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Federal Order Product Price Formulas and Cheesemaker Margins: A Closer Look

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Recent spikes in energy costs have resulted in escalating cheese manufacturing costs. Because of product formula pricing of milk, cheesemakers are largely unable to offset these costs. If they reduce the price paid to dairy farmers, then they violate federal order minimum pricing rules. If they charge customers more for cheese, then the higher cheese price is immediately translated by the Class III pricing formula back to a higher milk cost.

As a result of this bind, cheesemakers have called for increases in federal order make allowances to offset higher energy costs and/or a method of setting make allowances that automatically adjusts to cost changes beyond their control.[2]

Cheesemakers are also concerned about longer-term issues related to the changes in federal order pricing formulas that became effective April 2003. Specifically, these changes fundamentally altered assumed yields of cheese and butter from cheesemaking, which are applied to reference prices for cheese and butter that do not represent what many plants actually receive.

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[2] In late September, the Massachusetts-based dairy cooperative, Agri-Mark, formally requested USDA to hold an emergency hearing to consider three changes: alter the make allowances for cheese, butter, NDM and whey to reflect higher energy costs; reduce the block-barrel cheese price spread used to calculate the average cheddar cheese price; and alter the protein price formula to reflect the lower value associated with whey cream butter relative to the Grade AA butter price used to price butterfat.

This paper examines these issues. We first take a long-term view of how adoption of product price formulas has changed the level and variability of cheesemakers' gross margins. Then we look at specific issues related to USDA's adoption of new formulas for deriving Class III prices, focusing on deviations in the formula assumptions from real-life conditions. Finally, we assess how recent increases in energy costs have elevated cheese manufacturing costs.

Effect of Product Price Formulas on Cheese Plant Margins

The gross margin to a cheesemaker is the revenue from sales of cheese and cheesemaking byproducts per hundredweight of milk run through the plant less the cost per hundredweight of milk. While simple in concept, gross margin depends on the unique situation facing an individual cheesemaker. Product yields and prices vary among plants, even for plants making identical products.

To evaluate changes in gross margins over time, we considered typical make procedures and yields for a federal order-regulated plant manufacturing block cheddar cheese. The yields that we use to calculate gross revenue do not conform exactly to those assumed in current or previous federal order Class III formulas.[3] The principal difference is in our assumption that cheddar cheese plants recover 91.5 percent of the butterfat contained in cheese milk in the cheese compared to the federal order assumption of 90 percent. This results in marginally higher cheese yields and marginally lower butter yields per hundredweight of milk than the current Class III formula.

Cheddar cheese yield was specified by using the Van Slyke cheese yield formula at 38 percent moisture cheese, 109 percent solids retention, 91.5 percent fat recovery and 82.93 percent (true) protein recovery. The related formula was applied to milk testing 3.5 percent butterfat and 2.99 percent protein, the milk composition values used in calculating the Class III price, to derive a cheese yield per hundredweight of 9.8 pounds.

The cheddar cheese plant is assumed to capture 0.36 pounds of Grade B butter from the whey stream per hundredweight of milk processed. This value is based on recovery of 0.085 pounds of butterfat per pound of butterfat in a cheese milk supply testing 3.5 percent fat assuming a butter overrun of 1.2 pounds.

Skimmed whey is assumed to be dried, yielding 5.86 pounds of dry whey per hundredweight of milk processed. Whey recovery is based on 5.69 pounds of non-fat, non-protein solids in milk and a yield of 1.03 pounds of dry whey per pound of solids, both reflecting federal order assumptions.

[3] Product price formulas have only been used to set federal order prices since 2000 and yield assumptions have changed. We needed to use common yields (corresponding to industry experience) in order to calculate cheesemaker margins that were consistent over time.

To calculate gross cheesemaking value, these yields were applied to the reported monthly NASS prices for cheese, butter, and whey that are used to derive federal order prices. The NASS butter price was reduced by 10 cents per pound, which was the approximate average Grade AA – Grade B butter price spread on the Chicago Mercantile Exchange (CME) for the two years before the CME ended trading in Grade B butter (see subsequent discussion). The monthly cheese price was adjusted to reflect 38 percent moisture in barrel cheddar prior to adoption of that standard in federal order formulas in January 2001.

NASS has reported monthly prices only since May 1997 for cheese and September 1998 for butter and whey. To obtain a longer series for comparing gross margins, the NASS price series was extended backwards to 1991. This was done by simulating earlier NASS prices using the statistical relationship between CME and other published weekly prices and weekly NASS prices over the period that NASS prices have been reported.[4]

Gross margins were calculated by subtracting the applicable ***minimum*** cost of milk used for cheese, the federal order Class III price, from gross cheesemaking value (value of cheese and byproducts per hundredweight of milk).[5] Gross margins from January 1991 through September 2005 are shown in Figure 1.

Figure 1 shows some revealing patterns. Prior to implementing product price formulas in federal orders, gross margins were highly variable from month to month. This indicates that in months of rising cheese prices, cheesemakers expanded their gross margins. When cheese prices fell, margins contracted. This flexibility in gross margins had the effect of stabilizing farm milk prices — they rose and fell less rapidly than cheese prices because changes in cheese prices were not mechanically and immediately translated back to the farm level through product pricing formulas as they are today.

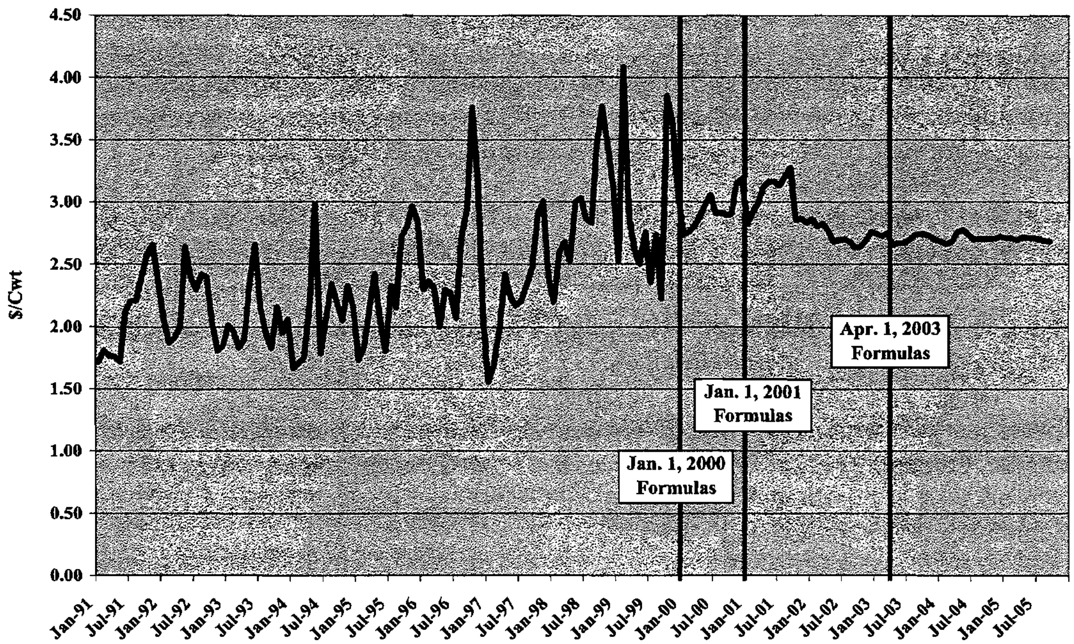
Gross margins trended upward from 1991 to 1999. The average increase was a penny per hundredweight per month, with the trend value at about $2.90 per hundredweight in December 1999. The increasing gross margin likely reflected inflationary increases in labor, energy, packaging, and non-milk material costs.

With the adoption of formula pricing, gross margins stabilized. With refining of the Class III price formula, the gross margin essentially flattened starting when the current formula was implemented in April 2003. Flexibility has all but disappeared. Except for the effect of using slightly different product yield factors, changes in cheese, butter, and whey prices are reflected immediately in corresponding changes in Class III milk prices. Gross margins calculated in this fashion essentially equal formula make allowances.

[4] The procedure used to "backcast" NASS prices is detailed in Jesse, E.V., "Backcasting Formula-Based Federal Order Class Prices," Staff Paper No. 478, Department of Agricultural and Applied Economics, UW-Madison, October 2004. This paper may be downloaded at: http://www.aae.wisc.edu/pubs/sps/

[5] The relevant Class III price was the M-W price prior to May, 1995, the BFP from May 1995 through December 1999, and the Class III price since January 2000. We emphasize that the applicable Class III price is the ***minimum*** cost of milk to cheesemakers. The actual cost in the Upper Midwest is consistently higher than the Class III price, especially when hauling subsidies are included in the cost. At the same time, cheese prices in the Upper Midwest are also higher than the U.S. averages used in the Class III price formula.

Figure 1. Imputed Gross Cheese Plant Margins

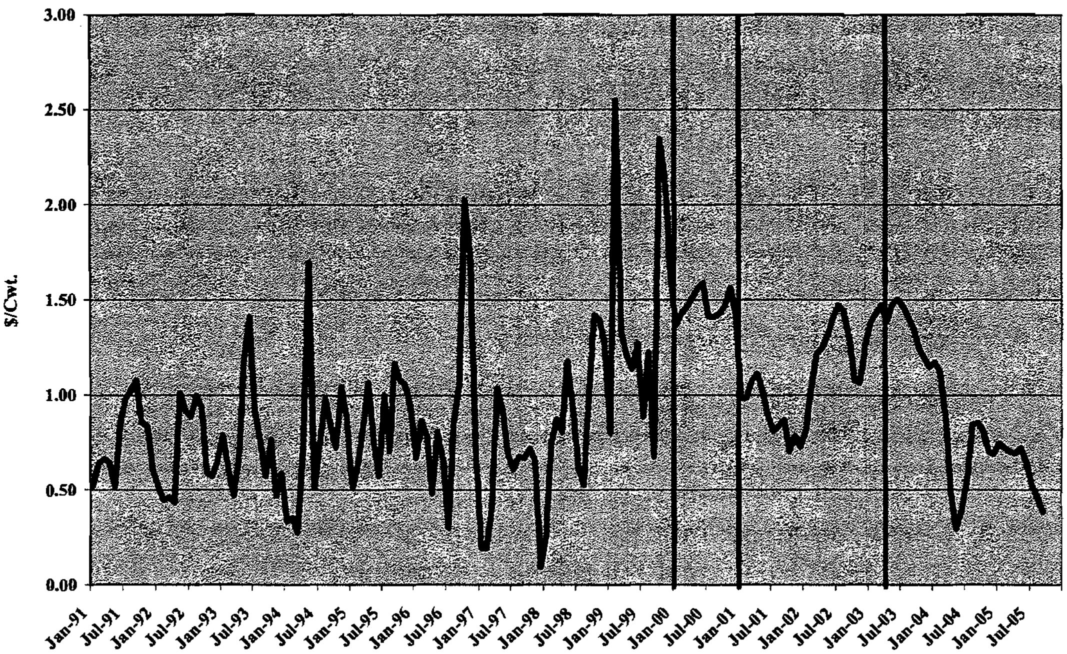


Another way of looking at margins is to define cheesemaker revenue as the value associated only with cheese sales. This measure of margins recognizes that while cheese yields and cheese prices may be fairly uniform across plants manufacturing cheddar cheese, revenue from byproducts is not. Some cheddar cheese plants derive little or no net value from either the fat or skim portions of whey. Others producing higher-valued whey fractions may garner more net revenue than implied by the Class III price formula.

Figure 2 shows gross cheese only margins for cheddar cheese plants obtaining 9.8 pounds of cheese per hundredweight of "standardized" milk purchased at the Class III price and selling cheese at the monthly NASS price.[6] The pattern is very similar to that for gross margins from 1991 through 1999. However, since adoption of formula pricing in 2000, the cheese only margin has trended downward, especially since changes in the Class III formula were made in April 2003. This means that assumed plant revenues from butter and whey represent an increasing portion of gross margins.

[6] Standardized milk is milk with composition equal to the federal order assumptions for calculating the Class III price (3.5 percent butterfat, 2.99 percent protein, and 5.69 percent other solids).

Figure 2. Imputed "Cheese Only" Plant Margins



Effect of April 2003 Formula Changes

To explore the effect of product yields and prices on gross margins, it is useful to express the Class III price directly in terms of its constituent product prices. This can be done by sequentially solving the equations that make up the Class III price for NASS cheese, butter, and whey prices. The resulting mathematical expressions are summarized in Table 1 for the three Class III formulas that have been used since January 2000.

Table 1. Class III Formula Equation Coefficients

Effective Dates	Yield coefficient for: *Cheese*	*Butter*	*Whey*	*Constant*
Jan. '00 – Dec. '00	10.2607	-0.4014	5.8817	-2.5064
Jan. '01 – Mar. '03	10.2607	-0.4014	5.8817	-2.4703
Apr. 03 -	9.6393	0.4199	5.8643	-2.5712

Table I is interpreted as follows: Under the current formula implemented in April 2003, the Class III price is derived by assuming that cheesemakers obtain about 9.64 pounds of cheese per hundredweight of milk, 0.42 pounds of butter, and 5.86 pounds of dry whey. The yield of each of these products is valued at respective NASS monthly product prices and the product values are combined to represent the assumed gross revenue per hundredweight of milk used in cheesemaking.

The constant in the formula is the negative of the total make allowance expressed per hundredweight of milk. It is what is left over after subtracting the Class III price from gross revenue. Cheesemakers who obtain the indicated yields and receive the NASS prices for cheese, butter and whey would have $2.57 per hundredweight left over to compensate them for manufacturing costs and to generate profits.

Note that the aggregate make allowance decreased by 3.6 cents per hundredweight in January 2001 when the product make allowance for cheese was reduced by 0.52 cents per pound, more than offsetting increases in the butter and whey make allowances of 0.1 and 0.3 cents per pound, respectively.[7] The aggregate make allowance increased by 10 cents per hundredweight in April 2003, primarily because of a 1.9 cents per pound increase in the whey make allowance and changes in the protein price equation.

Expressing the formulas in this way allows isolation of the effects of the Class III pricing formula implemented in April 2003. The cheese yield coefficient was reduced by 0.62 pounds per hundredweight and the butter yield coefficient was increased by 0.82 pounds. Moreover, the effect of the butter price on the Class III milk price — the cost of cheese milk — switched from negative to positive. Month-to-month increases in the butter price lowered the Class III price prior to April 2003 and raised it after. So with the current formulas, higher butter prices mean cheesemakers must pay more for milk, even though they are in the business of making cheese.

To measure the effect of the April 2003 Class III formula change, we calculated the Class III price from April 2003 through September 2005 using the formula that was in effect from January 2001 through March 2003. Actual Class III prices are compared with old formula prices in Figure 3.

Since its adoption, the current formula has yielded Class III prices that have averaged 21.6 cents per hundredweight higher than what the precedent formula would have generated. The standard deviation of the Class III price difference is 19 cents. Both of these values are almost exactly what we predicted in 2002, based on historical cheese and butter prices, when the new formulas became effective.[8]

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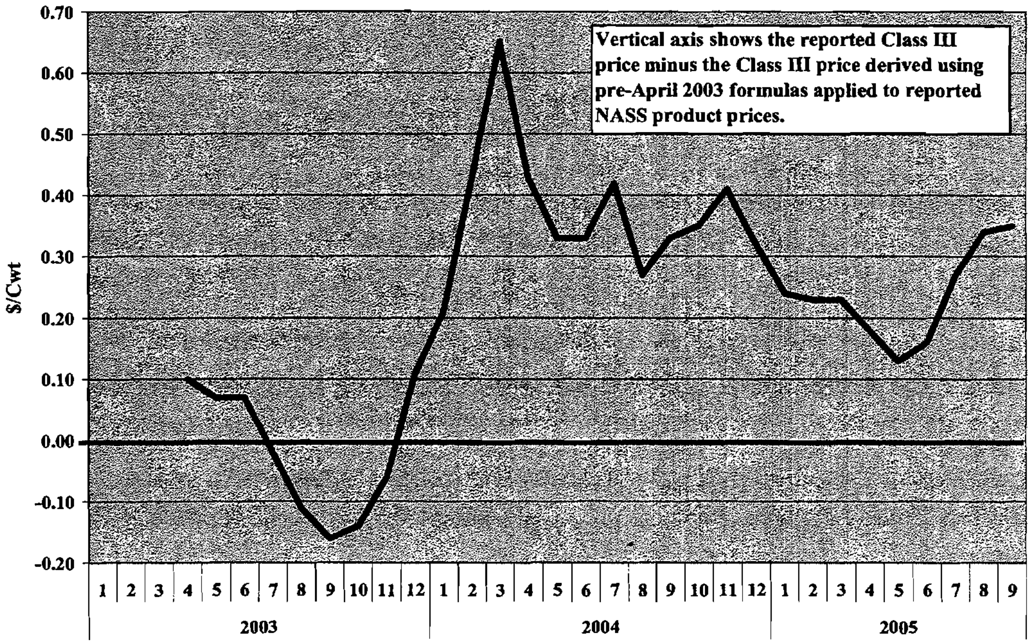
[7] The moisture adjustment for the barrel cheddar price was also changed in January 2001, from 39 percent to 38 percent. This raised the NASS cheese price used in the Class III formula, but it did not change the cheese make allowance

[8] See Jesse, Gould and Cropp, *Federal Milk Marketing Order Reform: November 2002 Final Decision on Class III/IV Formulas*, Marketing and Policy Briefing Paper No. 79, Department of Agricultural and Applied Economics, University of Wisconsin-Madison/Extension, November 2002. This paper can be downloaded at: http://www.aae.wisc.edu/future/publications/m_p_79REV_11_14_02.pdf

Figure 3. Reported Class III Price versus Class III Price calculated using pre-April 2003 formulas

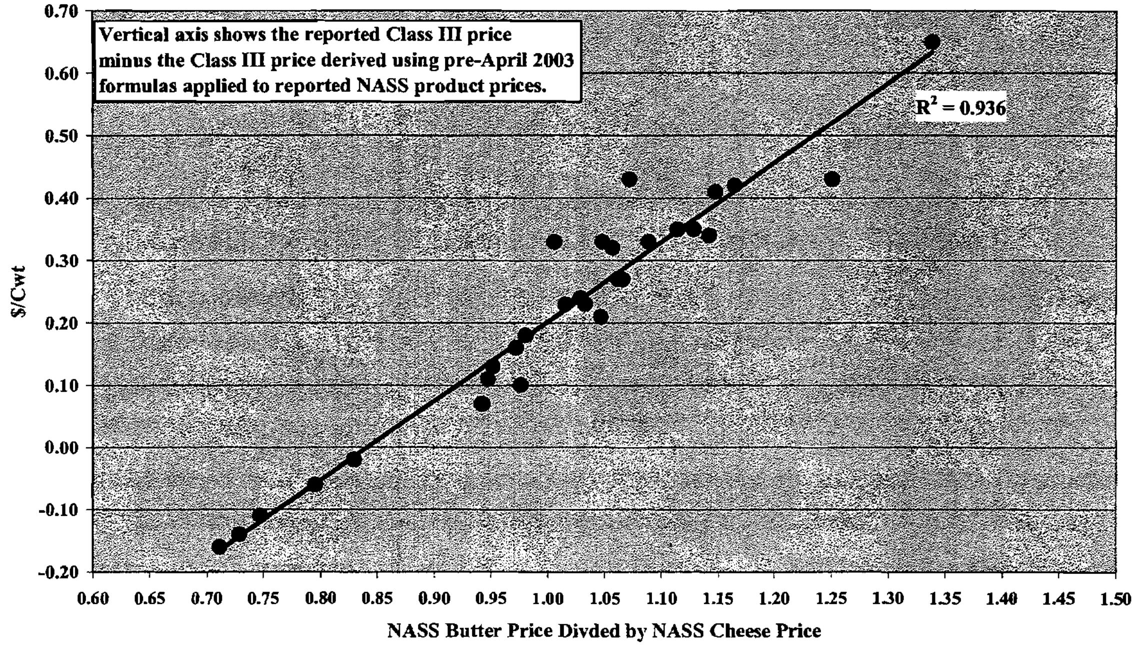


The surprise has been in the large differences since early 2004. Between February 2004 and September 2005, the Class III price has averaged 32 cents higher than what it would have been under the pre-April 2003 formulas.

These recent large differences are due almost entirely to unusually high butter prices relative to cheese prices. This is illustrated in Figure 4, which plots the formula price differences against the NASS monthly butter price divided by the NASS monthly cheese price.

Figure 4 shows that when the NASS butter price is roughly equal to the NASS cheese price, the current formula yields a Class III price about 20 cents per hundredweight higher than the formula it replaced. When butter prices are higher than cheese prices, the current formula yields higher Class III prices. At the extreme in March 2004, when the NASS butter price was $2.10 per pound and the NASS cheese price was only $1.57 per pound, (butter:cheese price ratio of 1.34), the difference was 65 cents per hundredweight. This means that even if cheesemakers obtained the same yields and received the same prices assumed by the current Class III formulas, they paid 65 cents per hundredweight more for milk in March 2004 than they would have under the formulas used prior to April 2003.

Figure 4. Difference in Formula Class III Prices as Related to Butter:Cheese Price Ratio



Formula Yield and Price Assumptions

The intent of product price formulas is to establish farm milk prices that allow reasonably efficient plants to earn enough revenue to be able to pay these prices and have enough money left over to cover their manufacturing costs and earn a competitive rate of return on equity. The assumed product yields, product prices, and make allowances in the formulas are critical in achieving this goal. Obviously formula assumptions cannot replicate what each and every cheesemaker might experience. But they must reflect general industry conditions and experience. In the following section of this paper, we address the adequacy of the make allowances in light of recent increases in energy costs. Here, we look at product yield and price assumptions.

As noted in Table 1, the current Class III price formula assumes cheesemakers convert a standard-test hundredweight of farm milk into 9.64 pounds of cheddar cheese, 0.42 pounds of butter, and 5.86 pounds of dry whey. These yield assumptions adjust for farm-to-plant losses in milk.[9]

[9] Specifically, formula yields reflect farm-to-plant losses of 0.25 percent of the farm-level weight of butterfat, protein and other solids plus an additional 0.015 pounds of butterfat per hundredweight of milk.

The yield assumptions correspond reasonably to industry experience for cheddar cheese plants using conventional make procedures — converting whole milk to cheese, skimming the resulting whey to separate whey cream from nonfat whey solids, and drying skimmed whey. One might argue that conventional make procedures are becoming increasingly rare as plants standardize milk composition and sell liquid whey to specialized processors or employ value-added whey processing methods. Nonetheless, the assumed yields are achievable.[10]

There are more substantive discrepancies between formula assumptions and real life experience in assumed product revenue.

Cheese Price

With respect to cheese, the Class III price equations use a cheese price that is intended to reflect the U.S. average value of block cheddar cheese. However, the cheese price is a weighted (by reported sales) average of the reported NASS block cheddar price and the NASS barrel cheddar cheese price. The barrel price used in the calculation is adjusted in two ways. The first is to standardize the price to a moisture content of 38 percent to reflect the typical moisture content for block cheddar. The second adjustment is the addition of 3 cents per pound to the 38 percent moisture barrel price to reflect a lower make cost for barrel cheddar relative to block.

In its recommended decisions pertaining to product price formulas, USDA has argued that these two adjustments are necessary to derive an appropriate national average price for cheddar cheese that conforms to the yield and make allowance assumptions in the Class III formulas. But some cheesemakers have countered that the combination of the two adjustments results in a cheese price that is higher than what can be realized. Consequently, cheesemakers' gross margin is less than implied by the Class III formulas. They have proposed using only block cheddar price in the Class III price formulas or adding only 1-2 cents per pound to the 38 percent moisture barrel price.

The volume-weighted average monthly NASS block cheddar cheese from January 2001 through September 2005 was $1.4003 per pound, 1.68 cents higher than the comparable NASS 38 percent moisture price of $1.3835.[11] Adding 3 cents per pound means the barrel price used in the Class III formula averaged 1.32 cents per pound more than the block price. During the 57 month period, the formula block price exceeded the adjusted barrel price in only 16 months (Figure 5). The block-barrel price difference ranged from +7 cents to -9 cents per pound.

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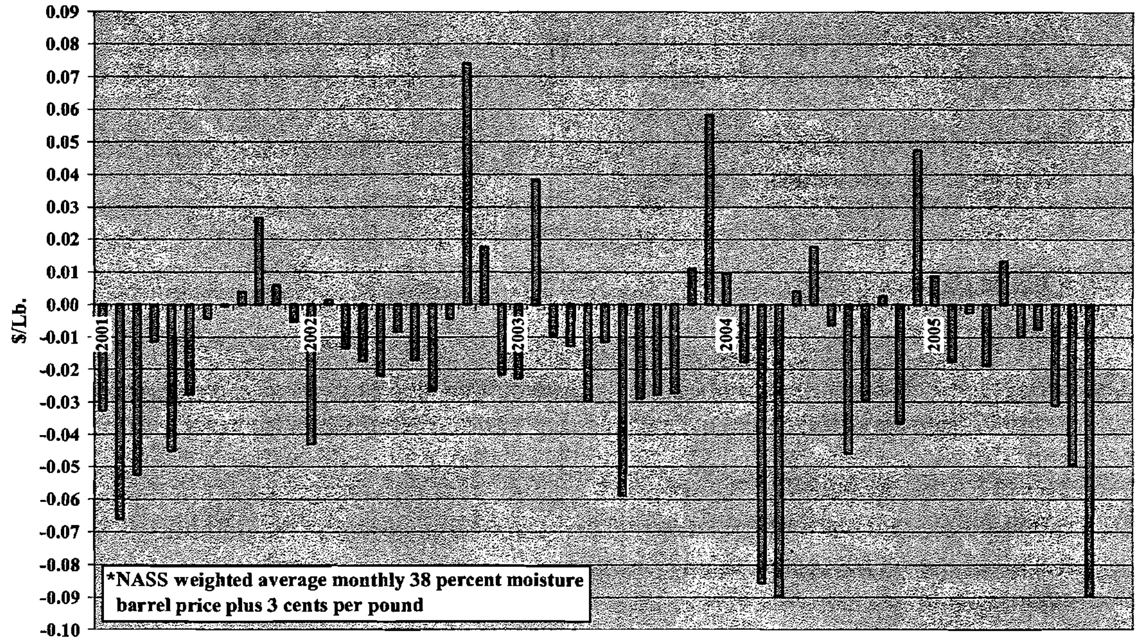
[10] The formula cheese yield uses 90 percent butterfat recovery, which is on the low side of efficient cheddar cheese plant experience. Lower fat recovery also results in an assumed whey fat yield slightly higher than most plants achieve.

[11] From January through December 2000, the barrel price used in the Class III formulas was adjusted to 39 percent moisture.

Figure 5. Formula Cheddar Cheese Prices:
Block minus Adjusted Barrel*



If the barrel cheese price adjustments are intended to equalize block and barrel prices, then the adjustments clearly overshoot their goal. Using only the block cheddar cheese in the Class III formulas would result, on average, in a lower cost of cheese milk and a resulting higher cheesemaker margin.

We simulated the effects of using a block-only cheese price by comparing the reported Class III price with what the Class III would have been if the weighted average monthly NASS block cheddar price were used as the formula cheese price. Cheese margins per hundredweight were then calculated by multiplying the NASS block price by 9.8 pounds and subtracting the reported and the simulated Class III prices. The results are shown in Table 2.

Since product price formulas were adopted in 2000, use of a block-only NASS cheese price would have resulted in 6 cents per hundredweight higher cheese margins. During calendar year 2000, when the barrel price was adjusted to 39 percent moisture, using blocks only would have reduced margins by 2 cents per hundredweight. This emphasizes the effect of USDA's change to using a 38 percent moisture adjustment. Under the formulas used from January 2001 through March 2003, using the block-only formulas would have raised the cheese margin by 7 cents per hundredweight. Under current formulas, the difference is 8 cents in favor of the block only formulas.

Table 2. Cheese Margins: Actual versus Block-Only Cheese Price					
Time Period	***Class III Price***		***Cheese Margin***		
	Actual	***Simulated***	***Actual***	***Simulated***	***Simulated minus Actual***
	Dollars per Hundredweight				
Jan. '00 – Sep. '05	12.29	12.23	0.97	1.03	0.06
Jan. '00 – Dec. '00	9.74	9.76	1.37	1.35	-0.02
Jan. '01 - Mar. '03	11.51	11.44	1.02	1.09	0.07
Apr. '03 – Sep. '05	14.02	13.94	0.78	0.86	0.08

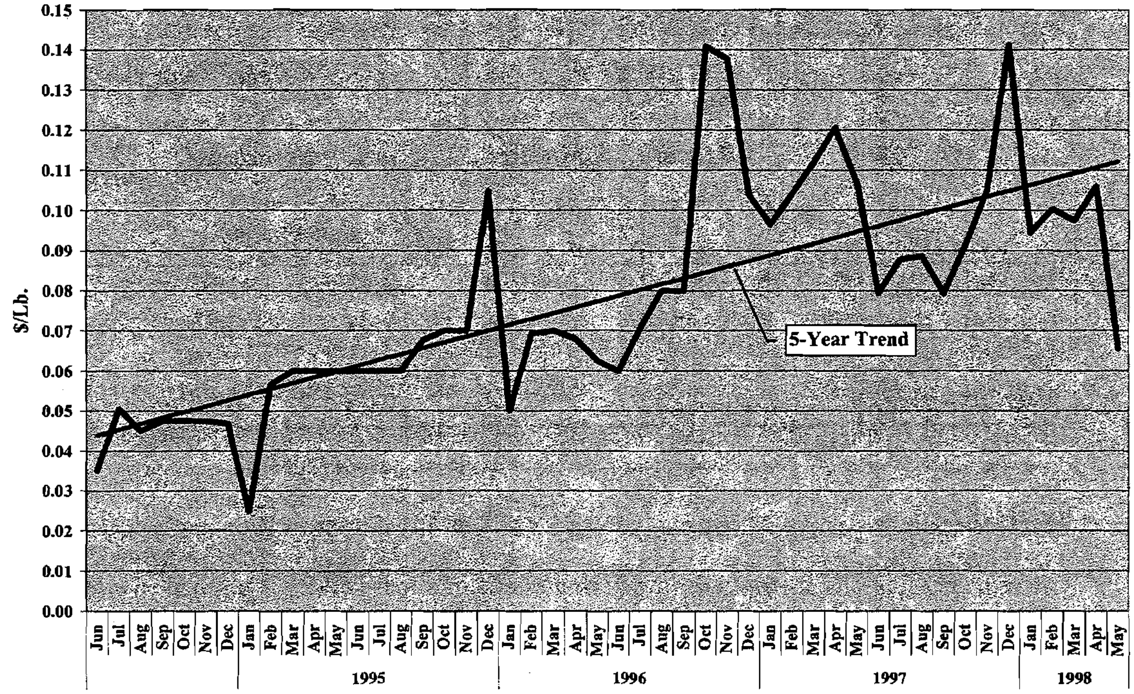
Butter Price

The current Class III formula assumes that cheesemakers sell 0.42 pounds of butter at the weighted average monthly NASS Grade AA butter price. In the conventional make procedure described above, whey is skimmed and the resulting whey cream is either converted to butter at the plant or sold to butter makers. The value of the butter or cream is based on Grade B butter prices — whey cream butter cannot be sold as Grade AA. Consequently, cheese plant revenues implied by the Class III formula are higher than can be achieved by plants using the conventional make procedure. In other words, cheesemaker margins are smaller than implied by the formula by the assumed butter yield (0.42 pounds per hundredweight) multiplied by the Grade AA-Grade B butter price difference.

Grade B butter prices are not currently reported. However, there is evidence about the AA – B spread from the CME, which operated a spot market for Grade B butter prior to June 1998. The CME spread for the last five years during which both grades of butter were traded (June 1994 - May 1998) is shown in Figure 6.

The mean monthly CME AA – B butter price spread over this period was 8 cents per pound, ranging from 2.5 cents to 14 cents. There was a clear upward trend in the spread, which averaged 10 cents per pound in the last two years both grades were traded. A 10 cent per pound price discount for Grade B butter means that cheesemaker gross revenue implied by the current Class III price formulas is inflated by 4.2 cents per hundredweight.

Figure 6. CME Grade AA - Grade B Butter Price Spread



Dry Whey Price

The Class III formulas assume "conventional make procedure" cheese plants dry and sell 5.86 pounds of skim whey powder at the weighted average monthly NASS dry whey price. Some cheese plants do utilize the conventional make procedure. Some convert liquid whey into value-added whey fractions, some sell liquid whey (skimmed or whole) to other plants for further processing, and some dispose of their whey at a cost. Given the diversity among plants in treatment of their whey stream, the formula assumption regarding whey value is probably the best that can be done. There are probably more serious problems with the whey make allowance, which is not addressed in this report.

Effect of Energy Cost Increases

Fixed make allowances are a particular concern to order-regulated dairy plants when the manufacturing cost assumptions built into the make allowances become rapidly outdated. Recent increases in energy costs are a good example — current make allowances reflect substantially lower fuel and electricity costs than exist today.

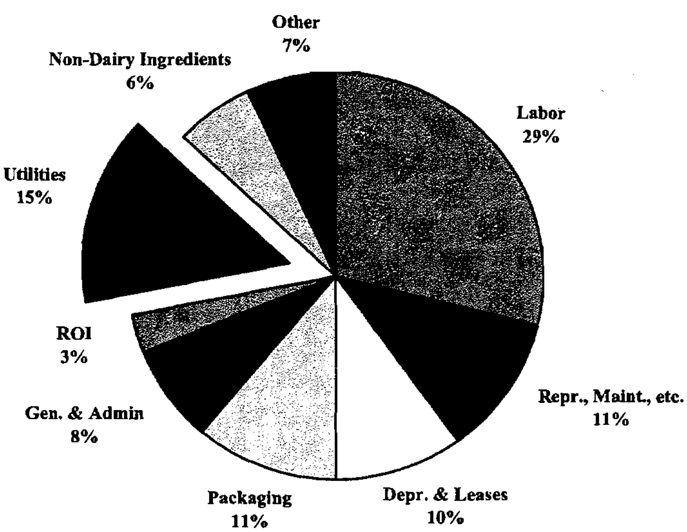
To estimate how higher energy costs have affected cheese manufacturing costs, we used the most recent audited survey of manufacturing costs conducted by the California Department of

Food and Agriculture (CDFA).[12] These studies are used to adjust product formulas used for Class 4a (butter and dried milk products) and Class 4b (cheese) under the California state milk pricing program. These surveys are close to a complete census of California's butter, NFDM and Cheddar cheese production in that the surveyed plants typically account for more than 95 percent of the state's total production of each product.

We emphasize that the California survey costs are ***not*** representative of manufacturing costs for plants in other states. In particular, California plants are, on average, larger than plants in other states and experience somewhat higher fuel and electricity prices. Nonetheless, the changes in costs due to escalating oil and gas prices are believed to be representative, since energy cost increases have been fairly uniform across states

CDFA's calendar year 2003 weighted average cost data show that estimated non-milk costs to manufacture cheddar cheese totaled 17.06 cents per pound of cheese.[13] Figure 7 breaks out these costs by major category. Energy costs are embedded in the utility cost category which accounts for 15 percent of total non-milk costs (2.6¢/lb). Utility costs include the cost of electricity and natural gas as well as sewage, water and whey disposal. Electricity and natural gas represented 40 and 32 percent, respectively, of total utility cost, or 1 cent per pound for electricity and 0.8 cents for natural gas.

Figure 7. Distribution of Non-Milk Cheddar Cheese Manufacturing Costs, California Survey, 2003

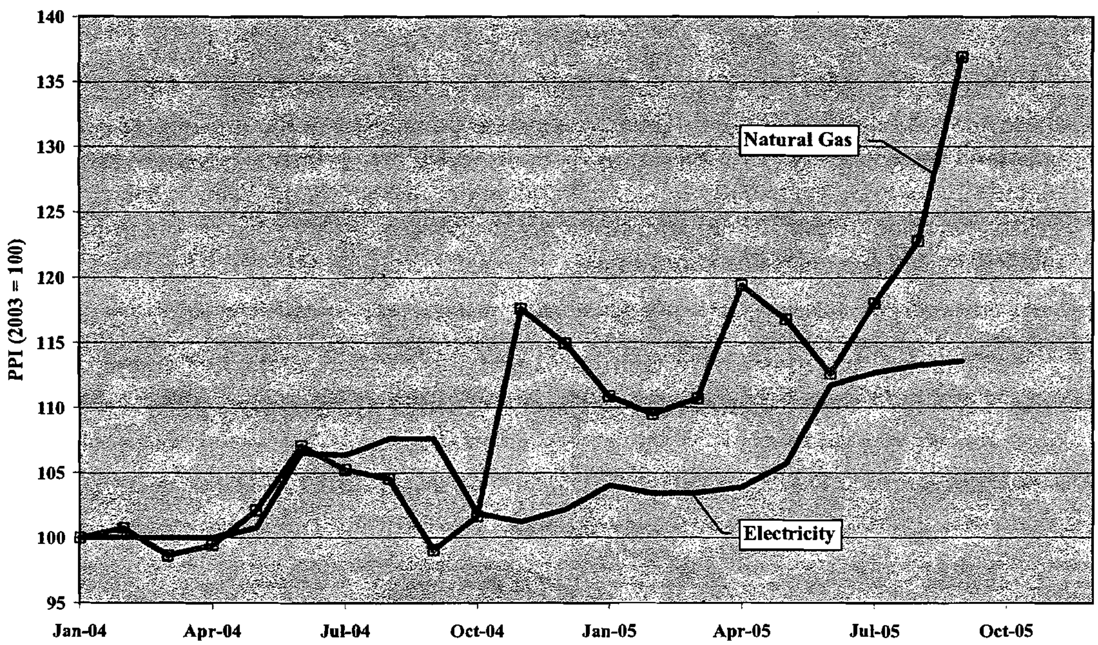


Source: California Department of Food and Agriculture

[12] California Department of Food and Agriculture, 2005. *California Manufacturing Cost Annual, 2004*, Sacramento.
[13] For comparison, the current federal order cheddar cheese make allowance is $0.165/lb.

We simulated the impact of recent energy price increases from 2003 by applying the U.S. average monthly producer price indices (PPI) for natural gas and electricity to the survey costs.[14] These PPI values are shown in Figure 8. Note that relative to their average annual values in 2003, natural gas prices were 37 percent higher in September 2005 and electrical costs were 13 percent higher. Between June and September 2005, natural gas prices rose by more than 21 percent.

Figure 8. U.S. Average Monthly Producer Price Index: Electricity and Natural Gas



Source: Bureau of Labor Statistics (Sep 05 value estimated from Sep. consumer price index)

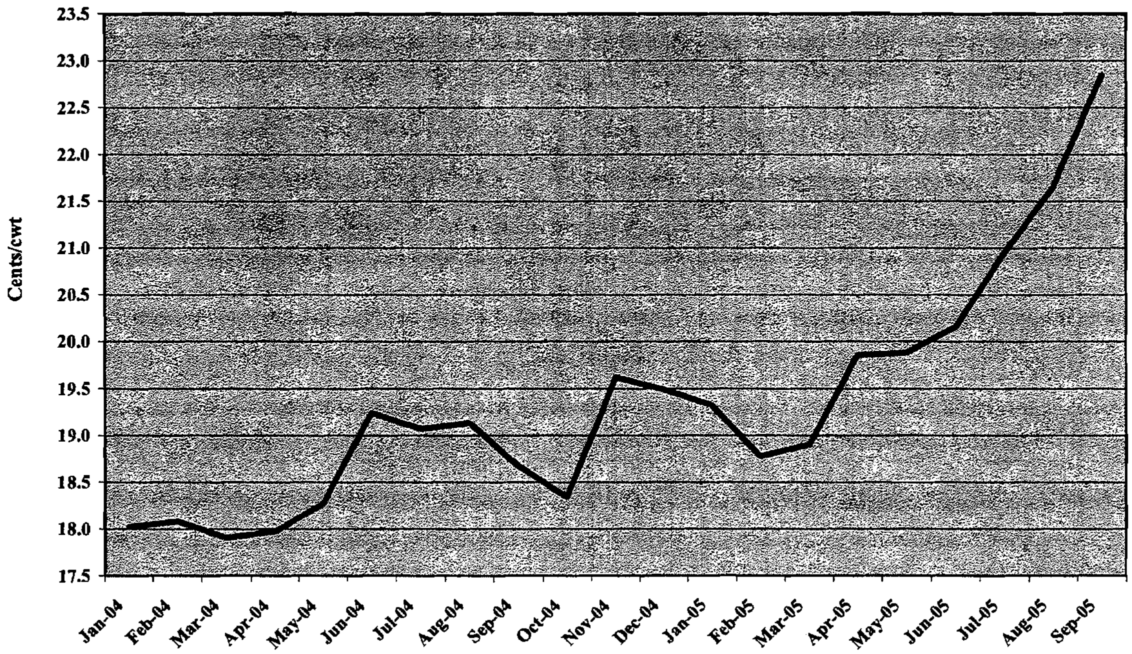
Assuming that cheesemakers cannot adjust energy use, at least in the short run, we multiplied the California survey average 2003 natural gas and electric costs by the monthly PPIs for natural gas and electricity expressed relative to their annual 2003 values. This yields an estimated monthly energy cost per pound of cheese. We then multiplied per-pound costs by 9.8 pounds of cheese per hundredweight to derive estimated costs per hundredweight of milk processed. These estimates are shown in Figure 9.

Not surprisingly given the pattern of the PPIs shown in Figure 8, simulated energy costs increase steadily through June 2005 and then rise rapidly. Assuming the California base cost estimates are reasonably representative, we estimate that there has been an approximate \$0.07/cwt increase in energy costs associated with cheese manufacturing since 2003.

[14] Bureau of Labor Statistics, *Producer Price Index, Industrial Natural Gas (Not-Seasonally Adjusted) and Commercial Electricity (Not-Seasonally Adjusted)*, Department of Labor, obtained from the website: http://www.bls.gov/ppi/home.htm, October 2005.

Approximately $0.025/cwt of this increase has occurred since June of 2005. Given the relative price changes of natural gas versus electricity since 2003, natural gas is making an increasingly larger contribution to the overall energy bill.

Figure 9. Cheddar Cheese Manuafcturing: Estimated Energy Cost per hundredweight of Milk

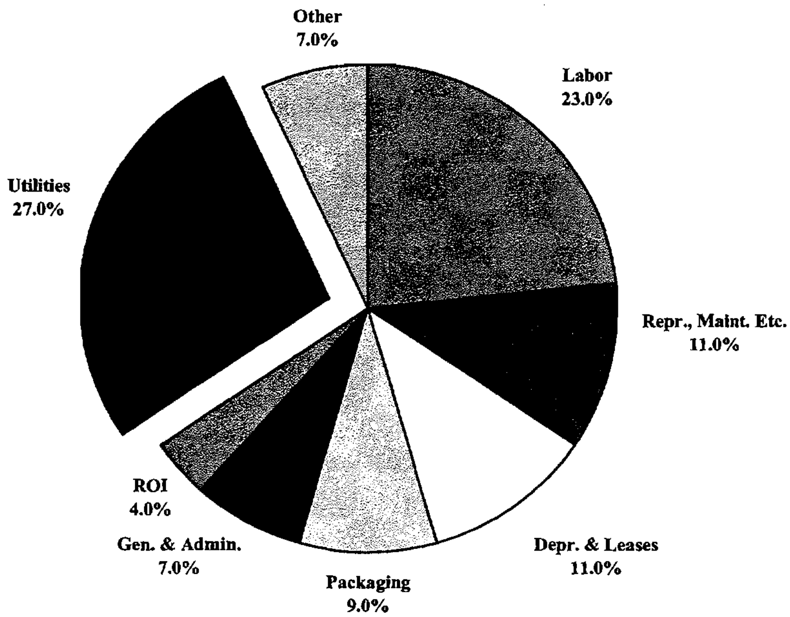


We expanded our analysis to consider the effect of higher energy costs on whey drying and butter manufacturing associated with cheddar cheese production in "conventional make procedure" plants. For whey, we used the 2003 California dairy industry survey nonfat dry milk (NDM) costs as a base.[15] Figure 10 shows the distribution of non-milk related costs of manufacturing NDM, which we assume approximates the distribution of costs for whey manufacturing.

Note the relatively more energy-intensive nature of NDM manufacturing, where utility costs account for 27 percent of total non-milk costs compared to 15 percent for cheese. CDFA estimates that two-thirds of the NDM energy costs were for natural gas compared to 32 percent for cheddar manufacturing. This reflects the heavy use of natural gas in drying.

[15] CDFA has published costs estimates for whey manufacturing. These estimates were derived from only four plants, and show extremely large variation among plants. Consequently, we elected to use the NDM estimates to reflect whey manufacturing costs.

Figure 10. Distribution of Non-Milk NDM Manufacturing Costs, California Survey, 2003



Source: California Department of Food and Agriculture

The CDFA survey reports a weighted average utility cost per pound of NDM of 4.3¢/lb. in 2003. About 90 percent of utility costs were energy costs and two-thirds of the energy costs were for natural gas. Using this information and PPI indices for electricity and natural gas, we simulated the implications of recent changes in energy price changes on whey manufacturing costs. Costs per hundredweight assuming 5.86 pounds of dry whey per hundredweight of cheese milk are shown in Figure 11. Relative to average 2003 costs, we estimate that the cost of whey manufacturing in September 2005 had increased by 7.3¢ per cwt of milk processed.

To complete our analysis of the impact of increased energy costs cheesemakers' total manufacturing costs, we simulated the increased costs of making 0.36 pounds of whey cream butter per cwt of cheese milk. Again we used the CDFA cost survey to set base level energy costs.

Figure 12 shows the distribution of non-milk costs of manufacturing butter. The significant characteristic of the butter cost structure is the relatively large proportion of labor costs compared to cheddar cheese and NDM production. This likely reflects labor involved in packaging. Utility costs are relatively small.

Figure 11. Dry Whey Manufacturing: Estimated Energy Cost per Hundredweight of Cheese Milk

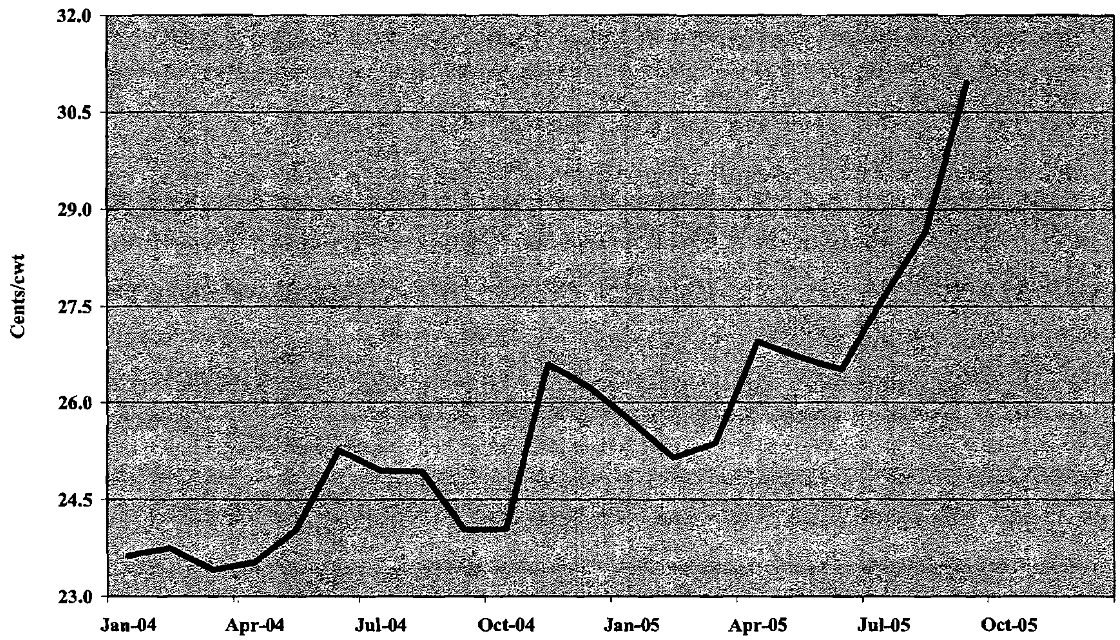
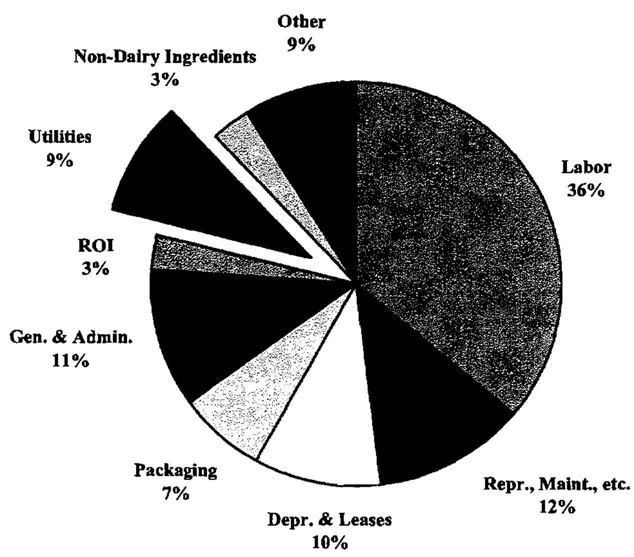


Figure 12. Distribution of Non-Milk Butter Manufacturing Costs, California Survey, 2003

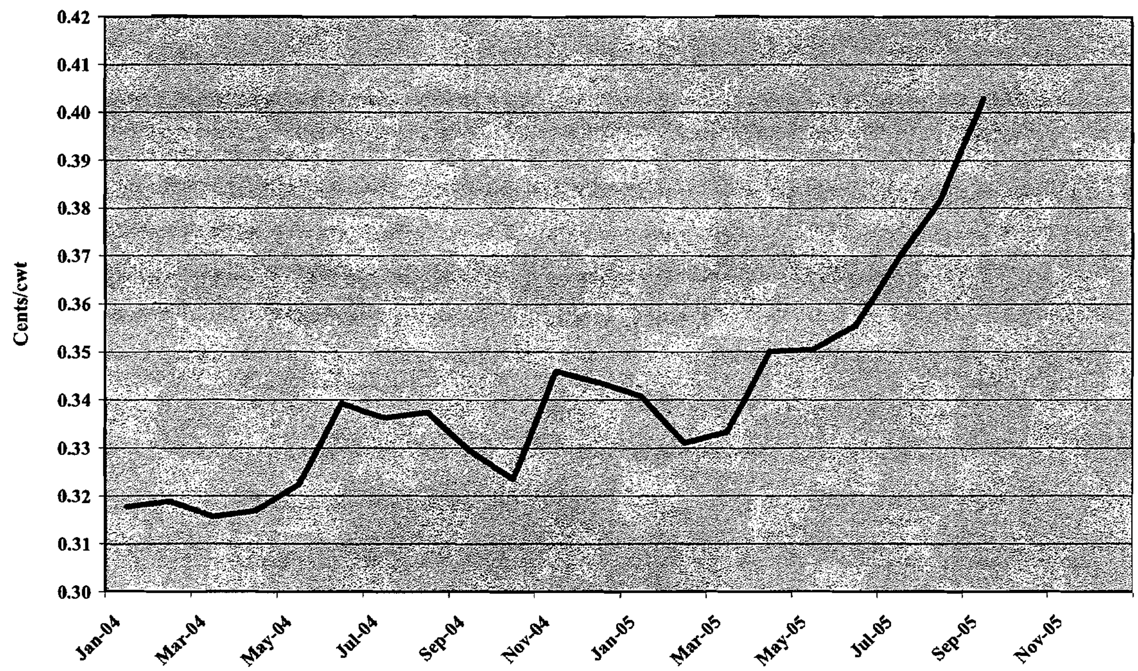


Source: California Department of Food and Agriculture

The CDFA survey indicated that the weighted average utility cost associated with butter production was 1.2¢/lb. of butter in 2003. Since the utility cost breakout for butter was not specified by CDFA, we assumed that the relative costs of water/sewage, natural gas, and electricity within the utility category is the same as that noted for cheddar cheese — 28 percent for water/sewer, 40 percent for electricity, and 32 percent for natural gas. These proportions yielded electricity and natural gas costs of 0.5¢ and 0.4¢/lb. of butter, respectively.

We applied the PPI indices for electricity and natural gas to these base costs to generate post-2003 monthly costs and multiplied by 0.36 pounds of butter per hundredweight of cheese milk to derive the per hundredweight cost estimates shown in Figure 13. Since 2003, the cost of energy to manufacture butter from cheesemaking increased from 0.32 to 0.40¢/cwt.

Fugure 13. Butter Manufacturing: Estimated Energy Cost per Hundredweight of Cheese Milk



The impacts of recent energy price increase on cheese gross margins can be summarized by combining the cheddar cheese, dry whey and butter cost changes (Table 3). Since 2003, we estimate that changes in natural gas and electricity prices have increased energy-related cheese production costs by 13.26¢ per hundredweight of milk.

Table 3 Comparison of Energy Cost Increase by Product (Cents per Hundredweight of Cheese Milk)				
Date	***Cheese***	***Whey***	***Butter***	***Total***
Annual 2003	17.96	22.68	0.31	40.95
April 2004	17.98	23.54	0.32	41.84
April 2005	19.86	26.96	0.35	47.17
Sept. 2005	22.85	30.96	0.40	54.21

Summary and Conclusions

This analysis points out several problems with using product price formulas to establish a value for milk used to make cheese. These problems stem from the fact that product price formulas do not and cannot replicate competitive conditions except, perhaps, coincidentally. In particular, competition would dictate cheesemakers gross margins rise and fall in response to changing costs. Formulas hold margins to a fixed amount that can only be changed through a laborious hearing process.

Compared to the time period prior to adopting product price formulas to set federal order prices, cheesemaker gross margins are more stable from month-to-month and show no discernible trend. Margins based solely on cheese value have fallen since product price formulas were adopted, indicating that cheesemakers who do not obtain the value of butter and whey assumed in the formulas are losing ground.

Changes in product price formulas that became effective in April 2003 altered assumed product yields. In particular, the value of butter took on a more important role in setting the Class III price and thereby affecting cheesemakers' margins. High butter prices relative to cheese prices since early 2004 have increased the cost of cheese milk relative to its cost using previous formulas.

While the product yields used in the Class III formulas reasonably reflect conditions in "conventional make procedure" cheese plants, formula assumptions with respect to cheese and butter prices are questionable. Adjustments made to the barrel cheddar price elevate the value of cheese used in the Class III price formula above the NASS block cheddar cheese price. The formula assumption that values whey cream butter at the Grade AA butter price is invalid.

Using readily available cost data and numerous assumptions, we simulated the impact of higher natural gas and electricity prices on the cost of manufacturing cheddar cheese along with associated dry whey and butter. We estimate that since 2003, energy costs per cwt of milk processed into cheese increased by more than one third, adding about 13 cents per hundredweight to manufacturing costs.

Unless offset by higher product prices, correcting the flaws in product price formulas that we have noted would result in a lower Class III price. This raises the question of whether changes would inequitably alter the sharing of revenues between dairy farmers and cheesemakers. Put more directly, farmers can argue — quite legitimately — that since they receive no assurance of profitable milk prices under federal orders, why should cheesemakers be treated any differently.

In response, we note that fixed cheesemakers margins may be fine if they assure reasonable profitability, promote efficiency and productivity growth, and encourage competition for cheese milk at prices above the federal order minimum. On the other hand, fixed margins can be a serious problem if they consistently yield sub-par returns and cause disinvestment in cheesemaking. Farmers and cheesemakers are partners — both must be profitable over the long run to sustain a healthy dairy industry.