply/demand balance. The marginal value of this restriction (given by the corresponding Lagrange multiplier) measures the shadow value of each milk component in each region.⁶ The model subsequently generates empirical estimates of regional shadow prices for each milk

⁶One approach for solving a constrained optimization problem is the Lagrange-multiplier method. This technique involves finding the maximum or minimum value of an objective function (such as utility maximization) subject to another expression that defines a constraint (i.e., a budget constraint). In general, given the objective function $z = f(x,y)$ subject to the constraint, $g(x,y) = c$, the Lagrangean function is defined as $Z = f(x,y) + \lambda [c - g(x,y)]$. This augmented expression includes a variable called the Lagrange multiplier, λ . This method has many comparative static properties, including the fact that the Lagrange multiplier, λ , provides a measure of the sensitivity of Z , the objective function, to changes or shifts in the magnitude of the constraint. In a linear programming context, the Lagrange multiplier can be interpreted as a shadow price, or imputed price, the maximum amount that someone would be willing to pay for the next unit of an input. In the current analysis, the model solution is characterized as the saddle point of a Lagrangean function, in which the Lagrange multipliers correspond to trade flow constraints across regions (See footnote 3 in this appendix).

component. The model also generates market prices that are consistent with milk component pricing for each commodity in each region.

Modeling Classified Pricing

The basic structure of the IRCM99 is consistent with a competitive market equilibrium, where, at the optimum, the market price equals the marginal cost of each commodity. However, USDA and California use a system of classified pricing for milk that influences pricing in ways that differ from the competitive outcome. Therefore, to incorporate the classified pricing system, price wedges are used in the model to represent the difference between the minimum price of milk in a particular class and the minimum price of milk in a reference class. In the model, the reference class for USDA's milk marketing orders is Class III, and the reference class for California is 4b.^{7,8} For example, the price wedge for raw milk used for fluid milk is the difference between the price for milk used for Class I (fluid) and the price for milk used for Class III (cheese), plus potential over-order premiums.⁹ For USDA's milk marketing orders in 1999, we calculated the price of raw milk used for manufacturing (Classes II, III, and IV) as the implicit price of milk used for Class II and Class III in the Upper Midwest Milk Marketing Order (portions of Illinois, Iowa, Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin). USDA milk marketing order prices for nonfat dry milk and butterfat differentials are computed by using USDA formulas and wholesale commodity prices. California milk prices are calculated for milk used in fluid products (Class 1); milk used for heavy cream, cottage cheese, yogurt, and sterilized products (Class 2); milk used in ice cream and other frozen dairy products (Class 3); milk used in butter and nonfat dry milk (Class 4a); and milk used in cheese

⁷The reference class 4b is comparable to USDA's Class III, which is the classification for milk used for manufacturing hard cheese.

⁸California's Class 4a is for milk used to manufacture butter and nonfat dry milk and corresponds to USDA's Class IV.

⁹When reviewing and commenting on our draft report, USDA officials suggested that a different method of calculating the Class I mover that took into account lags would be more consistent with the method that USDA uses. We did not use that method originally because the IRCM99 is an annual, not monthly, model. However, as a result of USDA officials' comments, we re-ran some specifications of the model using a method for calculating the Class I mover that more closely resembles USDA's method. The estimates of the impacts of the different compact scenarios that we obtained using 1999 and 2000 data were very similar to the estimates in our draft report and, therefore, we did not change the estimates in preparing our final report. In both sets of model runs, we used a consistent method for measuring the Class I mover in our baseline and in our compact scenarios. The choice of method for measuring the Class I mover, therefore, did not have a large impact because we are estimating the impacts of compacts by estimating deviations from a baseline.

other than cottage cheese (Class 4b). We computed California price wedges by using administered formulas for the fat and solids-not-fat component prices by class. These component prices are computed from wholesale commodity prices for butter, nonfat dry milk, and cheese that are endogenous to the model. Because Class 4a prices were lower than Class 4b prices in 1999, this method implies a negative price wedge in California for Class 4a. Finally, because dairy farmers are paid blend prices based on USDA and California's classified pricing systems, we incorporated price wedges that represent these blend prices in each of the respective modeled regions.

Modeling Producer Settlement Pools

We took into account pooling regulations for both USDA and the NEDC in modeling "producer settlement pools."¹⁰ The first step in this calculation is to compute total revenues from regional milk production under the assumption that all raw milk is pooled in the region where it is produced. This is done in each region by multiplying the price wedge for each commodity by the quantity of raw milk used to produce that commodity. However, by shipping some of their milk to another order, producers can sometimes become eligible to receive the minimum prices in the destination order for their milk, which might be higher than the minimum prices in their "home" order. As a result, in estimating how the proceeds from raw milk sales are distributed to producers, through producer settlement pools, the model can adjust its initial estimate to take into account that not all raw milk is pooled in the order where it is produced.

When we estimated the impacts of the compact scenarios, no such adjustments were necessary because the model's solutions did not yield

¹⁰"Producer settlement pool" is the amount of money available for payment to producers. Processors pay into the pool amounts based on the class of product for which they use the milk. Producers draw from the pool an amount that is based on the blend price for milk within each marketing order. The blend price is the monthly weighted average of the prices of milk used in the different classes in that marketing order, with the weights determined by the amount of milk sold for each class of use. A producer's milk is qualified to be pooled on a particular federal milk marketing order by its association with a pool plant that is regulated by the order. Once a producer's milk is qualified to be pooled on the order, it is not necessary for all of that producer's milk to be delivered to a plant regulated by that specific order in order to qualify for the blend price. Each marketing order has its own regulations establishing the amount of milk that must be delivered to a regulated pool plant in order to qualify for the marketing order's blend price. The NEDC also regulates the amount of milk that must be delivered to plants within the six states and to plants outside the six states that ship milk to the NEDC states in order for the processors to qualify for the NEDC price.

any pooling of raw milk outside any home order. As a result, before taking into account further adjustments described below, the revenue received from milk sales from farmers in any order were the same as they would have been had no adjustment been made and all producers' receipts from milk sales were based on the prices in their home order. We recognize that some milk is pooled outside the order in which it is produced. However, we did not have data on shipments of raw milk by individual farmers or shipments of fluid milk or other dairy commodities by individual processing plants, which limited the model's ability to estimate raw milk movements across orders.¹¹ Instead, the model solution includes substantial movement of packaged fluid milk to balance supply and demand across orders. If enough packaged fluid milk moves out of an order, the model's structure allows for further adjustments to be made in the producer settlement pools, but there was no region affected in this way.¹²

However, the producer settlement pools were adjusted for the movement of packaged fluid milk into compact regions under the various scenarios that we analyzed. These adjustments were made because processors in exporting regions shipping packaged fluid milk into compact regions are required to pay a compact premium on this milk. Similarly, these processors can return to their producers an amount equal to the compact premium multiplied by the percentage of the compact region's raw milk that is sold for Class I use.

Data Used in the Model

We obtained data for our analysis from several sources, including USDA, the state of California, academia, and research institutes. We obtained most of the price and production data from USDA and the California Department of Food and Agriculture. In particular, we obtained farm-level milk data from USDA's Milk Production, Disposition and Income—1999 Summary, and commodity production data from USDA's Dairy Products—1999 Summary. We obtained commodity price, stock, import, export, and

¹¹Since we are estimating the impacts of compacts by estimating deviations from a baseline that include the same limitation, it is not clear that this limitation has much of an effect on our estimates.

¹²The model requires an adjustment to be made if more than 40 percent of the milk packaged in an order is exported to another region. This threshold was chosen as a proxy for the requirement that an adjustment be made if a plurality of an order's packaged milk was sold in another region.

government utilization data from monthly USDA Economic Research Service “Livestock, Dairy, and Poultry” reports. We obtained federal milk marketing order data from USDA’s Agricultural Marketing Service Federal Market Order Milk Statistics—1999 Annual Summary. In addition, we obtained data on price support levels from USDA’s Commodity Credit Corporation.

We obtained regional projections of wholesale dairy product demand by using aggregate wholesale demand functions for the United States and regional population data. We obtained component yields—the amount of milk fat, protein, and carbohydrates per unit of milk and wholesale dairy product—from a component accounting exercise that fully allocates 1999 aggregate milk and dairy product production.¹³ We obtained regional farm-level milk supply elasticities from the Food and Agricultural Policy Research Institute and product demand elasticities from research conducted by Cox et al.¹⁴ and USDA’s Economic Research Service.¹⁵ These demand elasticities were estimated using USDA aggregate national time series data on commercial disappearance and wholesale prices. The estimates are consistent with a complete demand system specification covering all major food groups and products. We obtained data on refrigerated and nonrefrigerated transportation and assembly costs for farm milk from dairy researchers at Cornell University.¹⁶ We used USDA estimates of dairy manufacturing costs to incorporate processing costs into our analysis.

1999 Baseline Calibration

We calibrated the model to yield solutions that are close to the observed 1999 data for farm-level and wholesale-level measures of prices and production and to link key regional prices to commodity reference prices used by USDA and California, such as those reported by the Chicago

¹³R. Selinsky, T.L. Cox, and E.V. Jesse, “Estimation of U.S. Dairy Product Component Yields.” University of Wisconsin-Madison, Agricultural Economics Staff Paper No. 355, Sept. 1992.

¹⁴T.L. Cox, D. Lewis, and R. Selenski, *Estimation of Wholesale Demand for U.S. Dairy Products*, University of Wisconsin-Madison, Department of Agricultural Economics Mimeo, 1992.

¹⁵K.S. Huang, *A Complete System of U.S. Demand for Food*, USDA, Economic Research Service, Technical Bulletin No. 1821, Sept. 1993.

¹⁶The methodology used to generate these cost estimates is documented at <http://cpdmp.cornell.edu/CPDMP/Pages/Publications/Pubs/rb9709.pdf>.

Mercantile Exchange and USDA’s National Agricultural Statistics Service. Tables 10 through 13 compare the 1999 model solutions with actual 1999 data for farm-level prices, farm-level production, wholesale commodity prices, and wholesale commodity production, respectively. At the farm level, the simulated values calibrate closely with the actual data—all discrepancies are 0.5 percent or less, except for the farm-level price in California, for which the discrepancy is about 1 percent. At the wholesale level, the price discrepancies for major products (fluid milk, American and Italian cheeses, butter, and nonfat dry milk) are less than about 3 percent, while production discrepancies are 3.5 percent or less.

Table 10: IRCM99 Farm-Level Price Calibration

IRCM99 region	Farm-level prices in 1999 (dollars per hundredweight)		Difference between actual and modeled 1999 farm-level prices	
	Actual	Modeled	Dollars per hundredweight	Percentage
Northeast	\$15.21	\$15.15	\$(0.06)	(0.4)
Appalachia	16.02	15.96	(0.06)	(0.4)
Florida	17.20	17.13	(0.07)	(0.4)
Southeast	16.07	16.00	(0.07)	(0.4)
Mideast	14.70	14.64	(0.06)	(0.4)
Upper Midwest	13.88	13.81	(0.07)	(0.5)
Central	14.27	14.21	(0.06)	(0.4)
Southwest	14.54	14.48	(0.06)	(0.4)
West	13.23	13.17	(0.06)	(0.5)
Northwest	14.90	14.84	(0.06)	(0.4)
California	13.12	12.97	(0.15)	(1.1)
Arizona	13.80	13.75	(0.05)	(0.4)
United States	14.27	14.23	(0.04)	(0.3)

Note: Numbers in parentheses are negative.

Source: University of Wisconsin-Madison.

Table 11: IRCM99 Farm-Level Production Calibration

IRCM99 region	Farm-level production in 1999 (pounds in millions)		Difference between actual and modeled 1999 farm-level production	
	Actual	Modeled	Pounds in millions	Percentage
Northeast	29,205	29,178	(27)	(0.1)
Appalachia	6,450	6,435	(15)	(0.2)
Florida	2,393	2,389	(4)	(0.2)
Southeast	3,553	3,547	(6)	(0.2)

Appendix II: Methodology for Estimating the Interregional Impacts of Dairy Compacts

IRCM99 region	Farm-level production in 1999 (pounds in millions)		Difference between actual and modeled 1999 farm-level production	
	Actual	Modeled	Pounds in millions	Percentage
Mideast	12,253	12,237	(16)	(0.1)
Upper Midwest	32,848	32,798	(50)	(0.2)
Central	14,879	14,852	(27)	(0.2)
Southwest	10,292	10,276	(16)	(0.2)
West	8,869	8,853	(16)	(0.2)
Northwest	7,145	7,133	(12)	(0.2)
California	30,408	30,451	(43)	(0.1)
Arizona	2,918	2,914	(4)	(0.1)
United States	161,213	161,063	(150)	(0.1)

Note: Numbers in parentheses are negative.

Source: University of Wisconsin-Madison.

Table 12: IRCM99 Aggregate Wholesale Commodity Price Calibration

Dairy commodity	Wholesale commodity price in 1999 (dollars per hundredweight)		Difference between actual and modeled 1999 commodity prices	
	Actual	Modeled	Dollars per hundredweight	Percentage
Fluid milk	\$15.07	\$15.09	\$0.02	0.1
Soft dairy products	27.30	27.29	(0.01)	0
American cheese	139.84	139.20	(0.64)	(0.5)
Italian cheese	93.48	93.20	(0.28)	(0.3)
Other cheese	115.68	115.49	(0.19)	(0.2)
Butter	122.94	119.38	(3.56)	(2.9)
Frozen dairy products	21.41	21.38	(0.03)	(0.1)
Other manufactured products	27.36	27.68	0.32	1.2
Nonfat dry milk	101.78	102.63	0.85	0.8

Note: Numbers in parentheses are negative.

Source: University of Wisconsin-Madison.

Table 13: IRCM99 Aggregate Wholesale Commodity Production Calibration

Dairy commodity	Level of production in 1999 (pounds in millions)		Difference between actual and modeled 1999 levels of production	
	Actual	Modeled	Pounds in millions	Percentage
Fluid milk	55,039	55,020	(19)	0
Soft dairy products	6,068	5,986	(82)	(1.4)
American cheese	3,577	3,539	(38)	(1.1)
Italian cheese	3,143	3,176	33	1.0
Other cheese	578	598	20	3.5
Butter	1,275	1,274	(1)	(0.1)
Frozen dairy products	12,166	12,134	(32)	(0.3)
Other manufactured products	4,351	4,270	(81)	(1.9)
Nonfat dry milk	1,383	1,399	16	1.1

Note: Numbers in parentheses are negative.

Source: University of Wisconsin-Madison.

Because our baseline was calibrated to actual 1999 data, our original baseline values represented estimates for a time when the Compact was in place. As a result, we used the IRCM99 to estimate the impact of the NEDC by simulating the year 1999 without the NEDC and comparing those results with those obtained in our original baseline. That is, the estimated impacts of removing the Compact from our original baseline are interpreted as the estimated impacts of adding the Compact to a no-compact baseline, with the signs reversed. For each subsequent compact scenario, we used the IRCM99 to estimate the interregional impact of compacts. That is, we compared our estimates of farm-level and wholesale-level prices, production, and revenue in 1999 under each compact scenario with our estimates of what they would have been in that year without any compact. In effect, the no-compact scenario became our new baseline for comparison.

Compact Scenarios

We developed three compact scenarios: the NEDC, which includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; an expanded NEDC that also includes Delaware, Maryland, New Jersey, New York, and Pennsylvania; and an expanded NEDC in conjunction with a southern compact that includes Alabama, Arkansas, Georgia, Kansas, Kentucky, Louisiana, Missouri, Mississippi, North

Carolina, South Carolina, Tennessee, and Virginia. These states were included in the expanded NEDC and the southern compact on the basis that they had enacted legislation as of the end of February 2001 that would allow them to enter into a dairy compact, should the Congress enact legislation allowing them to do so. While West Virginia had also enacted such legislation as of the end of February 2001, we did not include it in our analysis of an expanded NEDC in conjunction with a southern compact because of the difficulty of modeling West Virginia as part of a southern compact, given that it would have been the only state in USDA's Mideast Marketing Order whose milk would fall under compact regulation. Since West Virginia produced less than 0.2 percent of the nation's milk supply in 2000, we do not believe that its omission significantly affects our estimates of the impact of the southern compact.

The IRCM99, as discussed previously, models different regions of the country based, in part, on USDA's milk marketing orders and California. Because of this, the states in the NEDC are incorporated as part of the IRCM99 Northeast region. This region encompasses the following states: Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont (and the District of Columbia). To account for the NEDC, we calculated the amount of milk produced by the six NEDC states as a percentage of the total amount of milk produced within the Northeast Milk Marketing Order. Therefore, while we are able to estimate the impact of the NEDC on other noncompact regions of the country that do not contain any compact states, we could not estimate the NEDC's impacts on other noncompact states within the Northeast region. Further, because we defined the impacts of the NEDC scenario to be based on the amount of milk produced by the six NEDC states, the impacts of this scenario do not account for milk that noncompact states, such as New York, may ship into the NEDC states. Further, reductions in revenue in noncompact states are also not accounted for. Thus, our estimate of the NEDC's impact on noncompact regions is a little smaller than would be expected had we been able to isolate the effects of noncompact and compact states within the same region.

Similarly, in our scenario of an expanded NEDC in conjunction with a southern compact, the IRCM99 has the compact region extending into four regions: the Appalachian, Central, Northeast, and Southeast. While this compact scenario fully includes the majority or all of the states encompassed by three of the four regions, one region—the Central—is not fully encompassed. The Central region includes the following seven states: Colorado, Illinois, Kansas, Missouri, Nebraska, Oklahoma, and South

Dakota. However, only two of these states—Kansas and Missouri—are assumed as part of a compact. As with our modeling of the NEDC, we calculated the amount of milk produced by the two states as a percentage of the total amount of milk produced within the Central region. Therefore, while we are able to estimate the impact of the expanded NEDC in conjunction with a southern compact on noncompact regions of the country that do not contain any compact states, we could not estimate this compact scenario's impact on the Central region. Similarly, under this compact scenario, we do not take into account the amount of milk that may be shipped into the compact states by bordering noncompact states in the Central region. Further, reductions in noncompact producer revenue in these noncompact states was also not accounted for. Thus, our estimate of the expanded NEDC in conjunction with a southern compact's impact on all noncompact regions combined is a little smaller than would be expected had we been able to isolate the effects of noncompact and compact states within the Central region.

Parameter Values for Our Baseline and Initial Estimates

We used specific parameter values to arrive at our baseline, or no-compact, scenario and initial estimates of the impacts of the different compact scenarios. We also used key assumptions regarding the amount of market-driven over-order premiums, compact producer price payment levels, and transportation costs, and the ability of milk to move from region to region.

Specifically, we used a milk price support payment amount, or price floor, of \$9.90 per hundredweight of milk, which equates to \$1.10 per pound for American cheese, 65 cents per pound for butter, and \$1.01 per pound for nonfat dry milk. In addition, we assumed medium-term, or 5-year, wholesale demand elasticities for fluid milk and other dairy products, as shown in table 14.

Table 14: Medium-Term Wholesale Demand Elasticities Used in Initial Estimates

Dairy commodity	Medium-term demand elasticity
Fluid milk	-0.144
Soft dairy products	-0.42
American cheese	-0.16
Italian cheese	-0.251
Other cheese	-0.477
Butter	-0.243
Frozen dairy products	-0.327

Dairy commodity	Medium-term demand elasticity
Other manufactured products	-0.276
Nonfat dry milk	-0.449

Source: Cox et al., 1992, and USDA's Economic Research Service.

We also assumed medium-term regional supply elasticities as shown in table 15.

Table 15: Medium-Term Regional Supply Elasticities Used in Initial Estimates

IRCM99 region	Medium-term supply elasticity
Northeast	0.258
Appalachia	0.641
Florida	0.408
Southeast	0.396
Mideast	0.317
Upper Midwest	0.312
Central	0.430
Southwest	0.388
West	0.424
Northwest	0.430
California	0.433
Arizona	0.389

Source: Food and Agricultural Policy Research Institute.

We also assumed that within a compact region, there was no market-driven over-order premium above the compact minimum price. This initial assumption represents a lower bound, and assumes that compact over-order producer price payments may have replaced, or become a substitute for, much of the market-driven over-order premiums in the compact region. We also assumed that the Class I price in a compact region, or the compact price, was \$16.94 per hundredweight of milk.

To better model the effect of pooling and to account for milk shipments from region to region and from noncompact to compact regions, we assumed that no more than 40 percent of any one region's packaged fluid milk could be shipped to another region without being pooled in the receiving region. We also assumed that a processor had to pay the compact over-order producer price into a compact pool for milk shipped into a compact region in order to receive a compact blend price for these fluid shipments. With these assumptions, we did not restrict milk flows from region to region or from noncompact to compact regions. We also used transportation costs as developed by researchers at Cornell University, with no adjustment.

Sensitivity Analyses

Following our initial analyses, we conducted additional analyses of the impacts of compacts by varying our initial parameter values or assumptions to determine how sensitive our initial estimates were to changes in key values or assumptions. Specifically, with respect to wholesale demand elasticities, we changed the medium-term elasticities used in our initial analyses to long-term, as shown in table 16, to determine what impact higher elasticities would have on our initial estimates.

Table 16: Long-Term Wholesale Demand Elasticities Used in the Sensitivity Analyses

Dairy commodity	Long-term demand elasticity
Fluid milk	-0.30
Soft dairy products	-0.907
American cheese	-0.625
Italian cheese	-0.741
Other cheese	-0.477
Butter	-0.42
Frozen dairy products	-0.42
Other manufactured products	-0.45
Nonfat dry milk	-0.60

Source: GAO, based on an analysis of pertinent agricultural economics literature.

In a separate analysis, we changed our regional supply elasticities to long-term, as shown in table 17, to determine if changes in long-term supply elasticities would affect our initial estimates.

Table 17: Long-Term Regional Supply Elasticities Used in the Sensitivity Analyses

IRCM99 region	Long-term supply elasticity
Northeast	0.431
Appalachia	0.951
Florida	0.674
Southeast	0.629
Mideast	0.517
Upper Midwest	0.514
Central	0.666
Southwest	0.614
West	0.727
Northwest	0.748
California	0.793
Arizona	0.605

Source: Food and Agricultural Policy Research Institute.

In a separate analysis, we changed our assumption regarding the lack of any market-driven over-order premium within compact regions and added a 50-cent-per-hundredweight over-order premium above the compact's minimum price to determine what impact this would have on our initial estimates. We then simultaneously used long-term supply and demand elasticities in conjunction with the 50-cent over-order premium in compact regions to determine what combined effect these three changes taken together would have on our initial estimates.

In a separate analysis, we inflated transportation costs that we obtained from Cornell University by 25 percent within each of the IRCM99 regions to determine what effect increased transportation costs would have on our initial estimates.

In addition, we conducted a separate sensitivity analysis specific to the expanded Northeast Compact in conjunction with a southern compact scenario. In this analysis, we varied the assumption regarding the Class I minimum price, or compact price, in the compact region. We increased the minimum price from \$16.94 to \$18.00 per hundredweight in the southern compact but retained the \$16.94 minimum price in the expanded Northeast Compact. We conducted this analysis because data on cooperative pay prices in selected cities in USDA's Appalachia, Southeast, and Central milk marketing orders were about a dollar higher in 1999 than in the Northeast Milk Marketing Order.¹⁷

We also analyzed how sensitive the model was to trade limitations across regions. Our initial estimates and previous sensitivity analyses assumed that milk flowed relatively freely between noncompact and compact regions. We revised this assumption by limiting the amount of milk that could flow into a compact region from a noncompact region to that amount of milk produced within 100 miles of a compact region's border. Although we recognize that there are no regulations establishing such a limit, we performed this particular analysis to reflect the fact that the IRCM99 uses average transportation costs, on a regional basis, because of the lack of specific data on the location of processing plants for 1999. This limitation may lead to a model solution with unrealistically high interregional milk trade. We then compared the estimated impacts of the

¹⁷Each month, cooperative associations announce cooperative pay prices. A cooperative pay price is based on a blend price—a weighted-average value based on milk usage—plus the costs of services performed by the cooperative association and cooperative membership dues, and other costs such as the national advertising and promotion program.

different compact scenarios with the impacts of the no-compact scenario using this revised trade assumption. We also conducted the same sensitivity analyses discussed above to determine how sensitive these new estimates were to changes in key values and assumptions.

We also conducted an analysis of how sensitive our initial estimates were to the magnitude of the difference between USDA and compact prices. We derived our initial estimates and our sensitivity analyses using 1999 pricing data because 1999 was the most recent year for which complete data were available. During 1999, the national average blend price of milk, or the average weighted minimum farm-level price, was \$14.09 per hundredweight, which was higher than the prices observed in some other years, including 2000. For example, the national average blend price of milk in 2000 was \$12.11 per hundredweight. To determine how sensitive our 1999 estimates were, we used preliminary milk pricing data for 2000 to determine what impact this difference may have had. This required a new baseline for assessing the magnitude of change that compacts made, given the relative magnitude of change in compact and USDA prices. We did not, however, conduct a full range of sensitivity analyses regarding this change in assumptions because of the preliminary nature of the 2000 pricing data. Further, the 2000 pricing data reflected regulatory reform measures implemented by USDA in January 2000, which posed potential data reliability concerns.

We calibrated the model using dairy sector data for 2000 to simulate the impact of compacts during that year. The method used to develop the IRCM00 was similar to the method used to develop the IRCM99, with two exceptions:

- We used data on 2000 regional farm production and milk prices; aggregate commodity supply/demand balance (commodity production, imports, exports, and stocks) and prices; and component balance (using 2000 disaggregate commodity production data) to develop the base model.
- We incorporated revised January 2000 USDA milk marketing order pricing regulations into the model. These revisions include a methodology for computing (1) classified prices based on USDA's "Final Rule" multiple component pricing, (2) Class I prices based on the higher of the Class III or Class IV multiple component price, and (3) minimum Class II prices based on adding a 70-cent-per-hundredweight premium to Class IV prices.

As in the IRCM99, all classified pricing commodity wedges are computed relative to Class III prices, so that if Class IV prices are higher than Class III prices, additional classified pricing premiums are added to Class I, II,

and IV prices. Tables 18 and 19 summarize the additional classified pricing premiums for USDA and California.

Table 18: USDA’s Classified Prices, and the Difference Between These Prices and the Price for Cheese (USDA’s Class III or California’s Class 4b) in 2000

Dollars per hundredweight

Class	USDA's class price	Difference between USDA's class price and USDA's Class III price of \$9.74	Difference between USDA's class price and California's Class 4b price of \$9.69
I minimum	\$14.03	\$4.29	\$4.34
I actual	15.31	5.57	5.62
II	12.53	2.79	2.84
III	9.74	0	0.05
IV	11.83	2.09	2.14

Source: USDA's Agricultural Marketing Service.

Table 19: California's Classified Prices, and the Difference Between These Prices and the Price for Cheese (USDA's Class III or California's Class 4b) in 2000

Dollars per hundredweight

Class	California's milk marketing program price	Difference between California's milk marketing program price and USDA's Class III price of \$9.74	Difference between California's milk marketing program price and California's Class 4b price of \$9.69
1	\$13.38	\$3.64	\$3.69
2	12.34	2.60	2.65
3	12.20	2.46	2.51
4b	9.69	(0.05)	0
4a	11.82	2.08	2.13

Note: Numbers in parentheses are negative.

Source: USDA's Agricultural Marketing Service.

USDA’s revised pricing regulations result in larger Class I and II premiums over Class III milk than occur under California’s pricing regulations, as shown in table 20.

Table 20: IRCM00 Classified Component Price Premiums in Federal Milk Marketing Orders and California

Dollars per hundredweight

Dairy commodity (Class)	Commodity premium	
	California	Federal marketing order
Fluid milk (I or 1)	\$3.92	\$4.35
Soft dairy products (II or 2)	2.59	2.54
Frozen dairy products (II or 3)	2.32	2.36
Butter (IV or 4a)	0.71	0.73
Nonfat dry milk (IV or 4a)	22.37	23.02
Residual (IV or 4a)	17.51	18.02

Source: University of Wisconsin-Madison.

USDA Class I and II premiums are also higher in 2000 than in 1999 because of lower Class III prices in 2000 relative to 1999, and the impact that Class IV prices had on Class I and II. Also, in modeling the impacts of compacts in 2000, we computed commodity premiums in producer price settlement pools on the basis of fat and skim-not-fat commodity components, using revised classified fat and skim-not-fat prices.

IRCM Limitations

As with any modeling exercise, the IRCM has certain limitations. These limitations include: (1) the model cannot identify individual shipments of raw milk from one milk marketing order to another because we do not have data on shipments of raw milk and packaged fluid milk by individual farmers and processors, respectively, (2) the model is static and does not take into account dynamic adjustments, (3) the model ignores some institutional and/or historical rigidities and capacity constraints (other than for the milk marketing orders and component flow constraints), (4) the model assumes the absence of farmer, processor, and/or retailer market power, and (5) the model takes exports and imports as being exogenous to the model.

Appendix III: NEDC's Intraregional Impacts

The intraregional impacts of the NEDC on (1) retail milk prices, (2) milk producer income, (3) dairy farm structure, (4) milk production, and (5) milk consumption are difficult to determine. Data indicate that retail milk prices increased when the NEDC's alternative minimum pricing requirement took effect in July 1997, and prices continue to remain relatively high compared with retail milk prices in the rest of the country. However, because many factors affect retail milk prices, we were unable to determine what portion of the retail price increases in the NEDC states was due to the NEDC as opposed to other factors. With regard to milk producer income, when the NEDC price has been higher than the Class I price, dairy farmers have received payments that reflect the NEDC price—that is, the Class I price plus the difference between the Class I price and the NEDC price. (This difference is called an over-order payment.) However, it is likely that farmers would have received some portion of the difference even without the Compact in the form of market-driven over-order premiums. Data on the structure of dairy farms, milk production, and fluid milk consumption in the six NEDC states and data for the rest of the United States show similar trends, suggesting little or no change in the NEDC states following the Compact's establishment.

Retail Milk Prices Increased in the NEDC States, but It Is Difficult to Determine the Amount Attributable to the Compact

Retail milk prices increased in the NEDC states in July 1997, when the Compact's alternative minimum price for raw milk to be used for and sold as fluid milk in the six states took effect, but not in the rest of the country. Data indicate that since July 1997, retail prices in Boston and other selected cities and towns in New England have remained relatively high, compared with prices in other major cities in the country. It is difficult to determine, however, what portion of the retail price increase can be attributed to the NEDC's alternative minimum price as opposed to other factors that affect retail milk prices. Economic analyses of the NEDC's impact on retail milk prices have concluded that retail milk prices increased following the Compact's establishment, but the estimated amount attributable to the Compact's higher alternative minimum price varies among the different studies.

Retail Milk Prices Increased in July 1997 in New England but Not in the Rest of the Country

The retail price of milk in the New England states increased sharply during July 1997, when the NEDC began setting minimum prices that processors must pay for raw milk used for and sold as fluid milk—milk used for drinking purposes—in the NEDC states, but comparable increases did not occur in most other locations in the United States. In that month, the NEDC price—\$1.46 per gallon—was 26 cents higher than USDA's milk marketing order Class I price of \$1.20 per gallon. This 26-cent per gallon

(or 22 percent) price increase appears to have been passed on to consumers at the retail level on fluid milk prices during the same month. Table 21 shows the increase in retail prices according to data collected by the departments of agriculture in Connecticut, Maine, and New Hampshire; the International Association of Milk Control Agencies;¹ and A.C. Nielsen.²

Table 21: Retail Prices for a Gallon of Milk in NEDC States Before and Immediately Following the NEDC's Establishment

Organization collecting the data	June 1997	July 1997
Connecticut, Maine, and New Hampshire departments of agriculture	\$2.43	\$2.58
International Association of Milk Control Agencies ^a	2.49	2.66
A.C. Nielsen ^b	2.40	2.60

^aAssociation data are an average for five cities or towns in Maine; Boston, Massachusetts; and three cities or towns in Vermont.

^bA.C. Nielsen data for Boston, Massachusetts, which we selected to represent the NEDC.

Source: GAO analysis of data from Connecticut, Maine, and New Hampshire departments of agriculture; the International Association of Milk Control Agencies; and A.C. Nielsen.

Data from the International Association of Milk Control Agencies indicate that between June and July 1997, the average retail price of a gallon of milk increased by about an average of 7 percent in nine cities in Maine, Massachusetts, and Vermont. A.C. Nielsen data for Boston indicate that retail milk prices increased by an average of about 8 percent during the same period.

Our review of data for the rest of the United States indicates few increases in the retail price of milk in July 1997 that were comparable to what occurred in the New England states. For example, data from the International Association of Milk Control Agencies for 42 cities and regions outside the NEDC states indicate that only two of those cities or regions experienced retail price increases comparable to or larger than those observed in selected cities in Maine, Massachusetts, and Vermont in July 1997: Eastern Virginia had a 31-cent increase and Reno, Nevada had a

¹The International Association of Milk Control Agencies is an organization whose members represent states and territories that regulate milk prices within their jurisdictions. Among other things, members collect data on retail milk prices for milk sold in selected cities within their jurisdictions.

²A.C. Nielsen is a private data collection and analysis company.

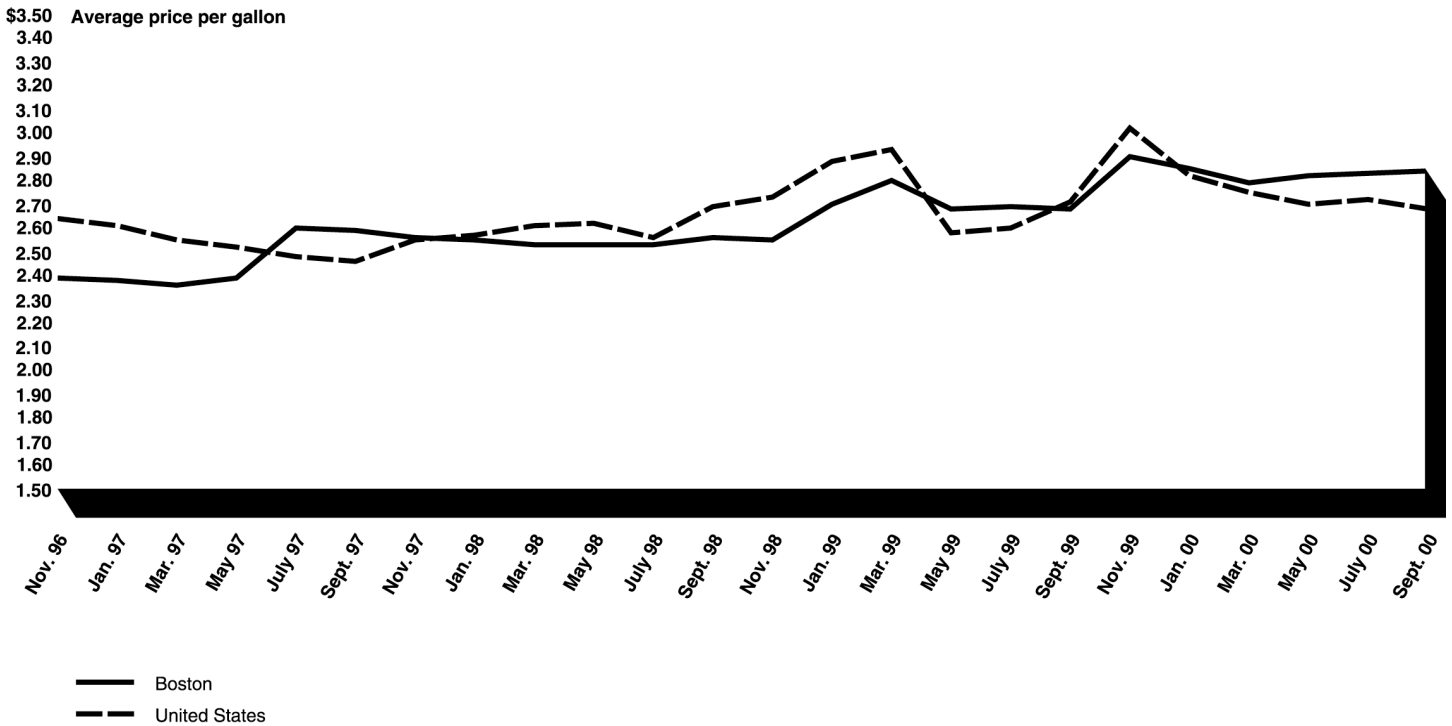
10-cent increase between June and July 1997. Moreover, data from A.C. Nielsen for 13 major cities outside the NEDC states show an increase in retail milk prices in only one city between June and July 1997: in Seattle, the price of milk rose from \$2.91 to \$3.01 a gallon. Elsewhere, retail milk prices declined, for example, in Cincinnati, from \$1.43 to \$1.35 per gallon between June and July 1997 and in Washington, D.C., from \$2.47 to \$2.44 per gallon.

From July 1997 to September 2000, Retail Milk Prices in the Rest of the Country Have Increased Less Than in the NEDC

In the longer term, between July 1997 and September 2000, retail milk prices in most of the United States did not increase as much as they did in the NEDC states, according to A.C. Nielsen data, as shown in figure 2.³ The average retail milk price in Boston increased by 18 percent between June 1997 and September 2000, from \$2.40 to \$2.84 per gallon. The national average retail price of milk increased by 8 percent during the same period, from \$2.49 to \$2.68 per gallon.

³We are using A.C. Nielsen data for Boston to represent the NEDC states.

Figure 2: Comparison of the Average Retail Price of a Gallon of Milk in Boston and in the United States, November 1996-September 2000



Source: GAO analysis of data from A.C. Nielsen.

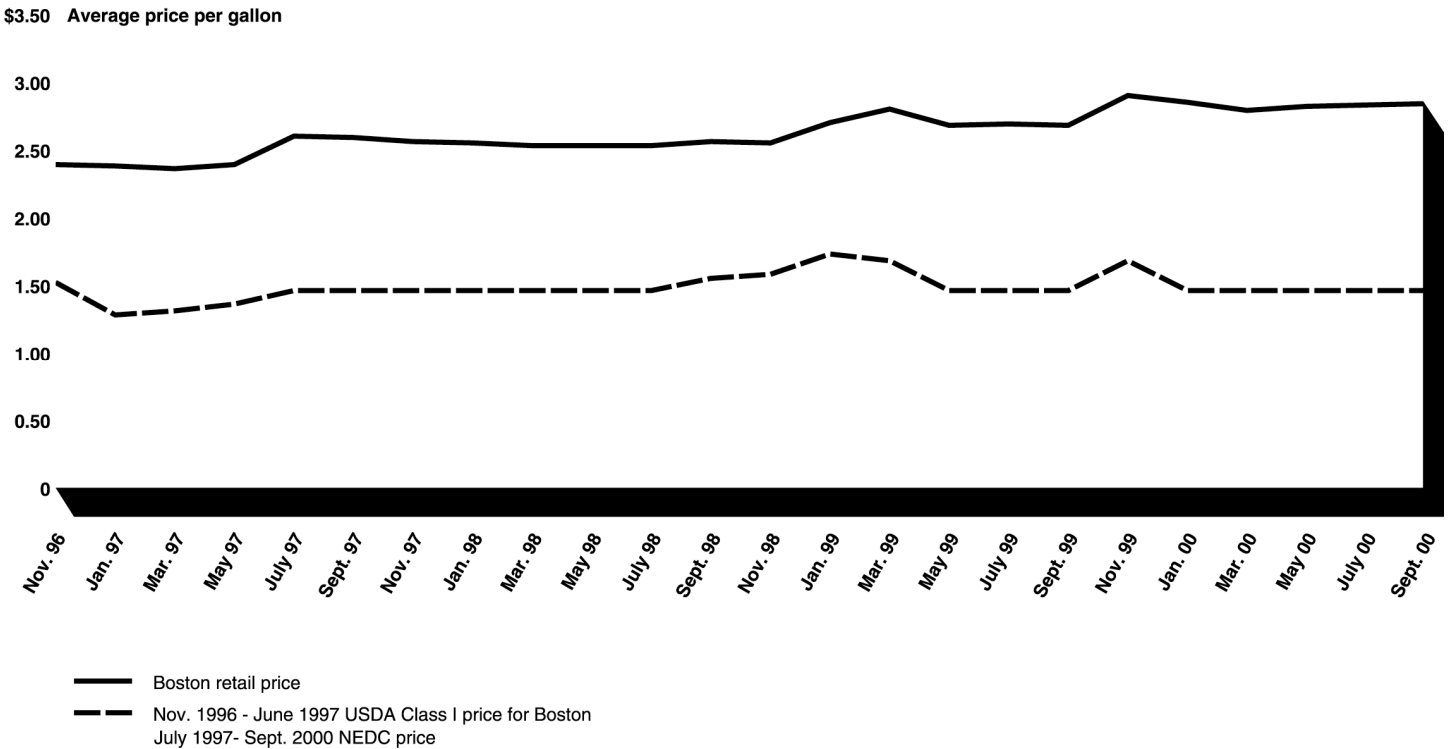
A.C. Nielsen data for 13 major cities outside the NEDC indicate that retail milk prices increased between June 1997 and September 2000 in 10 of those cities as well. For example, retail prices increased by 3 percent in Phoenix, or from \$2.21 to \$2.27 per gallon; by 12 percent in Seattle, or from \$2.91 to \$3.26 per gallon; by 17 percent in New Orleans, from \$2.58 to \$3.03 per gallon. Data for one city—Cincinnati—show a greater price increase than in Boston: prices increased by 80 percent, from \$1.43 to \$2.57 per gallon, between June 1997 and September 2000. However, data for Cincinnati indicate that between March 1997 and May 1998, retail milk prices were considerably lower than those in other major cities. In contrast to retail milk prices in cities such as Boston and Cincinnati, prices fell in Dallas, Denver, and San Diego.

Data from the International Association of Milk Control Agencies also indicate that retail milk prices increased from June 1997 to November 2000 in the NEDC states and the rest of the country. For example, retail prices increased by 17 percent, from \$2.59 to \$3.04 in Burlington, Vermont; and

by 10 percent, from \$2.18 to \$2.39 in Augusta, Maine, from June 1997 to November 2000. In the rest of the country, of the 29 cities or regions for which the Association had June 1997 and November 2000 data, retail milk prices increased in 21 of them. For example, retail milk prices increased by 4 percent, from \$2.76 to \$2.88 per gallon in Philadelphia, Pennsylvania; and by 20 percent, from \$2.55 to \$3.05, in Salem, Oregon.

Even though it is likely that the Compact caused some portion of the retail milk price increase in the NEDC states, it is difficult to determine the size of that portion. In part, this is because retail milk prices vary considerably in relation to the minimum farm-level price for raw milk. For example, after retail prices increased by about 20 cents per gallon in July 1997, they fell by about 5 to 7 cents per gallon for a period of several months. In addition, even though the NEDC price remained stable at \$1.46 per gallon between July 1997 and August 1998, data on retail milk prices for Boston indicate that retail prices fluctuated during that period from a high of \$2.60 to a low of \$2.53 per gallon. Figure 3 shows the relationship between the Class I or NEDC price and the average retail price of milk sold in Boston.

Figure 3: Comparison of the Average Retail Price of a Gallon of Milk in Boston and the USDA Class I or NEDC Price, November 1996-September 2000



Note: The NEDC price took effect beginning in July 1997. The NEDC price per gallon is the higher of either USDA's Class I price or the NEDC floor price of \$1.46 per gallon.

Source: GAO analysis of data from A.C. Nielsen, USDA's Agricultural Marketing Service, and the NEDC.

Between July 1997 and September 2000, the retail price in Boston varied between \$2.53 and \$2.90 per gallon. In September 1998 when the NEDC price increased by 9 cents, from \$1.46 to \$1.55 per gallon, the retail price increased by only 1 cent, from \$2.55 to \$2.56. As figure 3 shows, retail prices increased in early calendar year 1999 and again in late calendar year 1999. In November 1999, the retail price of milk reached a high of \$2.90, when the NEDC price was \$1.68 per gallon.

One of the reasons that there is not a close relationship between the NEDC price for milk and the retail price is that many factors affect the retail price of milk, including wholesalers' costs, state regulations,

consumer demand, and retailers' pricing strategies.⁴ More specifically, the retail price of milk is affected by wholesalers' costs of acquiring and processing raw milk and packaging and distributing processed fluid milk to retail outlets. The retail price can also be affected by state regulations that, for example, dictate how and where milk can be distributed. Another factor is consumers' shrinking demand for milk products, as opposed to other beverages. This shrinking demand has created a need to advertise and improve products, which has increased retail costs. Finally, retail milk prices are affected by retail pricing strategies involving such factors as retail costs, competitor pricing, if and how milk prices are used to attract customers, shopping convenience, the image a store may want to project regarding quality or low prices, and the extent to which retailers exercise market power.

Other Studies Estimate That the NEDC Has Increased Retail Prices

Four studies have estimated the Compact's impact on retail milk prices, and each has concluded that the NEDC has resulted in increased retail prices. Each study provides a different estimate of the amount that the NEDC has caused retail prices to increase, however, largely because of the different methodologies used and the time frames analyzed. The Office of Management and Budget (OMB) issued a study in 1998 that analyzed retail milk price data for the first 6 months that the NEDC was in effect.⁵ OMB estimated that the Compact could have had a small impact (an increase of 5 to 10 cents per gallon), a medium impact (an increase of 10 to 15 cents per gallon), or a large impact (an increase of 15 to 20 cents per gallon) on retail prices, depending on the extent to which costs were passed on from the farm to the retail level, and the extent to which wholesalers and retailers absorbed or passed on any increased costs. However, OMB cautioned that its study was completed too soon after the Compact began operating in July 1997 to determine its economic impacts and implications with confidence or precision. OMB further cautioned that U.S. dairy industry economics are complex, and that producer, wholesale, and retail prices are affected by numerous proprietary, regional, and national factors. OMB concluded that retail price patterns have fluctuated in recent years and provide no definitive indication of the retail price levels that would have occurred without the Compact.

⁴A detailed discussion of these various factors is included in our report entitled *Dairy Industry: Information on Milk Prices and Changing Market Structure* (GAO-01-561, June 15, 2001).

⁵OMB's *The Economic Effects of the Northeast Interstate Dairy Compact*, Feb. 1998.

In 2000, economists (Lass et al.) at the University of Massachusetts issued a study that analyzed the NEDC's impact on retail milk prices during the first year of the Compact.⁶ For this study, which was conducted for the NEDC, Lass et al. used data from January 1982 through June 1996 to develop a model of farm-to-retail price behavior in two markets: Boston and Hartford. They then used data from an 18-month period—July 1996 through December 1997—to predict what the retail price for milk would have been without the Compact and to compare those predicted effects with the effects that actually occurred in New England. Lass et al. concluded that the NEDC caused an average retail milk price increase of about 7 cents per gallon in the Boston market and about 6 cents per gallon in the Hartford market. They also concluded that because this estimated retail price increase was less than the NEDC increase in costs to fluid milk processors (the over-order amount due to the NEDC), an amount less than the NEDC over-order amount was being passed on to consumers. The authors cautioned, however, that the model did not capture changes that may have occurred in the farm-to-retail price relationship from July through December 1997.

A third study, issued in 2000 by an economist (Bailey) at Pennsylvania State University, analyzed the farm-to-retail markup for fluid milk over the period January 1996 through December 1999.⁷ Using a simple but direct markup model to evaluate the impact of the NEDC on retail fluid milk prices in Boston and Hartford, Bailey concluded that the retail price of milk increased after the Compact established its minimum price in July 1997. Specifically, Bailey concluded that the retail price of milk rose 24 cents per gallon from July 1997 to December 1999 over the average price in effect from January 1996 to June 1997. According to Bailey, the majority of this 24-cent per gallon increase—17 cents per gallon—was attributable to the Compact, while the rest was attributable to other factors.⁸ Finally, studies issued in 2001 by economists (Cotterill and Franklin) at the University of Connecticut examined specific factors that

⁶Daniel A. Lass, Mawunyo Adanu, and P. Geoffrey Allen, "Impacts of the Compact on Fluid Milk Retail Prices," *The Northeast Interstate Dairy Compact: Milk Market Impacts*, Research Report 73, Agricultural Experiment Station, University of Vermont, Mar. 2000.

⁷Kenneth Bailey, *Report on the Operation and Performance of the Northeast Interstate Dairy Compact*, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, July 2000.

⁸The increase in the retail price of milk was partially offset by a 3-cent-per-gallon decline in the retail price of milk due to the reduction in the cooperative market over-order premium.

may have increased retail milk prices in four New England marketing areas—Boston, Providence, Hartford/Springfield, and Northern New England—following the Compact's establishment in July 1997.⁹ Cotterill and Franklin compared retail price data from February 1996 through early July 1997 with retail price data from July 1997 through August 1998. The authors separated out retail price increases as caused by four factors: (1) the increased farm price of milk caused by the NEDC; (2) the increased farm price of milk caused by strong raw milk markets when the farm price spiked above the NEDC price; (3) nonmilk costs, such as increased processing costs other than costs for purchasing raw milk and increased distribution costs; and (4) changes in pricing at the wholesale and retail levels. Using this methodology, Cotterill and Franklin concluded that of the 29-cent increase in the retail price of a gallon of milk, on average, 2.7 cents per gallon were caused by the NEDC and 6.5 cents per gallon were caused by strong milk markets.¹⁰

Limited Data Are Available to Estimate the Potential Impacts of the Compact on Producer Income

While it is likely that the NEDC has stabilized producer income, it is difficult to determine how large of an impact it has had on producer income because of uncertainty about what dairy farmers in the six NEDC states would have been paid for their milk in the absence of the Compact. This uncertainty arises because NEDC payments made to dairy farmers may be, in part, substitutes for market-driven over-order premium payments. Even so, the NEDC commission has concluded that the Compact has had a positive effect on the financial status of dairy farmers in the six NEDC states and New York. USDA data on dairy farm income do not clearly indicate whether the improved financial status of an average dairy farmer in the NEDC states resulted from the NEDC. Finally, while two studies of the NEDC's impact on farm income concluded that the NEDC could have a positive impact on farm income, they provide no definitive estimate of the size of this impact.

⁹Testimony by Ronald W. Cotterill on *The Impact of the Northeast Dairy Compact and Market Channel Pricing Strategies on the Performance of the New England Dairy Industry* before the U.S. Senate Committee on the Judiciary, July 25, 2001; and Ronald W. Cotterill and Andrew W. Franklin, *The Public Interest and Private Economic Power: A Case Study of the Northeast Dairy Compact*, Food Marketing Policy Center, Department of Agricultural and Resource Economics, University of Connecticut, May 2, 2001.

¹⁰Cotterill and Franklin, in their May 2001 study, attributed 4.5 cents of the 29-cent per gallon milk price increase to the NEDC. They revised this estimate to 2.7 cents in the July 2001 study. The 1.8 cents-per-gallon reduction in the amount attributable to the NEDC was caused by a reduction in cooperative premiums.

NEDC Payments May Be, in Part, Substitutes for Market-Driven Premium Payments

We cannot determine how much impact the NEDC has had on dairy farmer income because we do not know what dairy farmers' incomes would have been from July 1997 to the present in the absence of the NEDC. While farmers would have received at least the minimum federal marketing order or state prices, in some cases it is likely that they would have received an amount greater than these prices even in the absence of the NEDC. According to USDA officials, dairy farmers in the NEDC states had received some market-driven over-order premiums prior to the NEDC's establishment. For example, in 1996, the over-order Class I premium in the New England order averaged 76 cents per hundredweight.¹¹ Research conducted by economists at Cornell University indicates that after the compact began, producers receiving NEDC payments received no over-order premiums above the amount needed to compensate them for cooperative services. In one survey conducted in August 2000, dairy farmers in New York who received NEDC payments were receiving no market-driven over order premiums, while producers not shipping milk into the NEDC states received about 60 cents per hundredweight in market-driven over-order premiums. USDA officials concurred with this assessment. According to one USDA official, over-order charges decreased about 50 cents per hundredweight after the NEDC began setting its price for Class I milk, and were at levels indicative of the costs of services provided by cooperatives for handlers.

We estimate, however, that dairy farmers supplying raw milk for use as fluid milk sold in the NEDC states have received revenue as a result of the Compact. We estimate that an average licensed dairy farmer located in one of the six NEDC states received annual payments of between \$3,892 and \$15,301 since the NEDC regulations took effect in July 1997 through December 2000, as shown in table 22.

¹¹The difference between the price actually paid for Class I milk and the Federal order minimum Class I price, called the "over-order premium," is negotiated between dairy cooperatives (which sell milk produced by their farmer members) and fluid milk processors. The over-order premium includes the price for cooperative services and any additional price that fluid milk processors must pay to obtain needed supplies that are driven by market forces (that is, supply and demand for Class I milk).

Table 22: Average Annual NEDC Over-Order Payment Received by a Dairy Farmer Located in the Six NEDC States

Calendar year	Number of dairy farms in the NEDC states	Milk produced within the NEDC states (pounds in millions)	Average NEDC net producer price (dollars per hundredweight)	Average annual dairy farm payment as a result of the NEDC (dollars per licensee)
Last half of 1997	3,237	2,272.2	\$.93	\$6,582
1998	3,049	4,663.0	.25	3,892
1999	2,964	4,691.0	.49	7,931
2000	2,772	4,664.2	.91	15,301

Source: GAO analysis of data from USDA and the NEDC.

As table 22 shows, the dairy farm payment resulting from the difference between the USDA Class I price and the NEDC price (the over-order producer price payment) increased significantly in 2000, when the USDA Class I price was low—\$14.80 per hundredweight to the NEDC price of \$16.94.¹²

Although we are unable to determine how much of an impact the NEDC has had on dairy farmer income in the six NEDC states, dairy farmers supplying milk and receiving over-order producer price payments have likely benefited from the NEDC. At a minimum, the NEDC has had a stabilizing impact on the prices paid to farmers for milk, irrespective of the amount of additional income it may have generated, because the \$16.94 NEDC price per hundredweight has protected dairy farmer income when the minimum federal marketing order price has fallen below the NEDC price. This occurred in 35 of the 46 months between July 1997 and March 2001.

NEDC Data Indicate a Positive Impact on Net Farm Income, but USDA Data Are Less Clear

NEDC commission data indicate that the difference between the Compact Class I price and the USDA minimum Class I price from July 1997 through June 2001, minus fees for administering the NEDC, totaled about \$146 million. This amount was provided to 4,217 farms supplying the New England market, of which 1,300 are estimated to be located in New York. According to the NEDC, between July 1997 and June 2001, the NEDC resulted in annual payments of between \$3,900 and \$14,700, to these

¹²The amounts available in the form of payments to farmers exclude fees collected by the NEDC commission for paying commission staff salaries, legal costs, and costs for compensating USDA and the states for estimated increased costs to milk price support and selected nutrition assistance programs.

farms, depending on herd size. The average annual payment was \$9,812 per farm. According to the NEDC commission, this additional income helped stabilize and enhance farm-level prices for farmers in the six NEDC states as well as New York, some of whom have historically been part of the New England milk shed.

Similarly, NEDC data indicate that net farm earnings improved as a result of the Compact. For example, the NEDC commission estimated that in 1997, the Compact increased net farm earnings of those supplying the New England milk shed by about \$6,800, from about \$11,000 to about \$17,800. The NEDC commission estimated that in 2000, the Compact increased net earnings by about \$15,200, from about \$8,100 to about \$23,300. The NEDC commission also estimated that in 2000, the percentage of dairy farms that experienced financial stress was 20 percent lower than it would have been in the absence of the Compact: About 50 percent of farms experienced some degree of financial stress, compared with 70 percent that would have experienced some degree of financial stress without the NEDC. These figures led the NEDC commission to conclude that the overall reduction in financial stress resulted in a significant reduction in the likely net loss of dairy operations in the Northeast.

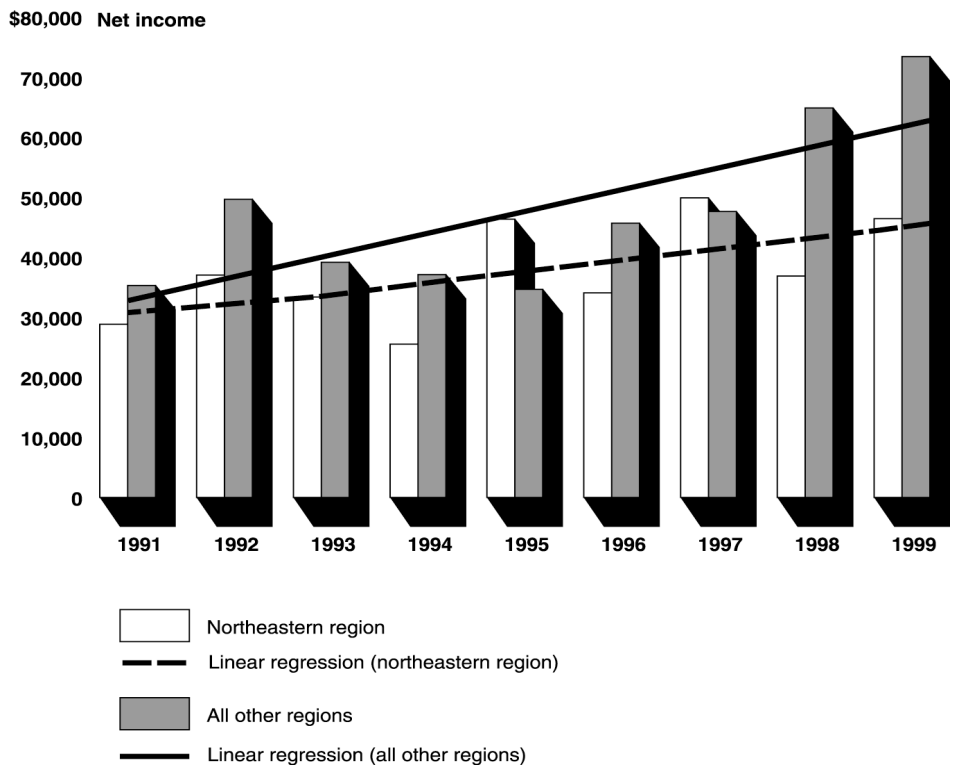
While USDA data indicate that the net farm income of an average dairy farmer in the northeastern region has increased slightly more than the net income of an average farmer in other regions between 1991 and 1999, the data also indicate that net farm income in the northeastern region was lower than that of farmers in other regions during the same time period.^{13,14} Figure 4 shows that the net farm income of average dairy farmers in the northeastern region and other regions in the country has increased between 1991 and 1999, but that the trend increased at a lower rate in the northeastern region than in other regions in the country. Regarding the northeastern region, the data indicate that an average dairy farmer's net farm income increased by 36 percent, from \$34,064 in 1996 to \$46,415 in 1999. In the rest of the United States, an average dairy farmer's net farm income increased by 61 percent, from \$45,650 in 1996 to \$73,486 in 1999. It

¹³USDA's Economic Research Service defines net farm income as total accrual receipts minus total accrual expenses when cash income is adjusted for changes in crop and livestock inventories.

¹⁴The northeastern region includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

is difficult to determine, however, the specific impact of the NEDC, because many factors influence dairy farm income, and USDA's northeastern region includes other states in addition to the six NEDC states.

Figure 4: Net Farm Income of a Representative Dairy Farmer in the Northeastern Region and in Other U.S. Regions, 1991-99



Notes: The northeastern region includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The other U.S. regions exclude these 11 states, Alaska, and Hawaii.

Net farm income is in 1999 constant dollars.

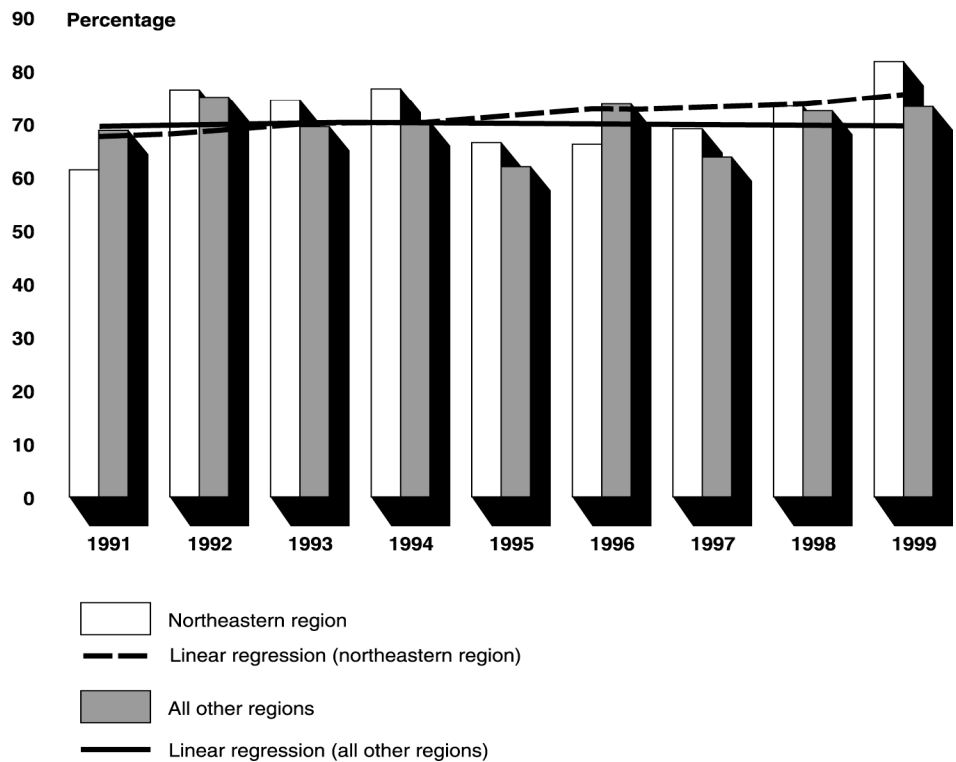
Source: GAO analysis of data from USDA's Economic Research Service.

USDA data also indicate that between 1991 and 1999, the percentage of northeastern dairy farms having favorable solvency¹⁵ grew more than the percentage of dairy farms with favorable solvency in other regions of the

¹⁵Dairy farms having a favorable solvency have debt-to-asset ratios of less than 0.40 and positive net farm incomes.

country.¹⁶ Figure 5 shows that the percentage of dairy farms having favorable solvency in other regions of the country remained relatively constant.

Figure 5: Comparison of the Percentage of Dairy Farms Having Favorable Solvency in the Northeastern Region With the Percentage in Other Regions, 1991-99



Note: The northeastern region includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The other U.S. regions exclude these 11 states, Alaska, and Hawaii.

Source: GAO analysis of data from USDA's Economic Research Service.

About 61 percent of the dairy farms in the northeastern region had favorable solvency in 1991, in comparison with about 69 percent of the dairy farms in the rest of the U.S. regions. About 82 percent of the dairy farms in the northeastern region had favorable solvency in 1999, in

¹⁶USDA's Economic Research Service uses favorable solvency as an indicator of the financial position of a farm business based on a combination of income (net farm income) and solvency (debt/asset ratio) measures.

comparison with about 73 percent of the dairy farms in the rest of the U.S. regions. Whether the NEDC caused the percentage of dairy farms in the northeastern region having a favorable solvency to grow faster is difficult to determine because, as noted previously, the six NEDC states form only a portion of the northeastern region.

Two Studies Provide Limited Information on the NEDC's Impact on Income

Two studies have analyzed the NEDC's impact on dairy farmer income and concluded that the Compact has the potential to improve farmer finances. OMB's 1998 analysis was limited by the fact that the Compact had been in effect for only about 6 months when OMB conducted its study.¹⁷ To estimate the NEDC's impact on farm income, OMB developed two alternative scenarios of what milk prices would have been had the Compact not been established. Under the first scenario, OMB assumed that the Class I price would have averaged \$15.92 per hundredweight in 1997; under the second scenario, OMB assumed that the Class I price would have been \$16.10 per hundredweight, taking into account the decline in the market-driven over-order premium when the NEDC took effect. OMB then compared these prices with a minimum NEDC price of \$16.94 per hundredweight. Using \$16.94 as a basis for calculating a blend price, OMB estimated that in 1997, the NEDC generated an average increase in gross farm income of \$5,650 under the first scenario and \$4,770 under the second scenario. Regarding the NEDC's overall impact on dairy farmers' income, OMB concluded that, if other factors affecting dairy farmers were held constant, higher milk prices would not be expected to greatly alter the long-term trend toward fewer, but larger and more efficient dairy operations in New England.

In 1998, an economist (Wackernagel) at the University of Vermont issued a study on the potential impact of the dairy Compact that used computer models to simulate characteristics of Vermont dairy farms under different milk pricing policies.¹⁸ The models varied with respect to factors such as farm size, farm profitability, productivity growth rate, and milk prices. Although no one model specifically simulated the impact of the NEDC, Wackernagel concluded that using his compact scenarios, the impact of

¹⁷OMB, Feb. 1998.

¹⁸Rick W. Wackernagel, "Potential Economic Impacts of the Northeast Interstate Dairy Compact on Vermont Dairy Farms," *Agricultural and Resource Economics Review*, Apr. 1998.

stabilizing prices could increase farmer cash reserves and net worth, but he estimated that such gains would be more limited than those that would be achieved by having a higher farm-level price that varied from month to month. Wackernagel also concluded that gains associated with price stabilization would be limited unless a Compact's policies recognized the impact of inflation as well as the variability and level of milk prices.

The NEDC's Impacts on Farm Structure, Milk Production, and Milk Consumption Are Difficult to Determine

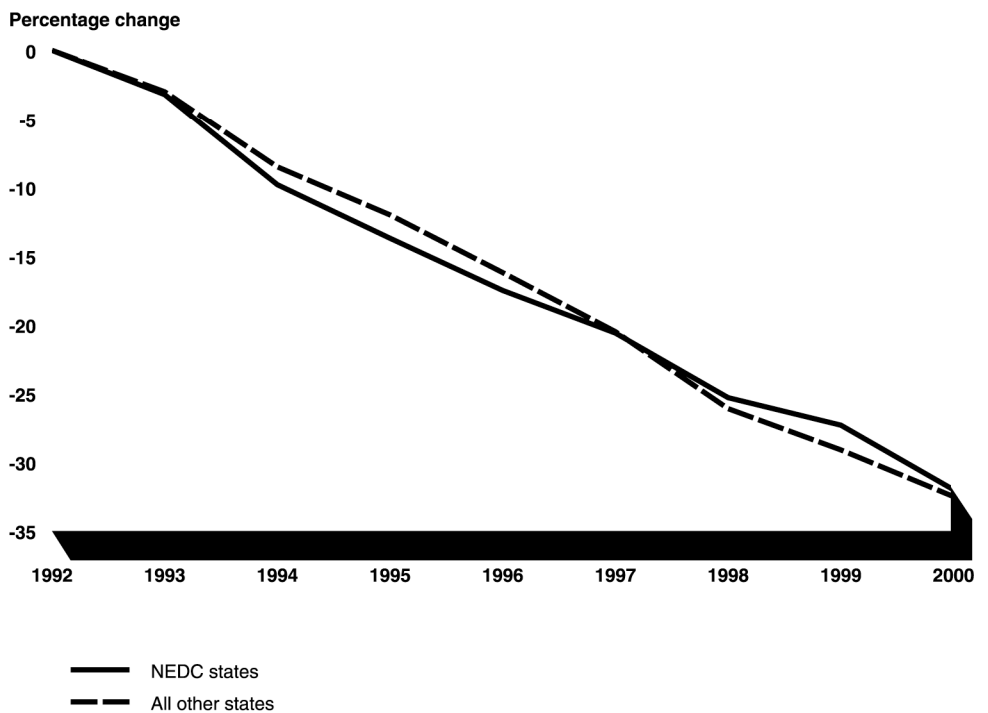
The Number of Farms Has Continued to Decline as Herd Size Has Increased

Data on the number of farms and herd size show similar trends in the NEDC and other states before and after the NEDC was established, suggesting little or no change in the NEDC states due to the Compact. Moreover, the data suggest that the trends are caused by other factors, such as major technological advancements in dairy farming.

The number of dairy farms in the NEDC and the rest of the United States has been decreasing, as measured by both the number of farms having at least one dairy cow and the number of licensed dairies. In the NEDC states, the number of farms having at least one milk cow decreased by 33 percent between 1992 and 2000, from 5,050 to 3,370. In the rest of the United States, the number of farms having at least one milk cow decreased by 39 percent in that same period, from 166,510 to 101,880. Given that some of the farms with at least one milk cow may not produce milk for sale to dairy processors, we also looked at the number of farms licensed to sell milk to dairy processors. Between 1992 and 2000, the number of licensed dairy farms in the six NEDC states decreased by 32 percent, or from 4,079 to 2,772, while the number of licensed dairy farms in the rest of the country decreased by 37 percent during that same time period, or from 127,456 to 80,253 (see fig. 6). From 1992 to 1998, the percentage decrease in the number of licensed dairy farms in the NEDC states was greater each year than in the rest of the United States; in 1998, the percentage decrease in the rest of the United States became greater each year. With respect to the change from 1997 to 2000, the number of licensed dairy farms

decreased by 14 percent in the NEDC states, or from 3,237 to 2,772 farms; while the number of licensed dairy farms decreased by 17 percent in the rest of the country, or from 96,176 to 80,253 farms. It is not known whether this change in trends was caused by the NEDC or some other factors.

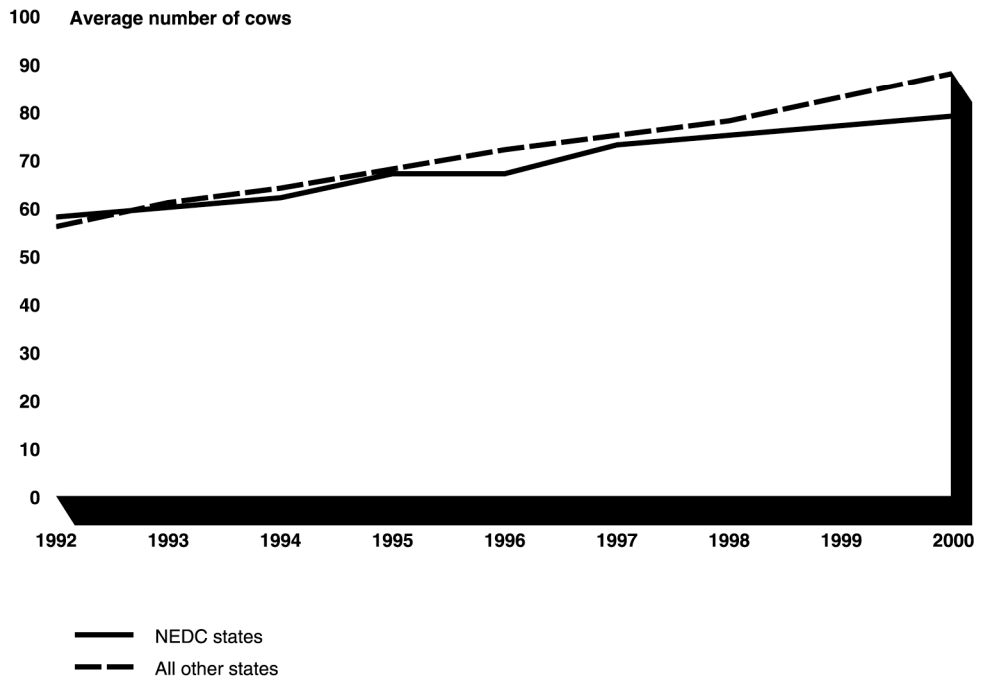
Figure 6: Decline in the Number of Licensed Dairy Farms in the NEDC States and in the Rest of the United States, 1992-2000



Source: GAO analysis of data from the American Farm Bureau Federation.

Between 1992 and 2000, the average herd size in the NEDC states increased by 36 percent, from 58 to 79 milk cows, while in the rest of the United States, average herd size increased by 57 percent, from 56 to 88 milk cows. As shown in figure 7, although average herd size has increased in the NEDC states, this increase consistently lagged behind the increases in the rest of the United States.

Figure 7: Average Number of Cows per Farm in the NEDC States and in the Rest of the United States, 1992-2000



Source: GAO analysis of data from USDA's National Agricultural Statistics Service.

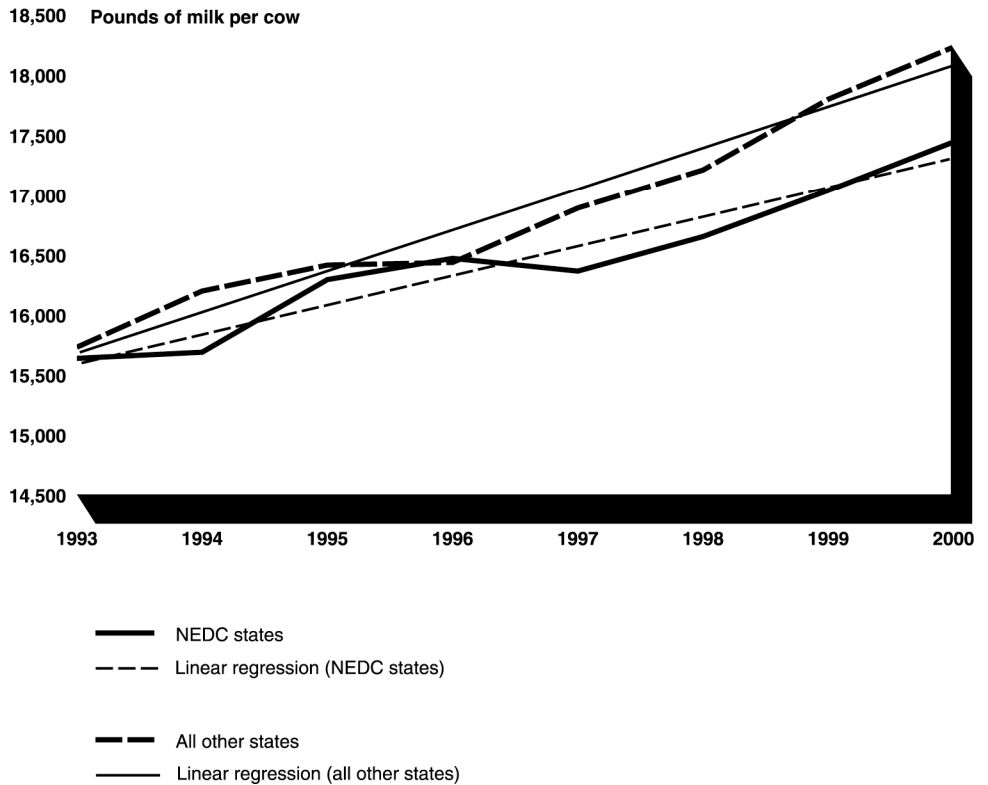
One of the reasons for the declines in herd size is that over the past 50 years, technological developments have significantly altered both dairy farming itself and the way farm products are processed and distributed. Farming has changed from an operation that was historically dependent on human and animal labor to one in which most operations are mechanized. As a result, at every level, economies of scale (the lower cost of large-scale versus small-scale operations) have led to fewer and larger farms. The number of farms in general, and dairy farms in particular, has been shrinking since the Depression. While dairy farms with 100 cows were considered large in 1950, today dairy farms as large as 1,500 to 3,000 are emerging in the western, northwestern, and midwestern regions of the country. This trend, along with the pressure to convert land used for agriculture into land used for nonagricultural purposes, will likely result in a continued increase in the size of farms with a commensurate decline in the total number of farms in the Northeast.

Production Has Continued to Increase

Milk production increased in the six NEDC states and the rest of the country both before and after the NEDC was established. This trend toward greater milk production has occurred at the same time as the total number of milk cows has declined, reflecting a greater amount of milk produced per cow. These trends make it difficult to determine what impact, if any, the Compact has had on milk production. Two studies have analyzed the NEDC's impact on milk production and concluded that while the NEDC may have caused an increase in production, any increase was small in relation to the total amount of milk produced in the NEDC states.

Milk production has increased in the NEDC states and the rest of the country, as measured by both total milk produced and milk produced per cow. From 1993 to 2000, total milk produced in the NEDC states increased 2.9 percent, from 4.545 billion pounds to 4.678 billion pounds, while production in the rest of the country increased 10.3 percent from 146.091 to 163.274 billion pounds. With respect to the change from 1997 to 2000, production increased by 2.5 percent in the NEDC states, or from about 4.6 billion pounds to 4.7 billion pounds; while production increased 7.8 percent in the rest of the country, or from about 151.5 billion pounds to 163.3 billion pounds. Much of this growth reflected an increase in milk production per cow. Figure 8 shows that from 1993 to 2000 the average amount of milk produced per cow in the NEDC states increased by 11.6 percent, from 15,633 pounds to 17,440 pounds, while production per cow in the rest of the United States increased 15.9 percent, or from 15,726 pounds to 18,226 pounds.

Figure 8: Pounds of Milk Produced per Cow in the NEDC States and in the Rest of the United States, 1993-2000



Source: GAO analysis of data from USDA's National Agricultural Statistics Service.

Whether the increase in milk production per cow was dramatically influenced by the NEDC, however, is not clear. The data on milk production per cow do not show a large difference in upward trend between the NEDC states and states in the rest of the country between 1997 and 2000. Specifically, during this period production per cow increased by 6.6 percent in the NEDC states, or from 16,360 pounds to 17,440 pounds; while production per cow increased by 7.9 percent in the rest of the country, or from 16,887 pounds to 18,226 pounds. Increases in production per cow, and increased efficiency in all of the states, has more likely resulted from fundamental changes in the structure of dairy farming throughout the country, such as the increased cost of labor; new improved machinery; artificial breeding services; better feed and forage; adoption of different strains of livestock; and careful use of fertilizer, irrigation, and chemicals. The overall impact drastically increased production per cow, which has led to the need for fewer cows to supply the market.

Both of the studies that analyzed the NEDC's impact on milk production were based on a limited amount of data. OMB's 1998 study found that from July through December 1997, New England milk production was up 3 percent from the same period in the previous year, while national milk production was up 2 percent during the same period.¹⁹ Given this increase in New England milk production and using USDA's dairy economic model, OMB estimated that the Compact commission's price of \$16.94 per hundredweight for raw milk used for and sold as fluid milk would have caused milk marketings to increase from 5.38 billion pounds to 5.40 billion pounds, or by about 0.4 percent, between July and December 1998. OMB cautioned, however, that the analysis addressed only the first 6 months of the NEDC.

At the request of the NEDC, economists (Nicholson et al.) at the University of Vermont also used a model to estimate the impact of higher Compact prices on milk production.²⁰ Their study, issued in 2000, used state quarterly all-milk prices for each of the six Compact states as a basis to estimate what milk prices would have been without a Compact. In Vermont, these prices ranged from \$12.85 to \$15.09 per hundredweight. On the basis of their analysis of milk production data for the period July 1997 to June 1998, Nicholson et al. concluded that the NEDC caused milk production to increase by 45 million pounds, or about 1 percent. Nicholson et al. estimated that the Compact resulted in increased production in each of the six NEDC states, with the largest increase occurring in Vermont. Nicholson et al. postulated that without the NEDC milk production in that state would have declined.

Milk Consumption Has Continued to Decrease

The impact of the NEDC on milk consumption in the six NEDC states is difficult to determine because even though the data indicate that per capita consumption of fluid milk was higher in the NEDC states than in much of the rest of the United States between 1993 and 1999, consumption slowly declined during that period, both within the NEDC states and throughout much of the rest of the country, suggesting little or no change

¹⁹OMB, Feb. 1998.

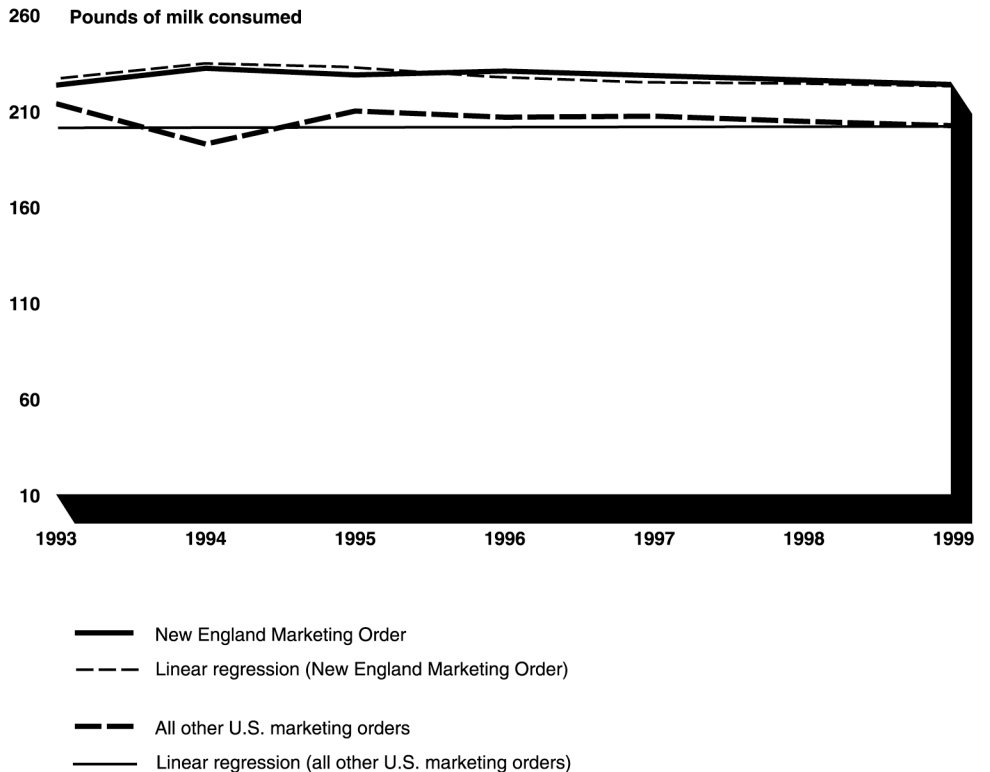
²⁰Charles F. Nicholson, Budy P. Resosudarmo, and Rick W. Wackernagel, "Impacts of the Compact on New England Milk Supply," *The Northeast Interstate Dairy Compact: Milk Market Impacts*, Research Report 73, Agricultural Experiment Station, University of Vermont, Mar. 2000.

as a result of the NEDC. On the other hand, one study that analyzed the impact of the NEDC on milk consumption concluded that the Compact could have caused a slight reduction in milk consumption in the NEDC states in the latter part of 1997.

As figure 9 shows, from 1993 to 1999 annual per capita milk consumption in the New England Milk Marketing Order declined by about 4 percent, from about 233 pounds to about 223 pounds.²¹ This decline is equivalent to a reduction from about 27 gallons to 26 gallons. Similarly, annual per capita milk consumption in the rest of the milk marketing orders in the United States for the same time period declined by about 6 percent, from about 214 pounds to about 202 pounds. This is equivalent to a reduction from about 25 gallons to 23 gallons.

²¹Because data are not available on milk consumption in the six NEDC states, we used data for USDA's New England Milk Marketing Order. The New England Milk Marketing Order includes Connecticut, Massachusetts, New Hampshire, Rhode Island, and Vermont, or portions thereof. In January 2000, this marketing order was dissolved and a larger Northeast Marketing Order, which incorporates additional states, replaced it.

Figure 9: Per Capita Fluid Milk Consumption in the New England Milk Marketing Order and in All Other Milk Marketing Orders, 1993-99



Source: GAO analysis of data from USDA's National Agricultural Statistics Service.

This slow decline in milk consumption began in the late 1970s, probably as the result of such factors as increasing consumption of other beverages, such as fruit beverages, bottled water, and carbonated soft drinks; growing dietary concerns about fat and cholesterol; and an aging U.S. population. USDA estimated that without marketing efforts undertaken by the milk industry, such as advertising and product innovation, milk consumption would have been lower than it was by as much as 1.4 percent from 1996 to 1999.²²

OMB's 1998 study found that from July to December 1997, fluid milk sales in New England totaled 1.3 billion pounds, which was down 0.7 percent

²²USDA Report to Congress on the Dairy Promotion Programs, 2000.

from the same period 1 year earlier.²³ Nationally, fluid milk sales increased by 0.2 percent in the last half of calendar year 1997. OMB noted that studies on the relationship between retail prices and consumption suggest that a 10-percent increase in retail fluid milk prices reduces consumption by 1 to 2 percent. Using USDA's model, OMB estimated that the average retail price in the Compact states would have been \$2.46 per gallon without the NEDC price regulations, and that with the NEDC price regulations retail prices increased by 3.7 percent to \$2.55 per gallon. Given the retail price and consumption relationship found in other studies, and the NEDC's impact on retail milk prices, OMB concluded that the NEDC's price regulations reduced fluid milk consumption in the NEDC states by about 10 million pounds, or about 0.5 percent, between July and December 1997.

Bailey's July 2000 study also analyzed the NEDC's impact on retail fluid milk consumption.²⁴ Bailey examined Class I sales in the New England Marketing Milk Marketing Order from 1996 through 1999 and observed a retail milk price increase of 24 cents per gallon in the Hartford and Boston markets over that period. He attributed this increase to an average 10-cent-per-gallon Compact obligation and a general rise in the farm-to-retail markup. Even though retail prices increased, Bailey concluded that total fluid milk consumption did not change appreciably after introduction of the Compact: He estimated that the amount of milk consumed decreased by less than 0.3 percent in 1998 and 1999.

²³OMB, Feb. 1998.

²⁴Kenneth Bailey, July 2000.

Appendix IV: NEDC's Impacts on Federal Program Costs

According to USDA, the NEDC has not increased the net federal costs of the milk price support program, and the agency is not certain whether the Compact has increased costs of the nutrition assistance programs administered by USDA. Net costs for USDA's milk price support program have not increased because the 1996 farm bill requires that the NEDC commission compensate USDA for any additional dairy commodity purchases to the extent that the percentage change in milk production in the NEDC states exceeds the national average.¹ Regarding nutrition assistance programs, according to USDA, federal costs for its Food Stamp Program may have increased as a result of the NEDC, but federal costs for its other nutrition assistance programs have not increased because of how these programs are funded or because of how federal program benefits are calculated for them. According to USDA officials, regardless of whether federal costs for its other nutrition assistance programs have increased, increased retail milk prices caused by the Compact have been borne by agencies or organizations that provide program benefits or by program participants in the NEDC states. The NEDC commission directly reimburses the NEDC states for increased costs incurred by selected nutrition assistance programs. While two studies assessed the NEDC's impacts on selected nutrition assistance programs, study results are inconclusive as to whether the NEDC has impacted these programs.

Federal Net Costs for the Milk Price Support Program Have Not Increased

Even though USDA estimates that the NEDC states' rates of increase in milk production have exceeded the national rates of increase in 2 of the 4 years since the Compact began setting the price of milk used for and sold as fluid milk in the NEDC states in July 1997, net federal milk price support program costs have not increased. The price support program, created in 1949, supports farm-level prices by providing a standing offer from the government to purchase butter, cheese, and nonfat dry milk at specified prices. The 1996 farm bill requires that the Compact commission compensate USDA when the estimated rate of increase in milk production in the six NEDC states is greater than the estimated rate of increase in national milk production. The NEDC commission is required to compensate USDA before the end of any fiscal year in which the NEDC states' estimated rate of increase in production is greater than the national rate of increase for the preceding fiscal year. Neither the NEDC nor USDA

¹Federal Agriculture Improvement and Reform Act of 1996 (P.L. 104-127, Apr. 4, 1996).

must determine whether the greater rate of increase, or what portion of the greater rate of increase, is attributable to the NEDC.

According to USDA officials, milk production in the NEDC states did not increase at a greater rate than the national rate of increase between July and September 1997. However, in 1998, USDA estimated that milk production in the NEDC states increased 1.8 percent, based on its analysis of the average amount of milk produced in the six states during 1997 and 1998, as compared to a national average increase in production of 1.3 percent. On the basis of these two rates, USDA estimated that it purchased about \$1.8 million of nonfat dry milk that was attributable to the NEDC's greater rate of increase in production. In 1999, USDA estimated that milk production in the NEDC states increased 3.6 percent, based on its analysis of the states' average milk production in 1998 and 1999, compared with a national average rate of increase of 3.2 percent. On the basis of these two rates, USDA estimated that it purchased about \$1.4 million of nonfat dry milk that was attributable to the NEDC's greater rate of increase in production. The NEDC commission compensated the federal government these amounts for these 2 fiscal years. The Compact commission was not required to compensate USDA for fiscal year 2000 because USDA concluded that the average rate of increase in milk production in the NEDC states (0.1 percent) was less than the average national rate (5.1 percent).

It Is Unclear Whether Federal Net Costs for Nutrition Assistance Programs Have Increased

USDA analyzed the Compact's impact on federal nutrition assistance program costs and concluded that it is uncertain whether the federal costs of one of its major programs—the Food Stamp Program—have increased, while federal costs of its other programs most likely have not. Food Stamp Program costs may have increased to the extent that the NEDC caused retail milk prices to increase nationally and to the extent that the agencies or organizations that provide or receive program benefits are not reimbursed. USDA's Food and Nutrition Service is responsible for nutrition assistance programs, which include the Food Stamp Program; the Special Supplemental Nutrition Program for Women, Infants and Children (WIC); school programs such as the National School Breakfast and Lunch Programs and the Special Milk Program; the Child and Adult Care Food Program; and several small food distribution programs for Indian reservations, the elderly, pregnant women, and children. These programs are carried out at the state and local level by state and local agencies and organizations, such as day care centers or schools.

Regarding the Food Stamp Program, USDA officials said that federal costs may have increased as a result of the NEDC, but they do not know because it is difficult to determine (1) how much of the increased retail milk price in the NEDC states was caused by the Compact, and (2) to what extent that portion of the increased retail milk price caused an increase in the national average cost of food items used to determine program benefits. The Food Stamp Program is operated by state and local welfare offices. Under the program, food stamp recipients spend their benefits (in the form of paper coupons or electronic benefits on debit cards), to buy eligible food in authorized retail food stores. Program benefits under this program are indexed to the cost of a selected group of foods, which is sensitive to the changes in the national average retail price of milk.² Benefit levels have increased since July 1997, because of, among other things, increased national average retail milk prices. USDA officials said that the retail milk price increases in the six NEDC states caused by the Compact had the potential to increase the index used to set benefit levels and, thus, federal costs, but it is not certain whether they did so. Further, it is difficult to determine what portion of the retail milk price increases was attributable to the Compact. USDA estimates that if the NEDC caused a 16-cent per gallon increase in the national average retail milk price, there is a 50 percent chance that Food Stamp Program benefits increased by \$1 per program participant per month and annual federal Food Stamp Program costs increased by about \$60 million. USDA officials also noted that even if the increased price of milk attributable to the NEDC was enough to increase national food stamp benefit levels, some portion of the increased retail milk costs have been borne by participants located in the six NEDC states.

Regarding WIC, USDA officials said that the Compact has not increased federal costs to the program because of the discretionary nature of its funding. Even so, because approximately 30 percent of the funds spent on WIC foods are used to buy fluid milk, any increase in retail milk prices can significantly affect the food package cost per participant and these higher costs, unless offset, would reduce the potential number of participants. WIC is administered by state agencies, most of whom provide WIC participants checks or food instruments to purchase specific foods each month at authorized retailers. While the 1996 farm bill does not require the Compact commission to reimburse the WIC program, NEDC regulations

²This selected group of foods is the core of the Thrifty Food Plan—a nutritious, low-cost model diet plan. Milk makes up about 10 percent of the value of this plan.

specify that the Compact commission is to compensate New England state agencies that administer WIC for any increased costs due to the Compact. The amount of compensation equals the over-order producer price payment multiplied by the volume of milk used by program participants in a given month.³ For example, in January of 1998 when the Vermont WIC program purchased 52,403 gallons of milk, the difference between the NEDC Class I milk price and the minimum USDA Class I price was 74 cents per hundredweight. Given that a hundredweight is equivalent to about 11.6 gallons of milk, the Compact commission compensated Vermont about \$3,343 for that month. In total, the Compact commission compensated the six states' WIC programs \$3.8 million from 1997 through 2000 for increased milk costs due to the NEDC.

According to state WIC officials, the programs used to administer WIC are being held harmless by the NEDC. These officials said that the NEDC has not resulted in increased WIC program costs or reduced program participation. One state WIC official said that the NEDC has done everything it can to ensure that the WIC programs in the six states remain unharmed by reimbursing the states the full difference between the NEDC's minimum Class I producer price and the milk marketing order minimum Class I price on all WIC milk purchases.

Regarding school programs, according to USDA officials, it is likely that federal costs to these programs have not increased as a result of the NEDC because program benefits are based on a broad index of food prices that is relatively insensitive to changes in the price of milk in the six NEDC states.⁴ Thus, any increases in milk prices caused by the Compact would either have to be absorbed by the schools or passed on to paying students. Programs such as the School Lunch Program are usually administered by state education agencies, which operate the program through agreements with local school districts. NEDC regulations specify that the Compact will reimburse schools for any Compact-related increased costs of fluid milk

³The memorandum of agreement between the NEDC commission and the state WIC agencies specifies that reimbursement shall be an amount equal to the over-order obligation for each month per hundredweight multiplied by the actual number of hundredweight equivalents of milk provided to WIC participants in each month.

⁴Under the school lunch and breakfast programs, meal reimbursements are indexed to the consumer price index for food-away-from-home for urban consumers. Under the Special Milk Program, reimbursements are indexed to the producer price index for milk.

sold in 8-ounce containers by schools in the six NEDC states.⁵ This commitment applies to all milk served in 8-ounce containers by schools, including milk provided under such child nutrition programs as the school lunch and breakfast programs and the Special Milk Program. The NEDC commission requires that school food authorities submit claim forms at the end of each school year that identify the number of 8-oz. cartons of milk purchased during the school year on these forms. School authorities document whether part of the price for the 8-ounce milk containers is attributable to the NEDC over-order premium and, if so, how much on the basis of milk vendor submissions. Our review of school food authority claim data indicates that the portion of the contract price that milk vendors have attributed to the NEDC varies. For example, Connecticut school food authorities attributed from .2 cents to 1.37 cents per 8-ounce container to the NEDC over-order premium during the 1999-2000 school year.

The NEDC commission then verifies that amounts claimed do not exceed the NEDC's average over-order premium for the school year and compensates school food authorities either the average over-order premium or the amount vendors attributed to the NEDC over-order premium, whichever is less. Thus, the amounts paid to school food authorities vary depending on the amount that they attributed to the NEDC and the amount of milk purchased. For example, one school food authority in Massachusetts was compensated \$308.35 for 146,835 cartons of milk purchased during the 1999-2000 school year, while another school food authority in that state was compensated \$316.33 for 31,633 cartons of milk purchased for the same year. In total, the NEDC commission reimbursed the states \$662,606 for the 1998-1999 and 1999-2000 school years.

Although the amounts paid varied from school to school, officials in the six states' departments of education generally said that schools claiming and receiving compensation were not, in the end, spending additional funds for milk or having to charge higher prices for milk sold to students. However, these officials also said that many school food authorities have chosen not to seek compensation because some school food authorities view the claim process as burdensome and not worth the effort given the relatively small amounts of money that they would receive.

⁵The regulations cover fluid milk sold in 8-ounce containers distributed by handlers under open competitive bid contracts and sold by schools.

As is the case with the school programs, according to USDA officials it is likely that federal costs of the Child and Adult Care Food Program also have not increased as a result of the NEDC because program benefits are based on a broad index of retail food prices that is relatively insensitive to changes in the price of milk.⁶ State education or health departments administer the program, with independent centers and sponsoring organizations entering into agreements with these departments to operate the program. Under the program, USDA provides eligible centers and sponsoring organizations, such as family day care homes and child-care centers, reimbursements for meals served. According to USDA, it has no data on the amount of milk purchased under the program, and it would be prohibitively labor-intensive for the NEDC to establish a method for compensating thousands of individual homes and centers for any increased retail milk prices.

Regarding USDA's food distribution programs, according to USDA officials, USDA has not estimated the potential NEDC-related increased costs to these programs. USDA officials said, however, that any increased costs would be relatively small, given the small size of these programs compared with programs such as WIC. Furthermore, because most of these programs are not entitlement programs and thus federal funding is not mandatory, any increased costs due to the NEDC would have to be borne by program providers and could result in fewer participants being served.

If Compacts Are Expanded, Federal Food Stamp Program Costs Could Increase, as Could Nonfederal Costs for Other Nutrition Assistance Programs

According to USDA, if the NEDC is expanded to include additional states or if a southern compact is also created, it is more likely that federal costs for the Food Stamp Program would increase than with the existing NEDC: The likely increase in retail milk prices in more states would have a more direct impact on the index used to set program benefits.

USDA estimated that if retail milk prices in the states of an expanded NEDC and a southern compact increased by about 20 cents per gallon—an amount that USDA noted is possible given the NEDC experience—food stamp participants in compact states would spend about \$93 million a year more to purchase milk. If this price increase did not cause the national

⁶Under the Child and Adult Care Food Program, meal reimbursements are indexed to the cost of the consumer price index for food-away-from-home for urban consumers.

price increase to rise sufficiently to increase program benefits, Food Stamp Program participants would have to absorb this cost. However, if the 20-cent-per-gallon price increase resulted in a sufficiently large national average retail milk price increase to cause a \$1- to \$2-per-participant increase in Food Stamp Program benefits, USDA estimated that federal Food Stamp Program costs could increase by as much as \$60 to \$120 million per year—an amount that would have to be federally funded.⁷ Moreover, if the NEDC is expanded and a southern compact is established, and if the NEDC does not provide reimbursements, increased retail milk costs could result in fewer participants being served by state WIC programs. Given these assumptions, it is also likely that costs to school programs would have to be absorbed by school food authorities and program participants because of the index used to establish benefits under these programs. Table 23 summarizes the additional costs that USDA estimated could be incurred under the above assumptions in fiscal year 2000 by food stamp, WIC, and school program providers or participants in compact states if the NEDC is expanded and a southern compact is established, and if retail milk prices increase in the compact states.⁸

⁷USDA used 2000 as a base year for developing its estimate of increased program costs.

⁸For purposes of its analysis, USDA included Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, and Vermont in an expanded NEDC, and Alabama, Arkansas, Florida, Georgia, Kansas, Kentucky, Louisiana, Missouri, Mississippi, North Carolina, South Carolina, Tennessee, Oklahoma, Texas, Virginia, and West Virginia in a southern compact.

Table 23: Estimated Impact on Food Stamp, WIC, and School Feeding Program Participants if Retail Milk Prices Increase 10, 15, or 20 Cents per Gallon Under an Expanded NEDC and a Southern Compact

Annual impact on the program	Increase in the retail price of a gallon of milk in an expanded NEDC and southern compact		
	10 cents	15 cents	20 cents
Increased Food Stamp Program costs^a	\$46,676,933	\$70,015,399	\$93,353,866
Increased cost to maintain level of WIC participation that existed before the NEDC expanded (number of participants that would leave WIC if funding remained constant)	15,586,611 (42,498)	23,379,916 (63,429)	31,173,222 (84,153)
Increased cost to National School Breakfast and Lunch Programs	20,315,004	30,472,505	41,630,007
Total increased cost	\$82,578,547	\$123,867,821	\$165,157,094

^aIncreased costs are borne by Food Stamp Program participants if federal benefits do not increase. If federal benefits increase, increased costs would be borne by participants in the first year of the compact until federal program benefits are reindexed in the year following the compact's establishment. According to USDA officials, even if federal benefits increase, the increase in program benefits may not be sufficient to fully offset increased retail milk prices in compact states. Further, households in noncompact states would receive higher benefits, even though retail milk price increases would be limited to compact states.

Source: USDA's Food and Nutrition Service.

Two Studies of the NEDC's Impact on Nutrition Assistance Programs Provide Inconclusive Results

Two studies—one prepared by the Office of Management and Budget (OMB) and the other by University of Vermont researchers—offer inconclusive results on the NEDC's potential impacts on USDA's nutrition assistance programs. Both studies were conducted early in the Compact's existence and relied on limited retail milk price data. For example, OMB's 1998 study began before the NEDC commission and the states entered into agreements for compensating states' WIC and school programs and relied on only 6 months of retail price data—from July through December 1997.⁹ Because of this, the study projected either a low (5- to 10-cent), medium (10- to 15-cent), or high (15- to 20-cent) impact on retail milk prices, as reflected in an increased price for a gallon of milk. Assuming no NEDC reimbursements and a medium impact on retail milk prices, OMB estimated that a 15-cent increase in the retail price of milk in the first 6 months of the NEDC would increase state WIC program costs by about \$721,300, which would require a reduction in program participation of about 3,000 people if the states did not spend the additional money. OMB also estimated that school lunch and breakfast program costs would increase by \$1.2 million during the first 6 months of the NEDC—an increase that would have to be absorbed by schools or passed on to

⁹OMB's *The Economic Effects of the Northeast Interstate Dairy Compact*, Feb. 1998.

families who pay for meals and snacks. For the same period, OMB also estimated that participants in USDA's Food Stamp Program who reside in the NEDC states would pay an additional estimated \$2.4 million because of increased retail milk prices—an amount that the federal government would not be required to pay because it is likely that national average milk prices would not have increased sufficiently to warrant an increase in benefits. Even if the price increase were large enough to trigger an increase in the index used to establish program benefits, only a small portion of the additional program benefits would go to food stamp recipients in the NEDC states, because all recipients nationwide would receive the increase.

Researchers at the University of Vermont, who were asked by the NEDC commission to conduct the study, also relied on limited data.¹⁰ Wang et al. focused on the NEDC's potential impact on the WIC program and analyzed retail milk price and program participation data for the period between June 1997 and February 1998. They accounted for NEDC reimbursements to the states' WIC programs and examined retail milk prices in Boston and Hartford. Their analysis concluded that WIC program participation had not been significantly affected by the NEDC during the time frame analyzed. The study also concluded that retail milk prices in Hartford increased significantly more than in Boston, an increase that might be explained by differences in market concentration and competition. However, the authors concluded that their study results had two principal limitations: (1) their analysis was limited to Boston and Hartford and (2) the NEDC had been in effect only since July 1997, thus providing a small amount of data for the analysis.

¹⁰Qingbin Wang, Zooyob Anne, Catherine Halbrendt, Charles Nicholson, and Jaimie Sung, "Impacts of the Compact on the WIC Program: Evidence From Boston and Hartford," *The Northeast Interstate Dairy Compact: Milk Market Impacts*, Research Report 73, Agricultural Experiment Station, University of Vermont, Mar. 2000.

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

This appendix provides our 1999 estimates of the interregional farm- and wholesale-level impacts of the NEDC, an expanded NEDC, and an expanded NEDC combined with a southern compact on various dairy sector indicators. To develop our estimates, we first estimated the impact of each compact scenario on the basis of certain assumptions, such as transportation costs and supply and demand elasticities. We then varied these assumptions to test the sensitivity of our initial estimates. (See app. II for a detailed discussion of our methodology; a description of the IRCM; a list of the states included in the different compact scenarios; values for parameters used, such as the responsiveness of consumers to changing commodity prices; and a summary of the data used and sources for these data.)

We present the data in a series of tables that summarize (1) the range of estimates that we obtained using our initial and subsequent sets of assumptions across the various compact scenarios for each of the dairy sector indicators that we analyzed; (2) our initial estimates of farm-level and wholesale-level impacts of the NEDC scenario, and the results of our sensitivity analyses for that scenario; (3) our initial estimates of farm-level and wholesale-level impacts of the expanded NEDC scenario, and the results of our sensitivity analyses for that scenario; (4) our initial estimates of farm-level and wholesale-level impacts of the expanded NEDC scenario combined with a southern compact, and the results of our sensitivity analyses for that scenario; and (5) the results of our sensitivity analysis for the expanded NEDC scenario combined with a southern compact using a more restrictive trade assumption. In all instances, we present the estimated impacts of the various compact scenarios as changes to our no-compact baseline values for 1999.

Range of Estimates Obtained Across Different Compact Scenarios

Table 24: Range of Estimated Impacts on 1999 Farm-Level Prices Across Different Compact Scenarios

Dollars per hundredweight					
IRCM99 region	No-compact baseline in 1999	Farm-level prices			
		Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Northeast	\$15.07	\$0.07 to 0.12	\$0.30 to 0.48	\$0.22 to 0.41	\$0.26 to 0.45
Appalachia	15.97	(0.01) to 0	(0.05) to (0.02)	1.10 to 1.85	1.16 to 1.96
Florida	17.14	(0.02) to 0	(0.05) to (0.02)	(0.02) to 0.04	(0.07) to 0
Southeast	16.01	(0.02) to 0.02	(0.05) to 0.02	0.79 to 1.66	2.99 to 4.51
Mideast	14.64	(0.02) to 0	(0.05) to (0.03)	(0.24) to (0.13)	(0.28) to (0.21)
Upper Midwest	13.82	(0.02) to (0.01)	(0.05) to (0.03)	(0.11) to (0.06)	(0.30) to (0.24)
Central	14.22	(0.01) to 0	(0.05) to (0.02)	0.10 to 0.27	0.15 to 0.33
Southwest	14.49	(0.01) to 0	(0.04) to (0.02)	(0.17) to (0.05)	(0.16) to (0.05)
Western	13.18	(0.01) to 0	(0.04) to (0.02)	(0.14) to (0.09)	(0.19) to (0.12)
Northwest	14.85	(0.01) to 0	(0.04) to (0.03)	(0.13) to 0.03	(0.17) to (0.10)
California	12.98	(0.02) to (0.01)	(0.06) to 0.02	(0.18) to 0.18	(0.27) to (0.16)
Arizona	13.76	(0.01) to 0	(0.04) to 0.03	(0.36) to 0.06	(0.09) to 0.06

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 25: Range of Estimated Impacts on 1999 Farm-Level Production Across Different Compact Scenarios

Pounds in millions					
IRCM99 region	No-compact baseline in 1999	Farm-level production			
		Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Northeast	29,138	36 to 90	150 to 383	106 to 313	127 to 255
Appalachia	6,437	(6) to (1)	(19) to (7)	283 to 504	300 to 533
Florida	2,390	(1) to 0	(4) to (2)	(1) to 9	(4) to 0
Southeast	3,548	(3) to 0	(7) to 2	70 to 164	261 to 534

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Pounds in millions					
IRCM99 region	Farm-level production				
	No-compact baseline in 1999	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Mideast	12,238	(7) to 0	(16) to (7)	(100) to (35)	(101) to (56)
Upper Midwest	32,803	(20) to (4)	(54) to (20)	(152) to (43)	(326) to (180)
Central	14,855	(5) to 0	(22) to (12)	45 to 121	103 to 186
Southwest	10,278	(3) to 0	(15) to (5)	(45) to (13)	(46) to (15)
Western	8,854	(3) to (1)	(20) to (7)	(64) to (28)	(83) to (35)
Northwest	7,134	(2) to 0	(12) to (5)	(42) to 5	(51) to (23)
California	30,459	(35) to (7)	(112) to 21	(400) to 185	(491) to (168)
Arizona	2,914	(1) to 0	(3) to 3	(29) to 6	(7) to 7

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 26: Range of Estimated Impacts on 1999 Farm-Level Revenue Across Different Compact Scenarios

Dollars in millions					
IRCM99 region	Farm-level revenue				
	No-compact baseline in 1999	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Northeast	\$4,391	\$26 to 46	\$110 to 193	\$80 to 159	\$95 to 165
Appalachia	1,028	(2) to 0	(6) to (2)	119 to 204	126 to 217
Florida	410	(1) to 0	(2) to (1)	(1) to 5	(2) to 0
Southeast	568	(1) to 1	(3) to 1	40 to 85	165 to 242
Mideast	1,792	(2) to 0	(8) to (5)	(43) to (21)	(45) to (34)
Upper Midwest	4,533	(9) to (4)	(24) to (13)	(63) to (26)	(133) to (103)
Central	2,112	(2) to 0	(10) to (5)	21 to 58	37 to 67
Southwest	1,489	(1) to 0	(6) to (3)	(24) to (7)	(23) to (7)
Western	1,167	(1) to 0	(6) to (3)	(20) to (13)	(26) to (15)
Northwest	1,059	(1) to 0	(4) to (3)	(15) to 3	(17) to (11)
California	3,954	(11) to (4)	(33) to 9	(118) to 80	(145) to (70)
Arizona	401	0	(2) to 1	(14) to 2	(4) to 3

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Table 27: Range of Estimated Impacts on 1999 National Average Wholesale-Level Prices Across Different Compact Scenarios

Dollars per hundredweight					
Dairy commodity	Wholesale-level prices				
	No-compact baseline in 1999	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Fluid milk	\$15.04	\$0.04 to 0.07	\$0.16 to 0.27	\$0.39 to 0.63	\$0.66 to 0.93
Soft dairy products	27.31	(0.10) to (0.02)	(0.19) to (0.08)	(0.55) to (0.17)	(0.52) to (0.18)
American cheese	139.24	(0.09) to (0.03)	(0.41) to (0.18)	(1.41) to (0.62)	(1.86) to (1.27)
Italian cheese	93.24	(0.08) to (0.03)	(0.31) to (0.13)	(1.11) to 0.36	(1.36) to (0.95)
Other cheese	115.58	(0.21) to 0.06	(0.44) to (0.05)	(1.11) to 0.69	(1.65) to (0.75)
Butter	119.52	(0.23) to (0.03)	(0.88) to (0.46)	(6.53) to 0.21	(2.80) to 0.07
Frozen dairy products	21.40	(0.02) to 0	(0.11) to (0.05)	(0.53) to (0.10)	(0.65) to (0.38)
Other manufactured products	27.68	(0.03) to 0.04	(0.01) to 0.07	(0.11) to 1.04	(0.18) to 0.08
Nonfat dry milk	102.63	(0.01) to 0	(0.06) to (0.02)	(1.22) to (0.07)	(0.05) to 0.01

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 28: Range of Estimated Impacts on 1999 Wholesale-Level Production Across Different Compact Scenarios

Pounds in millions					
Dairy commodity	Wholesale-level production				
	No-compact baseline in 1999	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Fluid Milk	55,043	(69) to (22)	(293) to (86)	(647) to (233)	(778) to (313)
Soft dairy products	5,984	1 to 4	8 to 20	27 to 51	29 to 50
American cheese	3,539	0 to 1	1 to 6	1 to 20	5 to 25
Italian cheese	3,175	0 to 2	1 to 8	(3) to 21	8 to 33
Other cheese	598	0 to 1	0 to 1	(1) to 4	3 to 5
Butter	1,274	0 to 1	1 to 3	(1) to 17	0 to 8
Frozen dairy products	12,131	2 to 4	13 to 20	26 to 98	41 to 79
Other manufactured products	4,270	(2) to 3	(2) to 1	(56) to 15	(3) to 9
Nonfat dry milk	1,396	1 to 4	9 to 23	22 to 98	27 to 54

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 29: Range of Estimated Impacts on 1999 Wholesale-Level Expenditures Across Different Compact Scenarios

Dollars in millions

Dairy commodity	Wholesale-level expenditures				
	No-compact baseline in 1999	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Fluid Milk	\$8,220	\$18 to 33	\$69 to 126	\$144 to 293	\$259 to 438
Soft dairy products	1,626	(5) to 0	(9) to (1)	(19) to (2)	(19) to 3
American cheese	4,823	(3) to (1)	(11) to (2)	(41) to (15)	(55) to (16)
Italian cheese	3,028	(2) to (1)	(8) to (3)	(25) to 9	(33) to (12)
Other cheese	792	(1) to 0	(3) to 1	(4) to 4	(7) to (2)
Butter	1,495	(2) to 1	(7) to (2)	(64) to 1	(27) to 1
Frozen dairy products	2,570	(2) to 0	(9) to (3)	(43) to (6)	(62) to (37)
Other manufactured products	1,199	(1) to 1	0 to 3	(1) to 28	(5) to 3
Nonfat dry milk	1,012	0	(1) to 0	(1) to 1	0

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

The Economic Impacts of the NEDC in 1999

To obtain our initial estimates of the effects of the NEDC in 1999, we used the following assumptions (our no-compact baseline includes the first three assumptions):

- No more than 40 percent of any one region's milk may be shipped to another region without being subject to the receiving region's pricing requirements. This assumption is used to simulate USDA milk marketing order regulations regarding minimum pricing requirements for milk shipped between marketing orders. This threshold was chosen as a proxy for the requirement that an adjustment be made if a plurality of an order's packaged milk was sold in another region.
- Supply elasticities are medium-term (that is, 5 years).
- Demand elasticities are medium-term.
- The Class I minimum price in the Compact region is the higher of the Compact price of \$16.94 per hundredweight of milk, or the USDA milk marketing order price.
- Market-driven over-order premiums are zero in the Compact region. This initial assumption represents a lower bound, and assumes that all market-driven over-order premiums in NEDC states are replaced by Compact over-order producer price payments.

- A handler must pay the compact over-order producer price into the Compact pool for milk shipped into the Compact region in order to receive the compact price.

We then performed a series of sensitivity analyses by varying key assumptions to test the “robustness” of these initial estimates—that is, whether, and if so by how much, our initial estimates would change when we used different assumptions. Tables 30 through 39 present our initial and subsequent estimates of the impacts of the NEDC in 1999 compared to a no-compact scenario on farm- and wholesale-level indicators.

Initial Estimates of the NEDC’s Impacts

Table 30: Initial Estimates of the NEDC’s Impacts on 1999 Farm-Level Indicators

IRCM99 region	Farm-level prices (dollars per hundredweight)		Farm-level production (pounds in millions)		Farm-level revenue (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Northeast	\$15.07	\$0.08	29,138	40	\$4,391	\$29
Appalachia	15.97	(0.01)	6,437	(2)	1,028	(1)
Florida	17.14	(0.01)	2,390	(1)	410	0
Southeast	16.01	(0.01)	3,548	(1)	568	(1)
Mideast	14.64	0	12,238	(1)	1,792	0
Upper Midwest	13.82	(0.01)	32,803	(5)	4,533	(4)
Central	14.22	(0.01)	14,855	(3)	2,112	(2)
Southwest	14.49	(0.01)	10,278	(2)	1,489	(1)
Western	13.18	(0.01)	8,854	(1)	1,167	(1)
Northwest	14.85	(0.01)	7,134	(1)	1,059	(1)
California	12.98	(0.01)	30,459	(8)	3,954	(4)
Arizona	13.76	(0.01)	2,914	0	401	0
All noncompact regions combined	^a	^a	131,910	(25)	18,513	(15)

Note: Numbers in parentheses are negative.

^aBecause farm-level prices are regional, an “all noncompact regions combined” price is not meaningful.

Source: GAO analysis using the IRCM99.

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Table 31: Initial Estimates of the NEDC's Impacts on 1999 Wholesale-Level Indicators

Dairy commodity	Wholesale-level prices (dollars per hundredweight)		Wholesale-level production (pounds in millions)		Wholesale-level expenditures (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Fluid milk	\$15.04	\$0.05	55,043	(23)	\$8,220	\$24
Soft dairy products	27.31	(0.02)	5,984	2	1,626	(1)
American cheese	139.24	(0.04)	3,539	0	4,823	(1)
Italian cheese	93.24	(0.04)	3,175	1	3,028	(1)
Other cheese	115.58	(0.09)	598	0	792	(1)
Butter	119.52	(0.14)	1,274	0	1,495	(2)
Frozen dairy products	21.40	(0.02)	12,131	3	2,570	(2)
Other manufactured products	27.68	0	4,270	0	1,199	0
Nonfat dry milk	102.63	0	1,396	3	1,012	0

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Sensitivity Analyses for the NEDC Scenario

Tables 32 through 37 display the results of our sensitivity analyses for 1999 farm- and wholesale-level indicators. In comparison with our initial estimates, we used (1) 10-year regional supply elasticities as opposed to 5-year; (2) long-term (i.e., higher), as opposed to medium-term, commodity demand elasticities, (3) higher market-driven over-order premiums as opposed to zero; (4) a combination of the previous three assumptions; and (5) an overall 25-percent increase in transportation costs.¹

¹In tables 32 through 37, as well as in comparable tables showing our estimates of the impacts of other compact scenarios, we include a column showing our baseline estimates for our no-compact scenario to provide a context for assessing the estimated changes due to the compacts under the assumptions used in each sensitivity analysis. In conducting each of the separate sensitivity analyses, we developed a separate baseline for our farm- and wholesale-level variables. For presentation purposes, however, we include only our baseline estimates developed for our initial estimates for each compact scenario because they were very similar to the baselines for each sensitivity analysis.

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Table 32: Estimated Change in 1999 Farm-Level Prices Using Different Assumptions Under the NEDC Scenario

Dollars per hundredweight

Estimated change to baseline farm-level prices using different assumptions

IRCM99 region	No-compact Baseline farm-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent
Northeast	\$15.07	\$0.08	\$0.08	\$0.12	\$0.11	\$0.07
Appalachia	15.97	0	(0.01)	(0.01)	(0.01)	0
Florida	17.14	(0.01)	(0.01)	(0.01)	(0.02)	0
Southeast	16.01	0	(0.01)	(0.01)	(0.02)	0.02
Mideast	14.64	(0.01)	(0.01)	(0.01)	(0.02)	0
Upper Midwest	13.82	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Central	14.22	0	0	(0.01)	0	0
Southwest	14.49	0	0	(0.01)	(0.01)	(0.01)
Western	13.18	0	(0.01)	(0.01)	0	0
Northwest	14.85	0	(0.01)	(0.01)	(0.01)	(0.01)
California	12.98	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
Arizona	13.76	0	0	(0.01)	0	(0.01)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO analysis using the IRCM99.

Table 33: Estimated Change in 1999 Farm-Level Production Using Different Assumptions Under the NEDC Scenario

Pounds in millions

Estimated change to baseline farm-level production using different assumptions

IRCM99 region	No-compact baseline farm-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent
Northeast	29,138	61	37	60	90	36
Appalachia	6,437	(3)	(2)	(2)	(6)	(1)
Florida	2,390	0	(1)	(1)	(1)	(1)
Southeast	3,548	0	(1)	(2)	(3)	2
Mideast	12,238	(3)	(3)	(3)	(7)	0
Upper Midwest	32,803	(9)	(4)	(7)	(20)	(6)
Central	14,855	(1)	(3)	(5)	0	(2)
Southwest	10,278	(2)	0	(3)	(2)	(2)
Western	8,854	(3)	(3)	(3)	(2)	(1)
Northwest	7,134	0	(2)	(2)	(2)	(1)
California	30,459	(33)	(7)	(11)	(35)	(11)
Arizona	2,914	(1)	(1)	(1)	0	0

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Note: Numbers in parentheses are negative.

*The combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO analysis using the IRCM99.

Table 34: Estimated Change in 1999 Farm-Level Revenue Using Different Assumptions Under the NEDC Scenario

Dollars in millions

Estimated change to baseline farm-level revenue using different assumptions							
IRCM99 region	No-compact baseline farm-level revenue in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent	
Northeast	\$4,391	\$33	\$29	\$44	\$46	\$26	
Appalachia	1,028	0	(1)	(1)	(2)	0	
Florida	410	0	0	0	(1)	0	
Southeast	568	0	(1)	(1)	(1)	1	
Mideast	1,792	(2)	(2)	(2)	(3)	0	
Upper Midwest	4,533	(5)	(4)	(4)	(9)	(4)	
Central	2,112	0	0	(2)	0	0	
Southwest	1,489	0	0	(1)	(1)	(1)	
Western	1,167	0	(1)	(1)	(0)	(0)	
Northwest	1,059	0	(1)	(1)	(1)	(1)	
California	3,954	(10)	(4)	(4)	(11)	(5)	
Arizona	401	0	0	0	0	0	

Note: Numbers in parentheses are negative.

*The combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO analysis using the IRCM99.

Table 35: Estimated Change in 1999 National Average Wholesale-Level Prices Using Different Assumptions Under the NEDC Scenario

Dollars per hundredweight

Estimated change to baseline wholesale-level prices using different assumptions							
Dairy commodity	No-compact baseline wholesale-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent	
Fluid milk	\$15.04	\$0.04	\$0.05	\$0.07	\$0.07	\$0.05	
Soft dairy products	27.31	(0.08)	(0.02)	(0.03)	(0.10)	(0.02)	
American cheese	139.24	(0.03)	(0.07)	(0.08)	(0.09)	(0.05)	
Italian cheese	93.24	(0.03)	(0.06)	(0.05)	(0.08)	(0.04)	
Other cheese	115.58	(0.21)	0.06	(0.10)	(0.12)	(0.15)	

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Dollars per hundredweight							
Estimated change to baseline wholesale-level prices using different assumptions							
Dairy commodity	No-compact baseline wholesale-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	Transportation costs increase 25 percent	
Butter	119.52	(0.12)	(0.03)	(0.23)	(0.06)	(0.12)	
Frozen dairy products	21.40	(0.01)	0	(0.02)	(0.01)	(0.01)	
Other manufactured products	27.68	(0.02)	0.04	0.01	(0.03)	0.01	
Nonfat dry milk	102.63	0	(0.01)	0	(0.01)	(0.01)	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO analysis using the IRCM99.

Table 36: Estimated Change in 1999 Wholesale-Level Production Using Different Assumptions Under the NEDC Scenario

Pounds in millions							
Estimated change to baseline wholesale-level production using different assumptions							
Dairy commodity	No-compact baseline wholesale-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	Transportation costs increase 25 percent	
Fluid milk	55,043	(23)	(46)	(36)	(69)	(22)	
Soft dairy products	5,984	1	2	3	4	2	
American cheese	3,539	0	1	0	1	0	
Italian cheese	3,175	0	1	1	2	0	
Other cheese	598	0	1	0	0	0	
Butter	1,274	0	1	1	0	0	
Frozen dairy products	12,131	3	2	4	3	2	
Other manufactured products	4,270	1	(2)	0	3	(1)	
Nonfat dry milk	1,396	1	4	4	3	2	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO analysis using the IRCM99.

Table 37: Estimated Change in 1999 Wholesale-Level Expenditures Using Different Assumptions Under the NEDC Scenario

Dollars in millions

Dairy commodity	Estimated change to baseline wholesale-level expenditures using different assumptions						
	No-compact Baseline wholesale-level expenditures in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent	
Fluid milk	\$8,220	\$18	\$20	\$33	\$28	\$24	
Soft dairy products	1,626	(4)	0	(1)	(5)	(1)	
American cheese	4,823	(1)	(1)	(3)	(2)	(2)	
Italian cheese	3,028	(1)	(1)	(2)	(1)	(1)	
Other cheese	792	(1)	0	(1)	(1)	0	
Butter	1,495	(2)	1	(2)	(1)	(2)	
Frozen dairy products	2,570	(1)	0	(2)	(1)	(1)	
Other manufactured products	1,199	(1)	1	0	0	0	
Nonfat dry milk	1,012	0	0	0	0	0	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO analysis using the IRCM99.

Summary of the Estimated Impacts of the NEDC

Tables 38 and 39 summarize the results of our initial estimates and sensitivity analyses by presenting the range of estimates of the changes from our no-compact scenario that we obtained from our various analyses.

Table 38: Summary of Estimated Changes in 1999 Farm-Level Indicators Using Our Initial and Subsequent Sets of Assumptions Under the NEDC Scenario

IRCM99 region	Change in farm-level prices (dollars per hundredweight)	Change in farm-level production (pounds in millions)	Change in farm-level revenue (dollars in millions)
Northeast	\$0.07 to 0.12	36 to 90	\$26 to 46
Appalachia	(0.01) to 0	(6) to (1)	(2) to 0
Florida	(0.02) to 0	(1) to 0	(1) to 0
Southeast	(0.02) to 0.02	(3) to 0	(1) to 1
Mideast	(0.02) to 0	(7) to (0)	(2) to 0
Upper Midwest	(0.02) to (0.01)	(20) to (4)	(9) to (4)
Central	(0.01) to 0	(5) to 0	(2) to 0
Southwest	(0.01) to 0	(3) to 0	(1) to 0
Western	(0.01) to 0	(3) to (1)	(1) to 0

IRCM99 region	Change in farm-level prices (dollars per hundredweight)	Change in farm-level production (pounds in millions)	Change in farm-level revenue (dollars in millions)
Northwest	(0.01) to 0	(2) to 0	(1) to 0
California	(0.02) to (0.01)	(35) to (7)	(11) to (4)
Arizona	(0.01) to 0	(1) to 0	0

Note: Numbers in parentheses are negative.

Source: GAO analysis using the IRCM99.

Table 39: Summary of Estimated Changes in 1999 Wholesale-Level Indicators Using Our Initial and Subsequent Sets of Assumptions Under the NEDC Scenario

Dairy commodity	Change in wholesale-level prices (dollars per hundredweight)	Change in wholesale-level production (pounds in millions)	Change in wholesale-level expenditures (dollars in millions)
Fluid milk	\$0.04 to 0.07	(69) to (22)	\$18 to 33
Soft dairy products	(0.10) to (0.02)	1 to 4	(5) to 0
American cheese	(0.09) to (0.03)	0 to 1	(3) to (1)
Italian cheese	(0.08) to (0.03)	0 to 2	(2) to (1)
Other cheese	(0.21) to 0.06	0 to 1	(1) to 0
Butter	(0.23) to (0.03)	0 to 1	(2) to 1
Frozen dairy products	(0.02) to 0.00	2 to 4	(2) to 0
Other manufactured products	(0.03) to 0.04	(2) to 3	(1) to 1
Nonfat dry milk	(0.01) to 0	1 to 4	0

Note: Numbers in parentheses are negative.

Source: GAO analysis using the IRCM99.

The Economic Impacts of an Expanded NEDC in 1999

To obtain our initial estimates of the impacts of an expanded NEDC in 1999, we used the same set of assumptions that we used under our no-compact scenario. We also used the same assumptions that we used in developing our initial estimates of the impacts of the NEDC. We then performed the same series of sensitivity analyses as under the NEDC scenario. Tables 40 through 49 present our initial and subsequent estimates of the impacts of an expanded NEDC in 1999 compared with a no-compact scenario.

Initial Estimates of the Expanded NEDC's Impacts

Table 40: Initial Estimates of an Expanded NEDC's Impacts on 1999 Farm-Level Indicators

IRCM99 region	Farm-level prices (dollars per hundredweight)		Farm-level production (pounds in millions)		Farm-level revenue (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Northeast	\$15.07	\$0.32	29,138	154	\$4,391	\$117
Appalachia	15.97	(0.04)	6,437	(10)	1,028	(4)
Florida	17.14	(0.03)	2,390	(2)	410	(1)
Southeast	16.01	(0.03)	3,548	(3)	568	(2)
Mideast	14.64	(0.03)	12,238	(9)	1,792	(5)
Upper Midwest	13.82	(0.04)	32,803	(27)	4,533	(17)
Central	14.22	(0.04)	14,855	(14)	2,112	(8)
Southwest	14.49	(0.03)	10,278	(9)	1,489	(4)
Western	13.18	(0.03)	8,854	(9)	1,167	(4)
Northwest	14.85	(0.03)	7,134	(6)	1,059	(3)
California	12.98	0	30,459	7	3,954	1
Arizona	13.76	(0.03)	2,914	(2)	401	(1)
All noncompact regions combined	^a	^a	131,910	(91)	18,513	(49)

Note: Numbers in parentheses are negative.

^aBecause farm-level prices are regional, an "all noncompact regions combined" price is not meaningful.

Source: GAO analysis using the IRCM99.

Table 41: Initial Estimates of an Expanded NEDC's Impacts on 1999 Wholesale-Level Indicators

Dairy commodity	Wholesale-level prices (dollars per hundredweight)		Wholesale-level production (pounds in millions)		Wholesale-level expenditures (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Fluid milk	\$15.04	\$0.17	55,043	(88)	\$8,220	\$80
Soft dairy products	27.31	(0.18)	5,984	8	1,626	(9)
American cheese	139.24	(0.32)	3,539	1	4,823	(10)
Italian cheese	93.24	(0.23)	3,175	2	3,028	(6)
Other cheese	115.58	(0.18)	598	1	792	(1)
Butter	119.52	(0.56)	1,274	1	1,495	(6)
Frozen dairy products	21.40	(0.07)	12,131	13	2,570	(6)
Other manufactured products	27.68	0.01	4,270	0	1,199	0

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Dairy commodity	Wholesale-level prices (dollars per hundredweight)		Wholesale-level production (pounds in millions)		Wholesale-level expenditures (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Nonfat dry milk	102.63	(0.02)	1,396	0	1,012	0

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Sensitivity Analyses for the Expanded NEDC Scenario

Table 42: Estimated Change in 1999 Farm-Level Prices Using Different Assumptions Under an Expanded NEDC Scenario

IRCM99 region	Estimated change to baseline farm-level prices using different assumptions						
	Dollars per hundredweight No-compact baseline farm-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent	
Northeast	\$15.07	\$0.30	\$0.30	\$0.48	\$0.46	\$0.32	
Appalachia	15.97	(0.04)	(0.03)	(0.05)	(0.05)	(0.02)	
Florida	17.14	(0.04)	(0.03)	(0.05)	(0.05)	(0.02)	
Southeast	16.01	(0.04)	(0.02)	(0.05)	(0.04)	0.02	
Mideast	14.64	(0.04)	(0.03)	(0.05)	(0.04)	(0.03)	
Upper Midwest	13.82	(0.04)	(0.03)	(0.05)	(0.05)	(0.03)	
Central	14.22	(0.03)	(0.02)	(0.05)	(0.03)	(0.03)	
Southwest	14.49	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)	
Western	13.18	(0.03)	(0.03)	(0.04)	(0.04)	(0.02)	
Northwest	14.85	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	
California	12.98	(0.01)	0.02	(0.01)	(0.06)	(0.02)	
Arizona	13.76	(0.02)	(0.02)	(0.04)	0.03	(0.03)	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

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Table 43: Estimated Change in 1999 Farm-Level Production Using Different Assumptions Under an Expanded NEDC Scenario

Pounds in millions

IRCM99 region	Estimated change to baseline farm-level production using different assumptions					
	No-compact baseline farm-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent
Northeast	29,138	248	150	237	383	160
Appalachia	6,437	(17)	(8)	(13)	(19)	(7)
Florida	2,390	(3)	(2)	(3)	(4)	(2)
Southeast	3,548	(5)	(2)	(5)	(7)	2
Mideast	12,238	(16)	(7)	(12)	(15)	(7)
Upper Midwest	32,803	(49)	(20)	(37)	(54)	(21)
Central	14,855	(22)	(12)	(21)	(21)	(12)
Southwest	10,278	(15)	(5)	(12)	(11)	(7)
Western	8,854	(16)	(8)	(13)	(20)	(7)
Northwest	7,134	(12)	(6)	(9)	(10)	(5)
California	30,459	(20)	21	(7)	(112)	(26)
Arizona	2,914	(3)	(2)	(3)	3	(2)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM.

Table 44: Estimated Change in 1999 Farm-Level Revenue Using Different Assumptions Under an Expanded NEDC Scenario

Dollars in millions

IRCM99 region	Estimated change to baseline farm-level revenue using different assumptions					
	No-compact baseline farm-level revenue in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	Transportation costs increase 25 percent
Northeast	\$4,391	\$125	\$110	\$177	\$193	\$118
Appalachia	1,028	(5)	(3)	(5)	(6)	(2)
Florida	410	(1)	(1)	(2)	(2)	(1)
Southeast	568	(2)	(1)	(3)	(3)	1
Mideast	1,792	(7)	(5)	(8)	(7)	(5)
Upper Midwest	4,533	(20)	(13)	(21)	(24)	(13)
Central	2,112	(8)	(5)	(10)	(7)	(6)
Southwest	1,489	(5)	(3)	(6)	(5)	(4)
Western	1,167	(5)	(4)	(5)	(6)	(3)
Northwest	1,059	(4)	(3)	(4)	(4)	(3)
California	3,954	(6)	9	(4)	(33)	(10)
Arizona	401	(1)	(1)	(2)	1	(1)

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Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 45: Estimated Change in 1999 National Average Wholesale-Level Prices Using Different Assumptions Under an Expanded NEDC Scenario

Dollars per hundredweight							
Estimated change to baseline wholesale-level prices using different assumptions							
Dairy commodity	No-compact baseline wholesale-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	Transportation costs increase 25 percent	
Fluid milk	\$15.04	\$0.16	\$0.18	\$0.27	\$0.27	\$0.19	
Soft dairy products	27.31	(0.18)	(0.08)	(0.15)	(0.19)	(0.09)	
American cheese	139.24	(0.30)	(0.23)	(0.41)	(0.35)	(0.18)	
Italian cheese	93.24	(0.25)	(0.19)	(0.30)	(0.31)	(0.13)	
Other cheese	115.58	(0.44)	(0.05)	(0.31)	(0.21)	(0.44)	
Butter	119.52	(0.54)	(0.46)	(0.88)	(0.52)	(0.66)	
Frozen dairy products	21.40	(0.07)	(0.05)	(0.11)	(0.07)	(0.07)	
Other manufactured products	27.68	(0.01)	0.07	0.04	0.06	0.07	
Nonfat dry milk	102.63	(0.02)	(0.04)	(0.02)	(0.06)	(0.03)	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 46: Estimated Change in 1999 Wholesale-Level Production Using Different Assumptions Under an Expanded NEDC Scenario

Pounds in millions							
Estimated change in baseline wholesale-level production using different assumptions							
Dairy commodity	No-compact baseline wholesale-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	Transportation costs increase 25 percent	
Fluid milk	55,043	(86)	(189)	(141)	(293)	(94)	
Soft dairy products	5,984	8	14	13	20	8	
American cheese	3,539	1	4	2	6	1	
Italian cheese	3,175	2	5	3	8	1	
Other cheese	598	1	1	1	1	0	
Butter	1,274	1	3	3	2	1	

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Pounds in millions							
Estimated change in baseline wholesale-level production using different assumptions							
Dairy commodity	No-compact baseline wholesale-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	Transportation costs increase 25 percent	
Frozen dairy products	2,131	14	13	20	17	13	
Other manufactured products	4,270	1	(2)	0	0	(2)	
Nonfat dry milk	1,396	9	18	16	23	12	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 47: Estimated Change in 1999 Wholesale-Level Expenditures Using Different Assumptions Under an Expanded NEDC Scenario

Dollars in millions							
Estimated change in baseline wholesale-level expenditures using different assumptions							
Dairy commodity	No-compact baseline wholesale-level expenditures in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	Transportation costs increase 25 percent	
Fluid milk	\$8,220	\$74	\$69	\$126	\$103	\$89	
Soft dairy products	1,626	(9)	(1)	(6)	(6)	(3)	
American cheese	4,823	(9)	(2)	(11)	(4)	(5)	
Italian cheese	3,028	(6)	(3)	(8)	(3)	(3)	
Other cheese	792	(3)	1	(1)	0	(2)	
Butter	1,495	(6)	(2)	(7)	(4)	(7)	
Frozen dairy products	2,570	(6)	(3)	(9)	(5)	(5)	
Other manufactured products	1,199	0	2	1	3	2	
Nonfat dry milk	1,012	0	0	0	(1)	0	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Summary of the Estimated Impacts of the Expanded NEDC

Tables 48 and 49 summarize the results of our initial estimates and sensitivity analyses by presenting a range of estimates of the changes from our no-compact scenario that we obtained in our various analyses.

Table 48: Summary of Estimated Changes in Farm-Level Indicators Using Our Initial and Subsequent Sets of Assumptions Under an Expanded NEDC Scenario

IRCM99 region	Change in farm-level prices (dollars per hundredweight)	Change in farm-level production (pounds in millions)	Change in farm-level revenue (dollars in millions)
Northeast	\$0.30 to 0.48	150 to 383	\$110 to 193
Appalachia	(0.05) to (0.02)	(19) to (7)	(6) to (2)
Florida	(0.05) to (0.02)	(4) to (2)	(2) to (1)
Southeast	(0.05) to 0.02	(7) to 2	(3) to 1
Mideast	(0.05) to (0.03)	(16) to (7)	(8) to (5)
Upper Midwest	(0.05) to (0.03)	(54) to (20)	(24) to (13)
Central	(0.05) to (0.02)	(22) to (12)	(10) to (5)
Southwest	(0.04) to (0.02)	(15) to (5)	(6) to (3)
Western	(0.04) to (0.02)	(20) to (7)	(6) to (3)
Northwest	(0.04) to (0.03)	(12) to (5)	(4) to (3)
California	(0.06) to 0.02	(112) to 21	(33) to 9
Arizona	(0.04) to 0.03	(3) to 3	(2) to 1

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 49: Summary of Estimated Changes in 1999 Wholesale-Level Indicators Using Our Initial and Subsequent Sets of Assumptions Under an Expanded NEDC Scenario

Dairy commodity	Change in wholesale-level prices (dollars per hundredweight)	Change in wholesale-level production (pounds in millions)	Change in wholesale-level expenditures (dollars in millions)
Fluid milk	\$0.16 to 0.27	(293) to (86)	\$69 to 126
Soft dairy products	(0.19) to (0.08)	8 to 20	(9) to (1)
American cheese	(0.41) to (0.18)	1 to 6	(11) to (2)
Italian cheese	(0.31) to (0.13)	1 to 8	(8) to (3)
Other cheese	(0.44) to (0.05)	0 to 1	(3) to 1
Butter	(0.88) to (0.46)	1 to 3	(7) to (2)
Frozen dairy products	(0.11) to (0.05)	13 to 20	(9) to (3)
Other manufactured products	(0.01) to 0.07	(2) to 1	0 to 3
Nonfat dry milk	(0.06) to (0.02)	9 to 23	(1) to 0

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

The Economic Impacts of an Expanded NEDC in Conjunction With a Southern Compact in 1999

As with the other compact scenarios, we developed initial estimates of the effects of an expanded NEDC in conjunction with a southern compact in 1999 by using a set of key assumptions and conducting subsequent sensitivity analyses. In addition to conducting the same sensitivity analyses that we conducted under the previous two compact scenarios, we also varied the assumption regarding the Class I minimum price, or compact price, in the compact region. For that analysis, we increased the minimum price from \$16.94 to \$18.00 per hundredweight in the southern compact but retained the \$16.94 minimum price in the expanded NEDC. We used this higher minimum southern compact price because cooperative pay prices in selected cities in USDA's Appalachian, Southern, and Central milk marketing orders averaged about a dollar higher than in the Northeast Marketing Order in 1999.² Under this scenario we conducted an additional analysis in which we assume that fluid trade movements into compact regions are limited to the amount of milk that is produced within a 100-mile radius surrounding a compact region.³⁴ Because this analysis represents a variation of the model, we also conducted a separate set of sensitivity analyses.

²Cooperative pay prices in each marketing order are related to the blend prices for those marketing orders. However, they also reflect the costs of certain services performed by the cooperative associations as well as other costs such as membership dues.

³We modified the model for each of the three compact scenarios to account for this additional fluid milk trade restriction. The model results under the NEDC and the expanded NEDC scenarios did not change when this restriction was added, but results were different for the expanded NEDC in conjunction with a southern compact scenario. Therefore, we are including the results of this additional modeling effort only for the expanded NEDC in conjunction with a southern compact scenario.

⁴We performed this analysis because our data are at the regional level as opposed to the milk plant or dairy farm level. Therefore, our transportation cost data are average cost data and do not apply to individual shipments. As a result, our initial results may reflect more movement of milk between regions than would actually occur.

Initial Estimates of the Impacts of the Expanded NEDC in Conjunction With a Southern Compact

Table 50: Initial Estimates of the Impacts of the Expanded NEDC in Conjunction With a Southern Compact on 1999 Farm-Level Indicators

IRCM99 region	Farm-level prices (dollars per hundredweight)		Farm-level production (pounds in millions)		Farm-level revenue (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Northeast	\$15.07	\$0.27	29,138	130	\$4,391	\$99
Appalachia	15.97	1.35	6,437	348	1,028	147
Florida	17.14	0.04	2,390	2	410	1
Southeast	16.01	0.80	3,548	70	568	40
Mideast	14.64	(0.18)	12,238	(49)	1,792	(29)
Upper Midwest	13.82	(0.07)	32,803	(52)	4,533	(30)
Central	14.22	0.10	14,855	45	2,112	21
Southwest	14.49	(0.10)	10,278	(27)	1,489	(14)
Western	13.18	(0.10)	8,854	(28)	1,167	(13)
Northwest	14.85	(0.09)	7,134	(19)	1,059	(9)
California	12.98	(0.06)	30,459	(63)	3,954	(26)
Arizona	13.76	(0.11)	2,914	(8)	401	(4)
All noncompact regions combined	^a	^a	107,070	(246)	14,805	(125)

Note: Numbers in parentheses are negative.

^aBecause farm-level prices are regional, an "all noncompact regions combined" price is not meaningful.

Source: GAO analysis using the IRCM99.

Table 51: Initial Estimates of the Impacts of the Expanded NEDC in Conjunction With a Southern Compact on 1999 Wholesale-Level Indicators

Dairy commodity	Wholesale-level prices (dollars per hundredweight)		Wholesale-level production (pounds in millions)		Wholesale-level expenditures (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Fluid milk	\$15.04	\$0.47	55,043	(248)	\$8,220	\$218
Soft dairy products	27.31	(0.33)	5,984	32	1,626	(11)
American cheese	139.24	(0.93)	3,539	4	4,823	(27)
Italian cheese	93.24	(0.62)	3,175	6	3,028	(16)
Other cheese	115.58	(0.66)	598	2	792	(2)
Butter	119.52	(2.55)	1,274	6	1,495	(25)

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Dairy commodity	Wholesale-level prices (dollars per hundredweight)		Wholesale-level production (pounds in millions)		Wholesale-level expenditures (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Frozen dairy products	21.40	(0.30)	12,131	55	2,570	(24)
Other manufactured products	27.68	0.20	4,270	(8)	1,199	6
Nonfat dry milk	102.63	(0.09)	1,396	40	1,012	(1)

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Sensitivity Analyses for the Expanded NEDC in Conjunction With a Southern Compact Scenario

Tables 52 through 57 present the results of our sensitivity analyses for 1999 farm and wholesale-level economic variables.

Table 52: Estimated Change in 1999 Farm-Level Prices Using Different Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

IRCM9 region	Estimated change to baseline farm-level prices using different assumptions						
	No-compact baseline farm- level prices in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over - order premiums	Combined assumptions ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Northeast	\$15.07	\$0.26	\$0.26	\$0.41	\$0.38	\$0.22	\$0.25
Appalachia	15.97	1.13	1.10	1.50	1.32	1.85	1.24
Florida	17.14	0.04	0.03	(0.01)	(0.01)	(0.02)	0.16
Southeast	16.01	0.79	0.80	1.19	1.18	1.66	0.89
Mideast	14.64	(0.19)	(0.18)	(0.24)	(0.23)	(0.24)	(0.13)
Upper Midwest	13.82	(0.08)	(0.08)	(0.11)	(0.13)	(0.10)	(0.06)
Central	14.22	0.11	0.12	0.14	0.14	0.17	0.27
Southwest	14.49	(0.09)	(0.05)	(0.12)	(0.07)	(0.13)	(0.17)
Western	13.18	(0.09)	(0.10)	(0.12)	(0.13)	(0.14)	(0.10)
Northwest	14.85	(0.08)	(0.09)	(0.11)	(0.12)	(0.13)	0.03
California	12.98	(0.13)	(0.18)	(0.17)	(0.22)	(0.18)	0.18
Arizona	13.76	(0.03)	0.06	(0.05)	0.05	(0.05)	(0.36)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 53: Estimated Change in 1999 Farm-Level Production Using Different Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Pounds in millions								
Estimated change to baseline farm-level production using different assumptions								
IRCM99 region	No-compact baseline farm-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent	
Northeast	29,138	212	126	203	313	106	126	
Appalachia	6,437	429	283	388	504	478	319	
Florida	2,390	4	2	(1)	(1)	(1)	9	
Southeast	3,548	111	70	104	164	145	78	
Mideast	12,238	(79)	(48)	(63)	(100)	(65)	(35)	
Upper Midwest	32,803	(90)	(60)	(81)	(152)	(74)	(43)	
Central	14,855	74	51	64	96	80	121	
Southwest	10,278	(41)	(13)	(33)	(29)	(34)	(45)	
Western	8,854	(47)	(30)	(34)	(64)	(39)	(28)	
Northwest	7,134	(31)	(20)	(23)	(42)	(26)	5	
California	30,459	(245)	(183)	(173)	(400)	(186)	185	
Arizona	2,914	(4)	4	(4)	6	(3)	(29)	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 54: Estimated Change in 1999 Farm-Level Revenue Using Different Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars in millions								
Estimated change in baseline farm-level revenue using different assumptions								
IRCM99 region	No-compact baseline farm-level revenue in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent	
Northeast	4,391	108	95	151	159	80	92	
Appalachia	1,028	146	119	164	172	204	135	
Florida	410	2	1	0	0	(1)	5	
Southeast	568	47	40	60	70	85	45	
Mideast	1,792	(35)	(29)	(38)	(43)	(39)	(21)	
Upper Midwest	4,533	(39)	(34)	(47)	(63)	(43)	(26)	
Central	2,112	27	25	30	35	37	58	
Southwest	1,489	(15)	(7)	(17)	(11)	(18)	(24)	

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Dollars in millions

Estimated change in baseline farm-level revenue using different assumptions							
IRCM99 region	No-compact baseline farm-level revenue in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Western	1,167	(14)	(13)	(15)	(20)	(17)	(13)
Northwest	1,059	(10)	(9)	(11)	(15)	(13)	3
California	3,954	(71)	(78)	(74)	(118)	(79)	80
Arizona	401	(1)	2	(2)	2	(2)	(14)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 55: Estimated Change in 1999 National Average Wholesale-Level Prices Using Different Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars per hundredweight

Estimated change to baseline wholesale-level prices using different assumptions							
Dairy commodity	No-compact baseline wholesale-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Fluid milk	\$15.04	\$0.44	\$0.39	\$0.61	\$0.57	\$0.59	\$0.63
Soft dairy products	27.31	(0.36)	(0.17)	(0.38)	(0.24)	(0.43)	(0.55)
American cheese	139.24	(0.91)	(1.00)	(1.25)	(1.24)	(1.41)	(0.62)
Italian cheese	93.24	(0.62)	(0.86)	(0.93)	(1.11)	(1.02)	0.36
Other cheese	115.58	(0.67)	(0.56)	(1.01)	(1.11)	(1.08)	0.69
Butter	119.52	(2.01)	0.21	(2.32)	(0.22)	(2.38)	(6.53)
Frozen dairy products	21.40	(0.26)	(0.10)	(0.33)	(0.16)	(0.34)	(0.53)
Other manufactured products	27.68	0.06	0.04	0.02	(0.11)	0.07	1.04
Nonfat dry milk	102.63	(0.07)	(0.07)	(0.08)	(0.09)	(0.09)	(1.22)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Table 56: Estimated Change in 1999 Wholesale-Level Production Using Different Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Pounds in millions							
	Estimated change in baseline wholesale-level production using different assumptions						
Dairy commodity	No-compact baseline wholesale-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Fluid milk	55,043	(233)	(445)	(330)	(647)	(328)	(324)
Soft dairy products	5,984	27	27	35	43	37	51
American cheese	3,539	3	16	5	20	6	1
Italian cheese	3,175	5	21	8	28	9	(3)
Other cheese	598	2	3	3	4	3	(1)
Butter	1,274	4	(1)	6	0	5	17
Frozen dairy products	12,131	51	26	62	41	65	98
Other manufactured products	4,270	(1)	3	2	15	(2)	(56)
Nonfat dry milk	1,396	32	22	40	34	42	98

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 57: Estimated Change in 1999 Wholesale-Level Expenditures Using Different Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars in millions							
	Estimated change in baseline wholesale-level expenditures using different assumptions						
Dairy commodity	No-compact baseline wholesale-level expenditures in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Fluid milk	\$8,220	\$205	\$144	\$282	\$211	\$271	\$293
Soft dairy products	1,626	(14)	(3)	(13)	(2)	(16)	(19)
American cheese	4,823	(27)	(12)	(36)	(15)	(41)	(20)
Italian cheese	3,028	(15)	(9)	(23)	(11)	(25)	9
Other cheese	792	(2)	0	(3)	(4)	(4)	4

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Dollars in millions								
Estimated change in baseline wholesale-level expenditures using different assumptions								
Dairy commodity	No-compact baseline wholesale-level expenditures in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent	
Butter	1,495	(20)	1	(22)	(3)	(24)	(64)	
Frozen dairy products	2,570	(20)	(6)	(27)	(10)	(27)	(43)	
Other manufactured products	1,199	2	3	1	(1)	2	28	
Nonfat dry milk	1,012	(1)	(1)	(1)	(1)	(1)	1	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Summary of the Estimated Impacts of the Expanded NEDC in Conjunction With a Southern Compact

Tables 58 and 59 summarize the results of our initial estimates and sensitivity analyses by presenting the range of estimates of the changes from our no-compact scenario that we obtained from our various analyses.

Table 58: Summary of Range of Estimated Changes in Farm-Level Indicators Using Our Initial and Subsequent Sets of Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

IRCM99 region	Change in farm-level prices (dollars per hundredweight)	Change in farm-level production (pounds in billions)	Change in farm-level revenue (dollars in millions)
Northeast	\$0.22 to 0.41	106 to 313	\$80 to 159
Appalachia	1.10 to 1.85	283 to 504	119 to 204
Florida	(0.02) to 0.04	(1) to 9	(1) to 5
Southeast	0.79 to 1.66	70 to 164	40 to 85
Mideast	(0.24) to (0.13)	(100) to (35)	(43) to (21)
Upper Midwest	(0.11) to (0.06)	(152) to (43)	(63) to (26)
Central	0.10 to 0.27	45 to 121	21 to 58
Southwest	(0.17) to (0.05)	(45) to (13)	(24) to (7)
Western	(0.14) to (0.09)	(64) to (28)	(20) to (13)
Northwest	(0.13) to 0.03	(42) to 5	(15) to 3
California	(0.18) to 0.18	(400) to 185	(118) to 80
Arizona	(0.36) to 0.06	(29) to 6	(14) to 2

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 59: Summary of Range of Estimated Changes in 1999 Wholesale-Level Indicators Using Our Initial and Subsequent Sets of Assumptions Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dairy commodity	Change in wholesale-level prices (dollars per hundredweight)	Change in wholesale-level production (pounds in millions)	Change in wholesale-level expenditures (dollars in millions)
Fluid milk	\$0.39 to 0.63	(647) to (233)	\$144 to 293
Soft dairy products	(0.55) to (0.17)	27 to 51	(19) to (2)
American cheese	(1.41) to (0.62)	1 to 20	(41) to (15)
Italian cheese	(1.11) to 0.36	(3) to 21	(25) to 9
Other cheese	(1.11) to 0.69	(1) to 4	(4) to 4
Butter	(6.53) to 0.21	(1) to 17	(64) to 1
Frozen dairy products	(0.53) to (0.10)	26 to 98	(43) to (6)
Other manufactured products	(0.11) to 1.04	(56) to 15	(1) to 28
Nonfat dry milk	(1.22) to (0.07)	22 to 98	(1) to 1

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

The Economic Impacts of an Expanded NEDC in Conjunction With a Southern Compact Using a More Restrictive Fluid Milk Trade Assumption

Tables 60 and 61 provide our initial estimates obtained by modifying the IRCM to include a more restrictive trade assumption about fluid milk.

Table 60: Initial Estimates of 1999 Regional Farm-Level Indicators Using a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

IRCM99 region	Farm-level prices (dollars per hundredweight)		Farm-level production (pounds in millions)		Farm-level revenue (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline

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IRCM99 region	Farm-level prices (dollars per hundredweight)		Farm-level production (pounds in millions)		Farm-level revenue (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Northeast	\$15.07	\$0.28	29,138	138	\$4,391	\$103
Appalachia	15.97	1.35	6,437	349	1,028	147
Florida	17.14	(0.02)	2,390	(2)	410	(1)
Southeast	16.01	2.99	3,548	261	568	156
Mideast	14.64	(0.24)	12,238	(64)	1,792	(39)
Upper Midwest	13.82	(0.26)	32,803	(195)	4,533	(112)
Central	14.22	0.33	14,855	151	2,112	71
Southwest	14.49	(0.12)	10,278	(32)	1,489	(17)
Western	13.18	(0.12)	8,854	(34)	1,167	(15)
Northwest	14.85	(0.11)	7,134	(22)	1,059	(11)
California	12.98	(0.16)	30,459	(168)	3,954	(70)
Arizona	13.76	(0.04)	2,914	(2)	401	(1)
All noncompact regions combined	a	a	107,070	(519)	14,805	(266)

Note: Numbers in parentheses are negative.

^aBecause farm-level prices are regional, an "all noncompact regions combined" price is not meaningful.

Source: GAO's analysis using the IRCM99.

Table 61: Initial Estimates of 1999 Wholesale-Level Indicators Using a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dairy commodity	Wholesale-level prices (dollars per hundredweight)		Wholesale-level production (pounds in millions)		Wholesale-level expenditures (dollars in millions)	
	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline	No-compact baseline in 1999	Change to baseline
Fluid milk	\$15.04	\$0.71	55,043	(336)	\$8,220	\$335
Soft dairy products	27.31	(0.48)	5,984	37	1,626	(19)
American cheese	139.24	(1.30)	3,539	5	4,823	(38)
Italian cheese	93.24	(0.95)	3,175	8	3,028	(23)
Other cheese	115.58	(1.19)	598	3	792	(5)
Butter	119.52	(2.48)	1,274	6	1,495	(24)
Frozen dairy products	21.40	(0.51)	12,131	65	2,570	(48)
Other manufactured products	27.68	(0.08)	4,270	2	1,199	(3)
Nonfat dry milk	102.63	0.01	1,396	42	1,012	0

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Tables 62 through 67 present the results of our sensitivity analyses using a more restrictive fluid trade assumption.

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Table 62: Change in 1999 Farm-Level Prices Using Different Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars per hundredweight

IRCM99 region	Estimated change in baseline farm-level prices using different assumptions						
	No-compact baseline farm-level price in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Northeast	\$15.07	\$0.28	\$0.28	\$0.45	\$0.31	\$0.26	\$0.27
Appalachia	15.97	1.18	1.16	1.59	1.39	1.96	1.24
Florida	17.14	(0.01)	0.00	(0.06)	(0.02)	(0.07)	0.00
Southeast	16.01	3.01	3.16	3.81	3.84	4.51	3.20
Mideast	14.64	(0.24)	(0.21)	(0.27)	(0.23)	(0.28)	(0.24)
Upper Midwest	13.82	(0.26)	(0.24)	(0.29)	(0.27)	(0.30)	(0.27)
Central	14.22	0.27	0.23	0.26	0.15	0.29	0.25
Southwest	14.49	(0.10)	(0.05)	(0.15)	(0.07)	(0.16)	(0.11)
Western	13.18	(0.12)	(0.13)	(0.17)	(0.17)	(0.19)	(0.12)
Northwest	14.85	(0.10)	(0.11)	(0.15)	(0.14)	(0.17)	(0.13)
California	12.98	(0.19)	(0.20)	(0.21)	(0.27)	(0.24)	(0.21)
Arizona	13.76	(0.01)	0.06	(0.05)	0.06	(0.05)	(0.09)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 63: Change in 1999 Farm-Level Production Using Different Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Pounds in millions

IRCM99 region	Estimated change in baseline farm-level production using different assumptions						
	No-compact baseline farm-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Northeast	29,138	225	139	220	255	127	135
Appalachia	6,437	448	300	412	533	507	320
Florida	2,390	(1)	0	(3)	(2)	(4)	0
Southeast	3,548	418	277	333	534	395	281
Mideast	12,238	(101)	(56)	(71)	(101)	(75)	(63)
Upper Midwest	32,803	(314)	(180)	(214)	(326)	(223)	(195)
Central	14,855	186	104	117	103	130	110
Southwest	10,278	(46)	(15)	(40)	(31)	(43)	(30)
Western	8,854	(61)	(37)	(48)	(83)	(53)	(35)

Appendix V: Interregional Impacts of Three Compact Alternatives in 1999

Pounds in millions							
Estimated change in baseline farm-level production using different assumptions							
IRCM99 region	No-compact baseline farm-level production in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Northwest	7,134	(39)	(23)	(31)	(51)	(34)	(26)
California	30,459	(348)	(211)	(218)	(491)	(249)	(224)
Arizona	2,914	(2)	5	(4)	7	(4)	(7)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 64: Change in 1999 Farm-Level Revenue Using Different Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars in millions							
Estimated change in baseline farm-level revenue using different assumptions							
IRCM99 region	No-compact baseline farm-level revenue in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Northeast	4,391	116	103	165	130	95	99
Appalachia	1,028	153	126	175	182	217	135
Florida	410	0	0	(2)	(1)	(2)	0
Southeast	568	186	165	201	242	241	168
Mideast	1,792	(44)	(34)	(43)	(43)	(45)	(38)
Upper Midwest	4,533	(128)	(103)	(124)	(133)	(129)	(115)
Central	2,112	67	49	56	37	62	53
Southwest	1,489	(17)	(7)	(21)	(12)	(23)	(16)
Western	1,167	(19)	(16)	(21)	(26)	(24)	(15)
Northwest	1,059	(13)	(11)	(15)	(17)	(17)	(13)
California	3,954	(103)	(88)	(92)	(145)	(105)	(93)
Arizona	401	(1)	2	(2)	3	(2)	(4)

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

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Table 65: Change in 1999 National Average Wholesale-Level Prices Using Different Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars per hundredweight								
Dairy commodity	No-compact baseline wholesale-level price in 1999	Estimated change in baseline wholesale-level prices using different assumptions					\$18.00 minimum southern compact price	Transportation costs increase 25 percent
		10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a			
Fluid milk	\$15.04	\$0.69	\$0.66	\$0.91	\$0.80	\$0.93	\$0.69	
Soft dairy products	27.31	(0.44)	(0.24)	(0.48)	(0.18)	(0.52)	(0.31)	
American cheese	139.24	(1.32)	(1.27)	(1.68)	(1.51)	(1.86)	(1.38)	
Italian cheese	93.24	(0.99)	(1.08)	(1.24)	(1.33)	(1.36)	(1.11)	
Other cheese	115.58	(1.25)	(0.75)	(1.41)	(1.33)	(1.50)	(1.65)	
Butter	119.52	(2.08)	(0.11)	(2.80)	0.07	(2.78)	(1.08)	
Frozen dairy products	21.40	(0.51)	(0.38)	(0.64)	(0.41)	(0.65)	(0.53)	
Other manufactured products	27.68	0.01	(0.05)	0.08	0	0.06	(0.18)	
Nonfat dry milk	102.63	(0.01)	(0.02)	(0.03)	(0.05)	(0.03)	0	

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM.

Table 66: Change in 1999 Wholesale-Level Production Using Different Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Pounds in millions								
Dairy commodity	No-compact baseline wholesale-level production in 1999	Estimated change in baseline wholesale-level production using different assumptions					\$18.00 minimum southern compact price	Transportation costs increase 25 percent
		10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumptions^a			
Fluid milk	55,043	(323)	(646)	(433)	(778)	(440)	(313)	
Soft dairy products	5,984	35	43	45	50	47	29	
American cheese	3,539	5	20	7	25	7	6	
Italian cheese	3,175	8	26	11	33	12	10	
Other cheese	598	3	4	4	5	4	3	
Butter	1,274	5	2	8	0	7	3	
Frozen dairy products	12,131	62	41	77	44	79	49	
Other manufactured products	4,270	(1)	7	(3)	5	(3)	9	
Nonfat dry milk	1,396	40	39	54	45	54	27	

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Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Table 67: Change in 1999 Wholesale-Level Expenditures Using Different Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dollars in millions

	Estimated change in wholesale-level expenditures using different assumptions						
	No-compact baseline wholesale-level expenditures in 1999	10-year regional supply elasticities	Higher commodity demand elasticities	Higher over-order premiums	Combined assumption ^a	\$18.00 minimum southern compact price	Transportation costs increase 25 percent
Dairy commodity							
Fluid milk	\$8,220	\$326	\$259	\$428	\$313	\$438	\$327
Soft dairy products	1,626	(17)	(2)	(17)	3	(18)	(11)
American cheese	4,823	(39)	(16)	(49)	(18)	(55)	(39)
Italian cheese	3,028	(25)	(12)	(31)	(14)	(33)	(27)
Other cheese	792	(5)	(2)	(5)	(5)	(6)	(7)
Butter	1,495	(20)	1	(26)	1	(27)	(10)
Frozen dairy products	2,570	(48)	(37)	(61)	(40)	(62)	(54)
Other manufactured products	1,199	0	0	3	1	2	(5)
Nonfat dry milk	1,012	0	0	0	0	0	0

Note: Numbers in parentheses are negative.

^aThe combined assumptions include the previous three assumptions: (1) 10-year long-term regional supply elasticities, (2) higher commodity demand elasticities, and (3) higher over-order premiums.

Source: GAO's analysis using the IRCM99.

Tables 68 and 69 summarize the results of our initial estimates and sensitivity analyses by presenting the range of estimates of the changes from our no-compact scenario that we obtained from our various analyses using a more restrictive trade assumption.

Table 68: Summary of Estimated Changes in 1999 Farm-Level Indicators Using Our Initial and Subsequent Sets of Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

IRCM99 region	Change in farm-level prices (dollars per hundredweight)	Change in farm-level production (pounds in millions)	Change in farm-level revenue (dollars in millions)
Northeast	\$0.26 to .45	127 to 255	\$95 to 165
Appalachia	1.16 to 1.96	300 to 533	126 to 217
Florida	(0.07) to 0	(4) to 0	(2) to 0
Southeast	2.99 to 4.51	261 to 534	156 to 242
Mideast	(0.28) to (0.21)	(101) to (56)	(45) to (34)
Upper Midwest	(.30) to (.24)	(326) to (180)	(133) to (103)
Central	0.15 to 0.33	103 to 186	37 to 71
Southwest	(0.16) to (0.05)	(46) to (15)	(23) to (7)
Western	(0.19) to (0.12)	(83) to (34)	(26) to (15)
Northwest	(0.17) to (0.10)	(51) to (22)	(17) to (11)
California	(0.27) to (0.16)	(491) to (168)	(145) to (70)
Arizona	(.09) to .06	(7) to 7	(4) to 3

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Table 69: Summary of Estimated Changes in 1999 Wholesale-Level Indicators Using Our Initial and Subsequent Sets of Assumptions and a More Restrictive Fluid Milk Trade Assumption Under an Expanded NEDC in Conjunction With a Southern Compact Scenario

Dairy commodity	Change in wholesale-level prices (dollars per hundredweight)	Change in wholesale-level production (pounds in millions)	Change in wholesale-level expenditures (dollars in millions)
Fluid milk	\$0.66 to 0.93	(778) to (313)	\$259 to 438
Soft dairy products	(0.52) to (0.18)	29 to 50	(19) to 3
American cheese	(1.86) to (1.27)	5 to 25	(55) to (16)
Italian cheese	(1.36) to (0.95)	8 to 33	(33) to (12)
Other cheese	(1.65) to (0.75)	3 to 5	(7) to (2)
Butter	(2.80) to 0.07	0 to 8	(27) to 1
Frozen dairy products	(0.65) to (0.38)	41 to 79	(62) to (37)
Other manufactured products	(0.18) to 0.08	(3) to 9	(5) to 3

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Dairy commodity	Change in wholesale-level prices (dollars per hundredweight)	Change in wholesale-level production (pounds in millions)	Change in wholesale-level expenditures (dollars in millions)
Nonfat dry milk	(0.05) to 0.01	27 to 54	0

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM99.

Appendix VI: Interregional Impacts of Three Compact Alternatives in 2000

We present our estimates of the three compact scenarios' impacts on 2000 farm-level and wholesale-level indicators when compared with a no-compact scenario in the following tables. As with our 1999 analysis, we calibrated the Interregional Dairy Sector Competition Model (IRCM) using 2000 data to develop a baseline—an IRCM00. However, we did not conduct a series of sensitivity analyses for the 2000 estimates for several reasons:

- The data for 2000 were preliminary when we conducted these analyses in July 2001.
- The dairy industry was undergoing a period of adjustment following USDA's regulatory changes to its milk marketing order program in January 2000. Because the IRCM is a spatial equilibrium model, and the dairy markets appeared to be in disequilibrium in 2000, we questioned whether 2000 could be used to accurately estimate the impacts of dairy compacts.
- The sensitivity analyses performed for the 1999 estimates indicated that the IRCM99 model was robust—that is, the estimates that we obtained when we used different assumptions were similar to the initial estimates that we obtained using our initial set of assumptions. As a result, we did not think that another series of sensitivity analyses would provide much additional information.

The following tables provide baseline estimates of the dairy sector indicators under our no-compact scenario and the estimates of the impacts of the three different compact alternatives. As with our 1999 estimates, we present estimates under both less restrictive and more restrictive fluid trade assumptions for the expanded NEDC in conjunction with a southern compact scenario. Our baseline estimates for 2000 also include the effects that USDA's milk marketing order regulatory reforms had on farm-level and wholesale-level dairy sector indicators. As a result, the baseline estimates for 2000 are not comparable to those for 1999.

We used the same set of assumptions to develop our 2000 estimates as we did to develop our 1999 baseline and initial estimates:

- No more than 40 percent of any one region's milk may be shipped to another region without being subject to the receiving region's pricing requirements. This assumption is used to simulate USDA milk marketing order regulations regarding minimum pricing requirements for milk shipped between marketing orders. This threshold was chosen as a proxy for the requirement that an adjustment be made if a plurality of an order's packaged milk was sold in another region.
- Supply elasticities are medium-term (that is, 5 years).

- Demand elasticities are medium-term.
- The Class I minimum price in the compact region, or the compact price, is \$16.94 per hundredweight of milk.
- Market-driven over-order premiums are zero in the compact region. This initial assumption represents a lower bound, and assumes that all market-driven over-order premiums in NEDC states are replaced by Compact over-order producer price payments.
- A handler must pay the compact over-order producer price into the compact pool for milk shipped into the compact region in order to receive the compact price.

Using these assumptions, tables 70 through 75 compare our no-compact baseline scenario with our estimated changes in farm-level and wholesale-level indicators across different compact scenarios for 2000.

Table 70: Range of Estimated Impacts on 2000 Farm-Level Prices Across Different Compact Scenarios

Dollars per hundredweight						
IRCM00 region	No-compact baseline in 2000	Farm-level prices				
		Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and 100-mile import constraint	
Northeast	\$13.39	\$0.12	\$0.47	\$0.41	\$0.36	
Appalachia	14.35	(0.01)	(0.04)	0.46	0.42	
Florida	15.64	(0.02)	(0.04)	0.03	0.03	
Southeast	13.52	(0.02)	(0.04)	1.35	2.25	
Mideast	12.84	(0.01)	(0.04)	(0.12)	(0.14)	
Upper Midwest	11.82	(0.01)	(0.04)	(0.04)	(0.43)	
Central	12.14	(0.01)	(0.03)	0.08	0.77	
Southwest	12.95	0	(0.03)	(0.08)	(0.10)	
Western	10.82	0	0.01	(0.03)	(0.17)	
Northwest	12.83	0	(0.03)	(0.09)	(0.12)	
California	11.05	(0.01)	(0.05)	(0.10)	(0.10)	
Arizona	11.93	0	(0.03)	(0.09)	(0.10)	

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM00.

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Table 71: Range of Estimated Impacts on 2000 Farm-Level Production Across Different Compact Scenarios

Pounds in millions						
IRCM00 region	Farm-level production					
	No-compact baseline in 2000	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint	
Northeast	29,165	66	262	231	203	
Appalachia	6,493	(5)	(12)	132	122	
Florida	2,461	0	(2)	2	2	
Southeast	3,505	(1)	(4)	139	232	
Mideast	12,704	(5)	(13)	(39)	(45)	
Upper Midwest	33,104	(15)	(34)	(41)	(375)	
Central	15,753	(5)	(19)	43	420	
Southwest	10,920	(3)	(11)	(29)	(33)	
Western	9,709	(3)	1	(14)	(67)	
Northwest	7,233	(1)	(8)	(23)	(30)	
California	32,093	(7)	(56)	(129)	(127)	
Arizona	3,006	0	(3)	(9)	(9)	

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM00.

Table 72: Range of Estimated Impacts on 2000 Farm-Level Revenue Across Different Compact Scenarios

Dollars in millions						
IRCM00 region	Farm-level revenue					
	No-compact baseline in 2000	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint	
Northeast	\$3,905	\$44	\$173	\$152	\$133	
Appalachia	931	(1)	(4)	50	46	
Florida	384	0	(1)	2	2	
Southeast	474	(1)	(2)	68	115	
Mideast	1,631	(2)	(7)	(20)	(24)	
Upper Midwest	3,913	(5)	(17)	(18)	(185)	
Central	1,912	(2)	(7)	18	176	
Southwest	1,414	0	(4)	(12)	(15)	
Western	1,050	0	1	(4)	(23)	
Northwest	928	0	(3)	(9)	(12)	
California	3,546	(4)	(22)	(46)	(46)	
Arizona	359	0	(1)	(4)	(4)	

Note: Numbers in parentheses are negative.

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Source: GAO's analysis using the IRCM00.

Table 73: Range of Estimated Impacts on 2000 National Average Wholesale-Level Prices Across Different Compact Scenarios

Dollars per hundredweight					
Wholesale-level prices					
Dairy commodity	No-compact baseline in 2000	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Fluid milk	\$13.55	\$0.07	\$0.26	\$0.47	\$0.58
Soft dairy products	27.44	(0.03)	(0.14)	(0.29)	(0.28)
American cheese	140.13	(0.08)	(0.27)	(0.88)	(2.20)
Italian cheese	99.58	(0.08)	(0.23)	(0.70)	(1.71)
Other cheese	126.23	(0.09)	(0.28)	(0.84)	(1.77)
Butter	123.04	(0.17)	(0.99)	(2.22)	(1.51)
Frozen dairy products	21.61	(0.03)	(0.12)	(0.24)	(0.17)
Other manufactured products	32.49	(0.04)	0.01	0.03	0.66
Nonfat dry milk	102.1	(0.02)	(0.02)	(0.17)	(0.34)

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM00.

Table 74: Range of Estimated Impacts on 2000 Wholesale-Level Production Across Different Compact Scenarios

Pounds in millions					
Wholesale-level production					
Dairy commodity	No-compact baseline in 2000	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Fluid milk	55,549	(37)	(155)	(313)	(371)
Soft dairy products	6,134	2	13	31	29
American cheese	3,610	0	1	3	8
Italian cheese	3,300	0	2	6	15
Other cheese	613	0	1	3	7
Butter	1,251	0	2	5	3
Frozen dairy products	12,015	4	21	43	32
Other manufactured products	4,115	2	1	1	(23)
Nonfat dry milk	1,507	3	17	36	41

Note: Numbers in parentheses are negative.

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Source: GAO's analysis using the IRCM00.

Table 75: Range of Estimated Impacts on 2000 Wholesale-Level Expenditures Across Different Compact Scenarios

Dairy commodity	Wholesale-level expenditures				
	No-compact baseline in 2000	Change to baseline with the NEDC	Change to baseline with an expanded NEDC	Change to baseline with an expanded NEDC and a southern compact	Change to baseline with an expanded NEDC, a southern compact, and a 100-mile import constraint
Fluid milk	\$ 7,467	\$34	\$122	\$216	\$268
Soft dairy products	1,672	(1)	(5)	(9)	(9)
American cheese	4,962	(3)	(8)	(26)	(67)
Italian cheese	3,315	(3)	(7)	(19)	(44)
Other cheese	995	(1)	(1)	(4)	(7)
Butter	1,502	(2)	(10)	(21)	(15)
Frozen dairy products	2,574	(2)	(9)	(19)	(13)
Other manufactured products	1,347	(1)	1	2	20
Nonfat dry milk	721	0	0	0	1

Note: Numbers in parentheses are negative.

Source: GAO's analysis using the IRCM00.

Appendix VII: Studies of the Interregional Economic Impacts of Various Dairy Compact Alternatives

We reviewed and analyzed five studies that provide estimates of the interregional economic impacts of various compact alternatives. These studies used a variety of economic models, assumptions about model parameters such as demand elasticities, and data sets. The compact alternatives that they examined also varied. Despite these differences, the results of these studies on the impacts of relatively small compacts, such as the NEDC, on dairy farmers in noncompact regions were generally comparable to ours. In addition, these studies agree with ours that, as compacts expand in size, the economic impacts on dairy farmers in noncompact regions increase.

USDA (1999)—A Study Using an Annual, Time-Series Dairy Sector Model

A study issued in 1999 by USDA estimated the interregional impacts that the NEDC would have on noncompact regions.¹ USDA used a model derived, in part, from a national dairy sector model developed by USDA's Economic Research Service and dairy sector data from 1999 to forecast the impact of the NEDC from 2000 through 2005.² The parameters used in the analysis were not directly estimated, but instead, were drawn from the Economic Research Service model. The Service's national dairy sector model is an annual, time-series dairy model that is estimated as a system of equations using a three-stage, least squares regression analysis. USDA modified the Service's model to allow for a multiregional analysis. The modified model used to estimate the interregional impacts of the NEDC consisted of five sections: (1) milk supply, (2) dairy product supply, (3) dairy product demand, (4) market equilibrium conditions, and (5) regional market utilization and pricing.³ The major features of USDA's analysis and model included the following:

- The model used an iterative process to solve a system of simultaneous dairy demand and supply equations.
- The model used 36 regions, including the former 32 federal milk marketing orders; California; and three other nonfederally regulated regions.
- The model did not provide for milk movements between regions.

¹USDA Agricultural Marketing Service analysis provided to the Subcommittee on Livestock and Horticulture, Committee on Agriculture, U.S. House of Representatives, June 14, 1999.

²The NEDC comprises Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

³For further discussion of the USDA regional dairy model, see *Federal Milk Marketing Order Reform: New England, Final Decision, Regulatory Impact Analysis*, USDA's Agricultural Marketing Service, Mar. 1999.

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- USDA adjusted parameters developed for the Economic Research Service model to reflect regional differences in the dairy industry.
- USDA used 1999 data to project the NEDC’s impacts in each of 6 years—2000 through 2005—and the average annual impact over the same period.

USDA used two different scenarios to estimate the NEDC’s impacts: (1) the NEDC price of \$16.94 per hundredweight of milk would remain constant during the years 2000 through 2005 and (2) the NEDC price of \$16.94 per hundredweight would remain in effect only in 2000, after which time the NEDC price would change to the USDA federal milk marketing order Class I price for Boston plus \$1.30 per hundredweight.

Table 76 summarizes USDA’s estimates of the 6-year average annual impact of the NEDC in (1) noncompact regions of the country affected the most by the NEDC, (2) all 32 marketing orders combined, (3) California, and (4) the country as a whole. These estimated impacts are expressed as changes to average production levels, farm-level prices, and farm-level revenue from levels that would be expected in the absence of the NEDC.

Table 76: USDA Estimates of the NEDC’s Interregional Impacts on Average Annual Production Levels and Farm-Level Prices and Revenue, 2000-05

Region	Amount without the NEDC	Change due to the NEDC using a \$16.94 over-order compact price in 2000-05		Change due to the NEDC using a \$16.94 over-order compact price in 2000 and a Boston Class I price plus \$1.30 in 2001-05	
	Baseline	Amount	Percentage	Amount	Percentage
New York-New Jersey					
Production (pounds in millions)	12,028	(1.6)	(0.01)	(2.4)	(0.02)
Farm-level price (dollars per hundredweight)	\$15.15	0	0	(0.01)	(0.07)
Farm-level revenue (dollars in millions)	\$1,822	(0.5)	(0.03)	(1.6)	(0.09)
Southeast					
Production (pounds in millions)	5,690	(0.5)	(0.01)	(0.8)	(0.01)
Farm-level price (dollars per hundredweight)	\$16.56	0	0	(0.01)	(0.06)
Farm-level revenue (dollars in millions)	\$943	0	0	(0.4)	(0.04)
Southern Michigan					
Production (pounds in millions)	4,606	(0.4)	(0.01)	(0.7)	(0.02)
Farm-level price (dollars per hundredweight)	\$15.24	0	0	(0.01)	(0.07)
Farm-level revenue (dollars in millions)	\$703	0	0	(0.4)	(0.06)
Chicago					
Production (pounds in millions)	14,777	(1.6)	(0.07)	(2.1)	(0.01)

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Region	Amount without the NEDC	Change due to the NEDC using a \$16.94 over-order compact price in 2000-05		Change due to the NEDC using a \$16.94 over-order compact price in 2000 and a Boston Class I price plus \$1.30 in 2001-05	
	Baseline	Amount	Percentage	Amount	Percentage
Farm-level price (dollars per hundredweight)	\$14.60	(0.01)	(0.01)	(0.07)	(0.07)
Farm-level revenue (dollars in millions)	\$2,154	(1.3)	(0.06)	(1.7)	(0.08)
Southwest Plains					
Production (pounds in millions)	3,059	(0.3)	(0.01)	(0.4)	(0.01)
Farm-level price (dollars per hundredweight)	\$15.08	0	0	(0.01)	(0.07)
Farm-level revenue (dollars in millions)	\$461	(0.1)	(0.02)	(0.3)	(0.07)
Texas					
Production (pounds in millions)	6,353	(0.6)	(0.01)	(0.9)	(0.01)
Farm-level price (dollars per hundredweight)	\$15.16	0	0	(0.01)	(0.07)
Farm-level revenue (dollars in millions)	\$963	(0.1)	(0.01)	(0.6)	(0.06)
Great Basin					
Production (pounds in millions)	2,635	(0.2)	(0.01)	(0.3)	(0.01)
Farm-level price (dollars per hundredweight)	\$14.25	(0.01)	(0.07)	(0.01)	(0.07)
Farm-level revenue (dollars in millions)	\$377	(0.2)	(0.05)	(0.3)	(0.08)
Pacific Northwest					
Production (pounds in millions)	7,619	(0.5)	(0.01)	(0.8)	(0.01)
Farm-level price (dollars per hundredweight)	\$14.37	0	0	(0.1)	(0.07)
Farm-level revenue (dollars in millions)	\$1,098	1	(0.01)	(0.6)	(0.05)
All federal order markets					
Production (pounds in millions)	112,739	20.5	0.02	30.7	0.03
Farm-level price (dollars per hundredweight)	\$15.04	0.01	0.07	0.01	0.07
Farm-level revenue (dollars in millions)	\$16,944	12	0.07	19.5	0.12
State of California					
Production (pounds in millions)	32,666	(2.2)	(0.01)	(3.4)	(0.01)
Farm-level price (dollars per hundredweight)	\$14.25	0	0	(0.01)	(0.07)
Farm-level revenue (dollars in millions)	\$4,667	(0.9)	(0.02)	(3.3)	(0.07)
United States					
Production (pounds in millions)	165,157	16.3	0.01	24.8	0.02
Farm-level price (dollars per hundredweight)	\$14.73	0	0	0.01	0.07
Farm-level revenue (dollars in millions)	\$24,369	8.6	0.04	13.2	0.05

Note: Numbers in parentheses are negative.

Source: USDA study.

USDA also reported on the interregional impacts in each of its then-existing 32 milk marketing orders and in all noncompact regions combined. For example, under the first scenario, for which it used a \$16.94 NEDC price for each of the 6 years, USDA estimated that the average all-milk price in all noncompact regions would decline by less than 1 cent per hundredweight during the years 2000 through 2005.⁴ With regard to its individual marketing orders, such as the Upper Midwest Marketing Order, USDA estimated that the all-milk price would decline by 1 cent per hundredweight in 2000, 2001, 2004, and 2005.

Cox et al. (1999)—A Study Using a Spatial Market Equilibrium Model

A study issued by Cox, Cropp, and Hughes in 1999 estimated the impacts of an expanded NEDC and an expanded NEDC in conjunction with a southern compact on noncompact regions.⁵ Cox et al. used a spatial market equilibrium model and dairy sector data for 1997 to estimate the potential impacts of compacts in that year. For purposes of the analysis, the expanded NEDC included the six New England states, New Jersey, New York, Maryland, and Pennsylvania. The southern compact consisted of 10 states.⁶

The spatial market equilibrium model also incorporated two additional modeling features: It simulated the processing of dairy commodities in a vertical marketing sector and used price wedges, or mark-ups, for each dairy commodity to simulate USDA's classified pricing system and compacts.⁷ To generate a competitive spatial market equilibrium, the model maximized producer and consumer surpluses in each region, minus transportation costs, for the different commodities, subject to certain trade-flow and other constraints. In addition, the model allowed for

⁴The all-milk price is the weighted average farm price of milk that meets the more stringent federal standards for milk to be used as fluid milk (although some is used for manufacturing purposes), and milk that meets less stringent federal standards and can only be used for manufactured dairy products.

⁵Tom Cox, Bob Cropp, and Will Hughes, "Interregional Analysis of Interstate Dairy Compacts," Department of Agricultural and Applied Economics, College of Agricultural and Life Sciences, University of Wisconsin-Madison, Marketing and Policy Briefing Paper No. 69, July 1999.

⁶The southern compact included Alabama, Arkansas, Florida, Georgia, Kansas, Kentucky, Louisiana, Mississippi, Missouri, and North Carolina.

⁷The vertical market portion of the model transformed raw milk into dairy products consistent with how milk components (protein, fat, and carbohydrates) are allocated and priced.

classified pricing so that raw milk used for fluid milk attracted a higher price than raw milk used for manufactured dairy commodities. Using an iterative technique, the model solved for regional farm-level milk prices and production, wholesale-level dairy prices and production, and interregional trade flows. This model—the IRCM97—is an earlier version of the model that we used for our analysis of interregional impacts.

The model assumed intermediate-run (3- to 5-year) supply and demand functions for 12 geographic regions of the country (the current 11 USDA milk marketing orders and California), representing different milk and dairy product supply and demand regions. In addition, Cox et al. used component yield data from other researchers.⁸ Features of their analysis follow:

- The model was an interregional, spatial equilibrium model.
- The model prohibited fluid milk trade between compact and noncompact regions.
- Twelve demand relationships for dairy products were developed for the 12 regions in the model; these demand relationships were based on consumer demand for nine distinct dairy products using national estimates of per capita wholesale demand.
- To link prices among the 12 regions, the model used 1995 transportation cost estimates provided by researchers at Cornell University.
- The model used 1997 price and production data obtained from USDA for developing a 1997 base year.
- The model added a price wedge of \$2 per hundredweight to the 1997 Class I differentials in each compact region.
- All scenarios assumed no Commodity Credit Corporation milk price supports because these were set to expire in 2000.

Under the model assumptions used, the researchers estimated the impacts of dairy compacts on farm-level prices and revenue, and commodity prices and expenditures. Tables 77 and 78 provide the study's results.

⁸R. Selinsky, T.L. Cox, and E.V. Jesse, "Estimation of U.S. Dairy Product Component Yields," College of Agricultural and Life Sciences, University of Wisconsin-Madison, Staff Paper No. 355, Sept. 1992.

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Table 77: Cox et al. Estimates of the Interregional Impacts of Compacts on Farm-Level Prices and Revenue in 1997

IRCM97 region	Expanded NEDC		Expanded NEDC in conjunction with a southern compact	
	Change in farm-level price (dollars per hundredweight)	Change in farm-level revenue (dollars in millions)	Change in farm-level price (dollars per hundredweight)	Change in farm-level revenue (dollars in millions)
Northeast	\$0.66	\$237	\$0.53	\$190
Appalachia	(0.09)	(10)	0.86	99
Florida	(0.08)	(3)	1.48	53
Southeast	(0.08)	(4)	1.32	74
Mideast	(0.10)	(16)	(0.26)	(42)
Upper Midwest	(0.10)	(42)	(0.22)	(92)
Central	(0.07)	(15)	(0.24)	(52)
Southwest	(0.05)	(7)	0.58	79
Western	(0.08)	(8)	(0.21)	(22)
Northwest	(0.08)	(8)	(0.14)	(14)
California	(0.08)	(31)	(0.28)	(110)
Arizona	(0.05)	(2)	(0.22)	(8)
United States	0.06	91	0.09	156

Note: Numbers in parentheses are negative.

Source: Cox et al., 1999.

Table 78: Cox et al. Estimates of the Interregional Impacts of Compacts on Commodity Prices and Expenditures in 1997

Dairy commodity	Expanded NEDC		Expanded NEDC in conjunction with a southern compact	
	Change in commodity price (dollars per hundredweight)	Change in commodity expenditures (dollars in millions)	Change in commodity price (dollars per hundredweight)	Change in commodity expenditures (dollars in millions)
Fluid milk	\$0.32	\$148	\$0.70	\$326
Soft dairy products	(0.10)	(3)	(0.30)	(8)
American cheese	(0.70)	(19)	(1.74)	(48)
Italian cheese	(0.70)	(15)	(1.14)	(32)
Other cheese	(0.52)	(4)	(0.72)	(5)
Butter	0.67	6	0.51	7
Frozen dairy products	(0.06)	(5)	(0.12)	(17)
Other manufactured products	(0.30)	(9)	(0.52)	(28)
Nonfat dry milk	(1.15)	(6)	(1.76)	(21)

Note: Numbers in parentheses are negative.

Source: Cox et al., 1999.

Bailey (2000)—A Study Using a Regional Economic Simulation Model

In 2000, Kenneth Bailey, an agricultural economist at Pennsylvania State University, issued a study that estimated the interregional economic impacts of a large compact on noncompact states.⁹ Bailey used a static equilibrium model, similar in structure to the constant elasticity functional form policy models developed by Gardner.^{10,11} In his 2000 study, Bailey relied on 1997 data to forecast the impact of compacts in 2000. The compact simulation included those states in USDA's Appalachian, Florida, Northeast, and Southeast milk marketing orders.¹² The model was multiregional to reflect milk supply, allocation, and class prices in federal milk marketing orders. However, overall supply and demand for dairy products were modeled at the national level, as opposed to on a marketing order basis. The model also relied on medium-run supply and demand elasticities as reported in agricultural economics literature. The data sources for the model included USDA's Agricultural Marketing Service, federal milk marketing order administrators, and the California Department of Agriculture.

The model incorporated several significant aspects of USDA's milk marketing order reform that were adopted in January 2000, including component pricing.¹³ As specified in milk marketing order reform, the model based the Class I price on the higher of the Class III or IV price. The model posited 13 regions: 11 federal marketing orders, California, and an

⁹Kenneth W. Bailey, "Evaluating the Economic Impacts of Regional Milk Pricing Authorities: The Case of Dairy Compacts," *Agricultural and Resource Economics Review*, Vol. 29, No. 2 (Oct. 2000), pp. 208-19.

¹⁰A constant elasticity functional form policy model is one in which the elasticity of supply or demand is assumed to be constant over the relevant range of the function.

¹¹Bruce L. Gardner, *The Economics of Agricultural Policies* (New York, N.Y.: MacMillan Publishing Company, 1987).

¹²In Bailey's model, the northern dairy compact consisted of the following states or portions thereof: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; and the District of Columbia. The Mid-Atlantic compact consisted of the following states or portions thereof: Georgia, Indiana, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. The southern dairy compact consisted of the following states or portions thereof: Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee.

¹³Even though the model incorporated changes included in USDA's January 2000 milk marketing order reform, the model used "Option 1B" Class I fluid milk pricing differentials that were initially proposed by USDA, as opposed to "Option 1A" milk pricing differentials, which were adopted in the Final Rule. The use of Option 1B as opposed to Option 1A resulted in different prices for the various classes of milk.

“unregulated” region representing all areas of the country that did not fall under federal marketing orders or California’s milk pricing plan.

Bailey analyzed the impacts of a large multiregional dairy compact accounting for about 27 percent of all milk marketed in the model. This compact scenario was evaluated relative to a no-compact baseline. Bailey also conducted additional analyses by varying retail fluid milk demand elasticities (from -0.32 to -0.23) and by using a fixed-percentage farm-to-retail milk markup instead of a fixed-dollar markup. The major features of Bailey’s analysis and model follow:

- The model did not allow for trade between regions.
- The model estimated supply, price, and demand for fluid milk and three dairy commodities: butter, cheese, and nonfat dry milk.
- Both a \$1 and a \$2 fixed amount per hundredweight were used to model an effective compact over-order producer price payment.
- The assumption about the amount of the market-driven over-order premium was varied to reflect either the full amount of the market-driven over-order premium as that in the no-compact baseline or half the amount in the no-compact baseline.
- The model estimated demand for fluid milk at the retail level and demand for manufactured dairy products at the wholesale level. In addition, the model used various farm-to-retail markup assumptions.

Table 79 summarizes Bailey’s estimates of the multiregion compact on farm-level milk prices, revenue, and production in 2000.

Table 79: Bailey’s Estimates of the Interregional Impacts of a Multiregional Compact on Farm-Level Prices, Revenue, and Production in 2000

Modeling assumptions	Impact in all noncompact regions					
	Farm-level milk price (dollars per hundredweight)		Farm-level revenue (dollars in millions)		Milk production (pounds in millions)	
	Baseline and change to baseline	Percentage change	Baseline and change to baseline	Percentage change	Baseline and change to baseline	Percentage change
No-compact baseline	\$12.94		\$15,402.40		\$119,042.20	
Compact using a \$1 compact producer price payment; full over-order premium	(0.07)	(0.06)	(114.3)	(0.7)	(212.3)	(0.2)
Compact using a \$1 compact producer price payment; one-half over- order premium	(0.04)	(0.03)	(56.4)	(0.4)	(106.2)	(0.1)

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Modeling assumptions	Impact in all noncompact regions					
	Farm-level milk price (dollars per hundredweight)		Farm-level revenue (dollars in millions)		Milk production (pounds in millions)	
	Baseline and change to baseline	Percentage change	Baseline and change to baseline	Percentage change	Baseline and change to baseline	Percentage change
Compact using a \$2 compact producer price payment; full over-order premium	(0.14)	(1.1)	(217.8)	(1.4)	(406.6)	(0.3)
Compact using a \$2 compact producer price payment; one-half over-order premium	(0.10)	(0.8)	(163.0)	(1.1)	(305.6)	(0.3)

Note: Numbers in parentheses are negative.

Source: Bailey, Oct. 2000.

In addition to estimating the multiregional compact’s impact on farm-level milk prices, revenue, and production, Bailey also estimated changes within the compact region, and the impact that these changes would have on all noncompact regions. Bailey estimated that milk production within the compact region would increase by 0.4 to 1.4 percent, causing lower wholesale prices for butter (by 0.3 to 1.0 percent), cheese (by 0.5 to 1.7 percent), and nonfat dry milk (by 0.3 to 0.8 percent) in all federal milk marketing orders.

Balagtas and Sumner (2001)—A Study Using a Price Discrimination Framework

A study conducted in 2001 by Balagtas and Sumner estimated the interregional effects of the NEDC and an expanded NEDC on noncompact regions.¹⁴ Balagtas and Sumner used an annual, national-level supply and demand simulation model to estimate the effects of the Compact on the U.S. dairy sector, based on 1999 data.¹⁵ For purposes of this analysis, the expanded NEDC included the NEDC states and New Jersey and New York.

The model simulated class and blend prices that would be announced by USDA’s milk marketing orders in the absence of any compact. The model’s parameters were established by using milk marketing order and Compact

¹⁴Joseph V. Balagtas and Daniel A. Sumner, “The Effect of the Northeast Dairy Compact on Producers and Consumers, with Implications of Compact Contagion,” Department of Agricultural and Resource Economics, University of California, Davis, 2001.

¹⁵The model built on a price discrimination framework developed by Ippolito and Masson, which assumed linear supply and demand schedules for milk across regions. See R.A. Ippolito and R.T. Masson, “The Social Cost of Government Regulation of Milk,” *Journal of Law and Economics*, Vol. 21 (Apr. 1978), pp. 33-65.

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commission data and intermediate-run (3- to 6-year) supply and demand elasticities. The model also used national-level, as opposed to regional-level, supply elasticities.

The major features of the model follow:

- The model included two aggregate milk categories—fluid milk and manufactured dairy products—as opposed to four milk classes.
- The model estimated the interregional impacts of the two different compacts in four noncompact regions: California, Wisconsin, Minnesota, and a combined rest of the United States that excluded the NEDC states.
- The model calculated the elasticity of demand for manufactured dairy products in the New England region.

Table 80 summarizes the results of Balagtas and Sumner’s estimates of the interregional impacts of the NEDC and an expanded NEDC on farm-level milk prices and production in noncompact regions.

Table 80: Balagtas and Sumner’s Estimates of the Interregional Impacts of the NEDC and an Expanded NEDC on Farm-Level Prices and Production in 1999

Noncompact region	Baseline amount with no NEDC	Change to baseline due to the NEDC	Percentage change due to the NEDC	Change to baseline due to an expanded NEDC	Percentage change due to an expanded NEDC
California					
Farm-level price (dollars per hundredweight)	\$13.47	\$(0.02)	(0.16)	\$(0.05)	(0.40)
Production (pounds in million hundredweight)	304.57	(0.49)	(0.16)	(1.16)	(0.40)
Wisconsin					
Farm-level price (dollars per hundredweight)	13.88	(0.02)	(0.16)	(0.05)	(0.37)
Production (pounds in million hundredweight)	228.34	(0.35)	(0.16)	(0.84)	(0.37)
Minnesota					
Farm-level price (dollars per hundredweight)	14.01	(0.02)	(0.15)	(0.05)	(0.36)
Production (pounds in million hundredweight)	93.87	(0.14)	(0.15)	(0.34)	(0.36)
All noncompact regions					
Farm-level price (dollars per hundredweight)	14.36	(0.02)	(0.15)	(0.05)	(0.35)
Production (pounds in million hundredweight)	1,562.63	(2.34)	(0.15)	(5.37)	(0.34)

Note: Numbers in parentheses are negative.

Source: Balagtas and Sumner, 2001.

Balagtas and Sumner also estimated the interregional impacts on the price of milk used for manufactured dairy commodities and farm-level revenue. They estimated that in 1999, the price of milk used for manufactured dairy commodities would fall in noncompact regions by about 2 cents per hundredweight, which would have translated into producer surplus losses for noncompact producers of about \$34 million in 1999.

Rosenfeld (2001)—A Study Using an Economic Model of Classified Pricing

A study issued by Allen Rosenfeld in 2001 estimated the interregional impacts of the NEDC and a larger compact on noncompact states.¹⁶ Rosenfeld used a classified pricing model and dairy sector data from 2000 to predict potential impacts in that year. For purposes of the analysis, the larger compact included a total of 29 states located in the Northeast and the South.¹⁷ These 29 states accounted for about 62 percent of Class I milk consumption in 2000.

The model used supply and demand analysis within the context of traditional modeling of classified pricing. Rosenfeld used supply and demand elasticities from the dairy economics literature to estimate the increase in milk production and the decrease in milk consumption in the compact regions caused by a higher compact minimum price for milk used for and sold as fluid milk. Rosenfeld then used these elasticities to estimate the decrease in the price of milk used for manufacturing purposes, which he then used to estimate the decline in dairy farm revenue in noncompact states.

The major features of Rosenfeld's analysis and model follow:

- The model used a compact Class I over-order premium for both compact scenarios of 18.5 cents per gallon of milk.
- The model used a supply elasticity of 0.227 to estimate the impact of a higher blend price within the compact region on milk production. The model subsequently used a higher elasticity (0.35) in a sensitivity analysis.

¹⁶Allen Rosenfeld, "The Impacts of the Proposed Expansion of Dairy Compacts on Dairy Farm Revenue in Noncompact States," M&R Strategic Services, Washington, D.C., May 2001.

¹⁷The expanded scenario included the six NEDC states in conjunction with Alabama, Arkansas, Delaware, Florida, Georgia, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

- The model used a wholesale demand elasticity of -0.144 for Class I milk and a wholesale demand elasticity of -0.261 for all other classes of milk to estimate the impact of price changes on consumption.
 - The model did not allow for decreased production by farmers in noncompact states in response to lower prices.
 - The study did not discuss interregional trade.
- Table 81 summarizes Rosenfeld’s estimates of the interregional impacts of the NEDC and a larger compact on dairy farm revenue in noncompact states for 2000.

Table 81: Rosenfeld’s Estimates of the Interregional Impacts of Compacts on Farm-Level Revenue in 2000

Dollars in thousands

Noncompact state	Reduction in farm-level revenue under different compact scenarios	
	NEDC scenario	Expanded 29-state compact scenario
Arizona	\$735	\$9,510
California	9,170	118,610
Colorado	475	6,145
Idaho	1,920	24,805
Illinois	520	6,690
Indiana	445	5,730
Iowa	970	12,565
Michigan	1,070	13,825
Minnesota	2,785	36,020
Montana	55	705
Nevada	120	1,565
New Mexico	1,010	13,075
North Dakota	125	1,615
Oregon	415	5,375
South Dakota	440	5,710
Utah	450	5,795
Washington	1,370	17,735
Wisconsin	6,825	88,250
Wyoming	20	230
Total	\$28,920	\$373,645

Source: Rosenfeld, 2001.

Rosenfeld noted that his use of 2000 data may have overstated the estimates of the impact of the NEDC and an expanded compact because, in 2000, the difference between the Class 1 milk marketing order price and the NEDC price of \$16.94 was larger than in other years since the NEDC

has been in effect. To account for this, he performed a sensitivity analysis by adjusting the compact Class I price to simulate the average amount of the NEDC over-order payment during the first 44 months of NEDC operations. The result was that the 29-state compact had a smaller impact on dairy farm revenue in noncompact states (\$228 million as opposed to \$374 million).

Comparison of Studies Reviewed

The five studies we reviewed and analyzed used a variety of models, assumptions, and data sets. They also varied in terms of the dairy compact alternatives they examined. To allow a comparison, table 82 summarizes the key features of these studies.

Table 82: Summary of Characteristics of Studies That Estimate the Interregional Economic Impacts of Dairy Compact Alternatives

Study characteristic	Study				
	USDA	Cox et al.	Bailey	Balagtas and Sumner	Rosenfeld
Type of model	A 36-region time-series dairy sector model that uses a multistage regression analysis technique	An interregional spatial equilibrium hedonic model incorporating a vertical milk marketing sector	A static equilibrium, 13-region, economic simulation model using a constant elasticity functional form	An annual national-level supply and demand simulation model based on Ippolito and Masson's price discrimination model	A supply and demand simulation model based on price discrimination inherent in classified pricing
Compact scenario	NEDC	An expanded NEDC and an expanded NEDC plus a southern compact	A region encompassing the Northeast, Appalachian, Southeast, and Florida milk marketing orders	The NEDC and an expanded NEDC	The NEDC and a 29-state compact
Baseline year	Forecasted for 2000 through 2005 based on 1999 data	1997	Forecasted to 2000 based on 1997 data	1999	2000
Level of model aggregation	Market equilibrium is determined at the national level for seven dairy commodities	Supply and demand are modeled at the regional level for nine dairy commodities	Supply and demand are modeled at the national level for four dairy commodities	Supply and demand are modeled at the national level for milk used for fluid milk and manufactured products	Supply and demand are modeled at the state level for raw milk used for fluid milk and manufactured products
Trade assumption	No trade between regions or compact and noncompact regions	No trade between regions or compact and noncompact regions	No trade between regions or compact and noncompact regions	Not a regional model	Not a regional model

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Study characteristic	Study				
	USDA	Cox et al.	Bailey	Balagtas and Sumner	Rosenfeld
Compact price assumption	Two price scenarios: either \$16.94 per hundredweight for the 6 forecasted years or \$16.94 per hundredweight in 2000 followed by \$1.30 per hundredweight above the USDA Class I price in the subsequent years	Price wedge of \$2 over-order producer price payment per hundredweight of milk	Price wedge of either \$1 or \$2 over-order producer price payment per hundredweight of milk	Price wedge of \$1.20 over-order producer price payment per hundredweight of milk	A compact Class I over-order premium of 18.5 cents per gallon for both compact scenarios.
Other key assumptions	Parameterized supply response	Intermediate supply and demand elasticities	Intermediate supply and demand elasticities; sensitivity analyses include (1) both 100-percent baseline and 50-percent over-order premiums, (2) lower retail fluid demand elasticity, and (3) an alternative farm-to-retail mark-up assumption	Intermediate supply and demand elasticities; supply elasticity of 1.0; fluid demand elasticity of -0.2; national manufacturing demand elasticity of -0.2; an estimated demand elasticity for the Northeast of -39; and assumes no over-order premiums	Supply elasticity of 0.227 and demand elasticities of -0.144 for Class I milk and -0.261 for milk used for manufacturing purposes

Source: GAO analysis of cited studies.

Appendix VIII: Comments From the Executive Director, NEDC

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

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September 7, 2001

Mr. Lawrence J. Dyckman, Director
Natural Resources and Environment
United States General Accounting Office
Washington, DC 20548

Dear Mr. Dyckman:

Thank you for the opportunity to comment on the draft report entitled Dairy Industry: Estimated Economic Impacts of Dairy Compacts (GAO-01-866). I appreciate perhaps more than most the complexity of the issues involved with analyzing dairy compacts and commend you and your staff on the thoroughness of the report. I would also like to indicate at the outset my appreciation for the courtesy shown to me by you and your staff throughout this process, particularly the courteous assistance and attention of Marcia McWreath and Jim Jones.

As we have discussed, I am responding in my capacity as Executive Director of the Compact Commission. While I am responding on behalf of the Commission, the views presented are essentially those of one individual staff official, and should be so construed, rather than being the Commission's official position in an organizational capacity.

My review and comment is limited to those sections of the report which relate to the operation of the unexpanded Northeast Compact. I limit my review in this manner given the time constraints for the review and the scope of my expertise and experience. The impact analysis for the existing Compact, including its impacts on other regions, can be critiqued against an actual record which is within my scope of knowledge and experience. This record includes the Commission's recently conducted comprehensive review, which also provides the basis for a comparative analysis of actual impacts.

My substantive comments involve five issues: 1) interregional impacts 2) the significance of the seeming failure of the intra regional and inter regional analysis to account either at all (the letter) or properly (the model) for the Compact price regulation's uniform



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application to all plants and farmers which supply the New England market; 3) farmer, farm and production impact analysis, 4) retail price impacts, and 5) the assessment of the price regulation's impact on the food stamp program.

1. Interregional Impacts of the Existing Six State Compact

Despite certain deep concerns expressed in the next section, it is important first to state that the report's finding of a marginal inter-regional impact of the existing compact is well described and of substantial contribution to the discussion. Despite the methodological reservations described below, the report, through the model, properly accounts for the relatively isolated nature of the New England market, and its small size. This means that the model properly reveals that the price regulation can only have at best a marginal impact on other regional markets in the country.

In part based on the analytical concerns raised below, further critique may yet reveal that even these marginal impacts are overstated, given that the rate of production increase for New England is currently well below the national average. (It should also be noted that the model apparently does not account for the fact that NASS has revised its calculation for 2000, and reducing New England production by 2 percent, indicating that for 2000, New England's production was essentially static.)

2. Omission of New York State Analysis

On page 10 - 11 the letter indicates that the report was developed in response to Senator Kohl's inquiry in part about the inter regional impacts of the price regulation. Despite its centrality to the compact's design and impact, the price regulation's application to New York farmers and milk plants so critical to the New England marketplace is mentioned only in the barest passing by the letter. By any measure, geographic, historic, or milk market regulation, these farms and plants are located in a different region. (For over sixty years, New York was of course covered by a different federal order!)

The report's omission of this construct means the report misses, if not misrepresents, the regulation's design and function in substantial part. By original design of the New England states, the Dairy Compact was intended to maintain the long-term stability and integrity of the *region's market* for fluid milk products. This market-based purpose was expressed in the textual provisions of the Compact such that any resulting regulation would necessarily be applied without regard to state boundary distinction in the location of either raw or finished supply. This meant uniform application to the entire New England milkshed, regardless of the residency of the farmer. By design also, the Compact was intended to provide for regulation without competitive impact on all processors who supply finished product to the New England marketplace, also without regard to their geographic location.

The price regulation as established by the Compact Commission fully carries through this purpose. The critical provisions are codified in law, have been tested in litigation, and

See comment 1.

Now on p. 2.

See comment 2.

See comment 3.

are now part of the regulatory structure of the combined New England/New York market.¹

See comment 4.

According to the regulation's provisions, New York farmers, who provide almost a third of the raw supply, are treated in uniform fashion as New England farmers. Equally important, if less apparent, the regulation is plant-based in application, meaning that all similarly situated processors are regulated uniformly – there is no advantage to be gained or lost because of the location of the milk procured for the plant.

Most tangibly, the net result is that fully one-third of the price regulation's proceeds are exported from New England to New York State. As the report does mention, though most barely and only in passing, to date, almost \$50 million has been provided in price enhancement and stability (however calculated) to New York dairy farmers.

See comment 3.

Yet the substantive impacts of those payments on the intra-regional New England market and the interregional New England/New York market are completely ignored by the letter. The analysis assesses the impact on the financial viability of New England farmers, but omits any discussion on the corollary impact on the viability of supplying New York farmers. Since it is the stability of the supply, from whatever source, that is so critical to the Compact's intent, in some sense the analysis misses the whole intra regional purpose of the Compact, or at least 30 percent of the point.

See comment 3.

Totally lost in the analysis is the basic structural feature of the inter regional market that the New York farmers who supply New England are nonetheless embedded in the milkshed for the New York City market. A whole host of critical interregional issues thus go unaddressed. Is the regulation ensuring stability between the markets as intended, or is serving as a magnet for unwanted milk in New England and thus destabilizing the market? What impacts do the Compact payments to the New York farm which supplies New England have on the neighboring farm's farm price structure for that farm's supply to the New York market? These are a mere few of the real issues of inter regional impacts that simply go unaddressed by the report.

See comment 3.

Part of the reason for the omission appears to be the report's apparent incorrect premise (which is most problematic though internally consistent) that all "licensed" New England farms somehow receive payments under the Compact by virtue of their residency in New England. In fact, this is most decidedly not the case. Because the regulation is plant-based and uniform in application to supplying farms, only those farms that ship to a Compact "pool plant" are so eligible. This means not only that New York farmers who so supply a plant get paid, but also that those New England farmers who don't so supply a plant, don't get paid.

See comment 5.

The letter also apparently omits from consideration the regulatory treatment of "partially regulated" plants, which are so critical to the market uniformity of the regulation's function. These plants, or those located outside New England with packaged milk sales

¹ See generally *New York State Dairy Foods, Inc. v. Northeast Dairy Compact Commission*, 198 F.3rd 1 (1999), cert denied, 529 U.S. 1098 (2000).

in New England, are placed on the same competitive footing as their New England based counterparts, and their supplying farms are again treated in uniform fashion without regard to geographic location²

Despite its omission from the letter discussion, the model from which the letter analysis flows at least in part flows does seem to account at least on some level for the pool plant and partially regulated plant construction. Based on the text and my oral discussions with the model's author, it is not totally clear to what extent the provisions are accounted for, but at least they are accounted for in theory in the model's design.

As discussed today, the model's design has a different theoretical problem with its treatment of the New York component of the New England milkshed. In contrast to the letter, which seems essentially to omit New York from its analysis, the model heads in the other direction and completely bundles New York into the New England region, (along with all the other states in the Northeast Order, for that matter) for purposes of its inter regional analysis. The result is that the payments to farms under the Compact are diluted against the great majority of the farms included within the larger region.

It may well be as described by the report's author that this bundled-in treatment is not statistically significant for assessing the inter regional impact of the existing Compact. The plain fact, as is well understood, is that New England simply does not produce enough milk to have any significant impact on the national market. This means there could well be substantial tolerance for error in the model and still allow it to yield the right result.

The key point remains, notwithstanding New York's inclusion in the model, that the inter regional impacts of the price regulation between New England and New York, are essentially omitted from this report. This is despite their central importance to the design and function of the New England Compact at issue in the report.

3. Farm, Farmer and Production Impacts

The report properly raises the relevant questions concerning farm profitability and farm structure impacts of the existing Compact. The report makes mostly limited determinations about actual impacts which seem appropriately circumscribed by the available, studied data sets. The report also appropriately notes that the Commission has conducted its own assessment describing a more tangible and positive impact on farm viability than that determined by the report. I would suggest that the Commission's recitation of the price regulation's impact on a "typical" New England farm and the resulting comparative farm stress review begin to plug some of the critical holes in the available data, and thereby represents an advancement in this dialog.

Perhaps the most concrete analysis depends on findings relating to the price regulation's impact on market premiums. The report seems to find that the regulation has affected the premium structure; however, in contrast to much of the other literature and data review, the analytical and data basis for this determination is opaque.

² Ibid.

See comment 2.

See comments 2 and 4.

See comment 6.

Now on p. 76.

See comment 7.

See comment 8.

Now on pp. 77 to 78.

See comment 9.

See comment 10.

See comment 11.

The report provides a useful overview of available data and analysis on farm attrition rates and production, among other data. It did seem that the trends found did not quite correlate with the reported data, in some regards. For example, on page 87, the report indicates similar trends in farm attrition rates in the New England states compared with the rest of the country. Yet the immediately following reported national rate for the period was 38 percent, while the rate for New England was only 32 percent. In a region with only 2800 farms, six percent represents a lot of farms. The production analysis is similarly a little confusing.

The report also seems to infer that the Compact had no impact on farm attrition, which is puzzling given that the attrition rate in New England went down after 1998, compared to the rest of the country, after being higher beforehand. While this certainly does not establish that the Compact had a positive impact, it does seem to warrant at least further inquiry rather than presentation of a contradictory inference of no impact.

The herd size discussion on page 88-89 is less helpful. Without any discussion of the dynamics of the New England market, the report asserts that there is an inevitable push toward greater consolidation and herd sizing that somehow must dwarf any potential impacts of compact price regulation. Without gainsaying the benefits or costs of consolidation, this analysis can only be described as incomplete and out of touch with the Commission's analysis of pool participants during the five year compact period. The pool data simply does not disclose any evidence at all of some inevitable trend toward larger herds as posited during this relatively extended period.

4. Retail Price Impacts

Again, the report serves the useful purpose of surveying the existing literature and highlighting the current status of analysis of this most complex question. As noted in my oral critique, the report does repeat one key omission of all these studies, in my opinion. Despite the determination of all the analyses to date that retail prices have increased during the period the price regulation has been in effect, there has been no accounting for the fact that retail prices actually declined for approximately one-third - the early part - of the studied period. Similarly, the report does little to account for the fact that the regulated price was absolutely flat for much of the recent period when prices have shown their sharpest increase.

5. Impact on the Food Stamp Program

The report's analysis of program impacts on CCC, school lunch programs and WIC is detailed and thorough. By contrast, the assessment of Food Stamps impacts is conjectural to the point of absurdity.

I have reviewed this portion of the report extensively as part of my oral critique. The description of program costing provided during this discussion was most helpful. The discussion prompted initiation of a review for the Commission's report of not only potential participant cost (as is currently in the Commission's report) but also potential program cost. At least preliminarily, the beginning analysis indicates no program cost

increase of any kind based on the program costing description provided in the draft report.

Thank you again for your courteous consideration of my comments. Please do not hesitate to contact me if you have further questions.

Sincerely,

Daniel Smith

Daniel Smith
Executive Director

The following are GAO's comments on the NEDC's written response dated September 7, 2001, to our draft report.

GAO Comments

1. We recognize that the National Agricultural Statistics Service revised its estimates of New England's milk production for 2000. However, our estimates of the impacts of the NEDC are based primarily on 1999 data. While we also used preliminary data for 2000 to estimate the impacts for that year, we note that these data are preliminary and as a result, we did not conduct sensitivity analyses for that year. Further, a 2-percent adjustment in New England's milk production would be unlikely to affect our estimates of the NEDC's impact on noncompact regions in the country.
2. We recognize that before USDA's milk marketing order regulatory reforms took effect in January 2000, New York was in a different milk marketing order than were the New England states. However, we do not model New York as being in a different milk marketing order. Rather, the dairy model that we used to estimate the impact of compacts aggregates states on a regional basis. As discussed in appendix II, the states included in the model's Northeast region include the six NEDC states, Delaware, the District of Columbia, Maryland, New Jersey, New York, and Pennsylvania. Because the model is a regional model, the NEDC is represented as being part of the Northeast region. As a result, the model is unable to estimate the impact of compact states on noncompact states within the same region.
3. We disagree that the report misrepresents the regulation's design and function. We state that all raw milk used for and sold as fluid milk in the six NEDC states is subject to the NEDC's regulations, not just milk produced by dairy farmers in the six NEDC states. We have revised the report to explicitly state that farmers in New York may receive NEDC payments. However, the impact of the NEDC on dairy farmers in New York was beyond the scope of work that we agreed to perform for Senator Kohl.
4. We concur that New York dairy farmers have received NEDC payments, based on data developed by the NEDC commission. The report, however, does not state that \$50 million has been provided to New York dairy farmers. We have revised the report to include data published by the NEDC that indicates that about 1,300 New York dairy

farmers have received NEDC payments that have averaged, on an annual basis, \$9,812 since the NEDC began in July 1997.¹

5. We disagree that the model omits from consideration the regulatory treatment of plants located outside New England that sell packaged milk in New England—partially regulated plants. The model provides for shipments of packaged milk between compact and noncompact regions. A discussion of how this is modeled is included in appendix II.
6. USDA officials and other dairy economists who have analyzed the NEDC's impact on the premium structure in New England told us that the NEDC has had the effect of eroding much of the market-driven over-order premium that processors had been paying prior to the NEDC's establishment, as opposed to premiums that cover services provided by cooperatives or handlers. This effect would vary, however, depending upon market forces. Such market forces could fluctuate from month to month and year to year. Much of the data needed to determine the specific impact that the NEDC has had on the premium structure in New England are proprietary in nature, and thus we do not have access to this data.
7. The report states that the trends regarding farm attrition rates and production in the NEDC states and the rest of the country were similar, both before and after the compact. This is not to say that the percentage change in the NEDC states was identical to the percentage change in the rest of the country. Regarding attrition, the number of farms has been steadily declining both within the NEDC states and in the rest of the country, but at a slightly different rate.
8. We disagree that the report concludes that the NEDC had no impact on farm attrition. We note that the percentage reduction declined slightly following the NEDC's establishment but conclude that it is difficult to determine the extent to which the NEDC, relative to other factors, may have changed farm attrition.
9. We disagree that the herd size discussion is less helpful. We believe that providing a longer-term perspective that includes national trends provides a useful context for discussing dairy policy options.

¹Testimony by Daniel Smith, Executive Director, Northeast Dairy Compact Commission, before the U.S. Senate Judiciary Committee, July 25, 2001.

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10. We agree that the NEDC's impact on retail milk prices is a complex question. Our report states that many factors affect retail prices, in addition to the farm-level price of milk. We revised the report to recognize that retail milk prices, after increasing by about 20 cents per gallon in July 1997, subsequently fell by as much as 5 to 7 cents per gallon for several months.
 11. We relied on USDA's Food and Nutrition Service's analysis of the NEDC's impact on the Food Stamp Program. On the basis of its analysis, USDA was unable to determine if the NEDC increased program benefit levels. According to USDA, if the NEDC's impact on retail milk prices in the NEDC states had caused a \$1 increase in national benefit levels, this would have resulted in an additional \$60 million in federal funding per year. Aside from the issue of whether the NEDC has increased federal costs, USDA indicated that the NEDC has increased Food Stamp Program participant costs.

Appendix IX: GAO Contact and Staff Acknowledgments

GAO Contact

James R. Jones, Jr (202) 512-9839

Staff Acknowledgments

In addition to those named above, M. Shawn Arbogast, Venkareddy Chennareddy, Jay R. Cherlow, Nancy L. Crothers, Oliver H. Easterwood, Barbara J. El Osta, and Marcia B. McWreath made key contributions to this report.

Related GAO Products

Dairy Industry: Information on Milk Prices and Changing Market Structure (GAO-01-561, June 15, 2001).

Fluid Milk: Farm and Retail Prices and the Factors That Influence Them (GAO-01-730T, May 14, 2001).

Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk (GAO-01-326, Mar. 5, 2001).

Dairy Industry: Information on Prices for Fluid Milk and the Factors That Influence Them (GAO/RCED-99-4, Oct. 8, 1998).

Dairy Industry: Information on Marketing Channels and Prices for Fluid Milk (GAO/RCED-98-70, Mar. 16, 1998).

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