Does the MILC Program Affect Milk Supply Response Across Regions of the U.S.?

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Abstract

This paper assesses the impact of the milk income loss contract program on U.S. dairy producers. The Milk Income Loss Contact (MILC) program was created through the 2002 farm bill, which financially compensates dairy producers when domestic milk prices fall below a predetermined Boston Class I trigger price. MILC payments were made to eligible dairy producers/farms on a per cwt basis at a rate equal to 45 percent of the difference between the trigger price of $16.94 and the Boston Class I milk price.

In the analysis, the 20 major milk-producing states were analyzed to determine if MILC payments caused a milk supply response to be different across these states. By dividing the U.S. into states, this will give a better understanding of production decisions based on the availability of inputs. To test the hypothesis, milk production was regressed against each state's All Milk price, MILC payments, production trends, the milk-feed price ratio, and average productivity per dairy farm in each state. Data were collected over an 10-year period (1995-2004), and MILC variable was used as a dummy variable in the model. The a priori expectations suggest that, in certain states, MILC payments will dampen the state's milk supply response to low milk prices. However, results may also help explain why a state increased or decreased milk production after the implementation of the MILC program.

Of the 20-states, those dairies located in the west and southwest regions of the U.S. experienced the largest increases of production during the selected eight years. OLS regression results obtained from the individual state models report mixed results and generally failed to support the hypothesis that MILC did alter the response of monthly milk production to All Milk prices.

Keywords: Dairy markets, MILC, Milk prices, Milk supply response

Milk income loss contract (MILC) is a price support program created by the Farm Security and Rural Investment Act of 2002, or 2002 Farm Bill, which financially compensates dairy producers when domestic milk prices fall below a predetermined "trigger" price. The MILC program provides dairy producers with income "safety net" and a degree of income protection from price volatility (Price, 2004). This safety net would provide some income support and protection from low milk prices; thereby, enhancing the economic viability of dairy farms during prolonged periods of unfavorable milk prices. MILC was expected to provide incentives for dairy farmers to maintain their operations and would likely have an influence and alter farm-level milk supply response when milk prices fall.

Eligible producers are dairy farmers who produced milk in any state and marketed this commodity commercially beginning December 2001 (USDA, 2003). Producers must also be in compliance with the wetland conservation provisions and must also enter into a contract with USDA's Commodity Credit Corporation (CCC) to provide monthly marketing and price data (Davis, 2005). The CCC is a government-owned and operated entity that was created for the purpose to support and protect farm income and commodity prices (USDA, 1999). The 2002 Farm Bill was passed by Congress and signed by the President in May 2002 specified that the MILC program would be implemented for the period from December 2001 until September 2005. These May 2002 actions set the USDA into motion establishing the rules and procedures for dairy farmers to receive these MILC payments and this process was completed in October 2002 and farmers received their first price support checks in November 2002.

Rates for MILC payment are established on a monthly basis by evaluating the monthly Class I (milk used for fluid purposes) milk price in Boston, Massachusetts. Eligible producers will receive compensation when the monthly Boston Class I milk price falls below the prescribed trigger price of $16.94 per hundredweight (cwt). The program is designed to provide each participating farm to receive a MILC payment equal to 45% of the difference between the Class I milk price and the Boston price for each cwt of milk produced and documented for the farm. However, dairy producers will receive this subsidy on a maximum of 2.4 million pounds of milk produced per fiscal year. Once this volume cap is met, producers are no longer eligible for this income assistance for the remaining months of the current fiscal year. The MILC program does allow each producer to select the month to initiate payments during the fiscal year. This selected month will remain the same throughout the duration of the contract unless the farmer informs the USDA of any modifications. Dairy producers that have not designated a starting month will be automatically issued October as the initial month, which is the first month of the U.S. government's fiscal year, so 2005 fiscal year payments would begin in October 2004 (WFBF, 2004). In the situation when Boston Class I price exceeds the $16.94/cwt trigger, no MILC compensation will be distributed to producers and the milk output quantities for these months will not count toward the farm's MILC volume cap.

As mentioned, payment rates are determined by multiplying 45 percent of the difference between $16.94 and the Boston milk price. For example, The Boston Class I price for July 2003 was $13.02 (WFBF, 2004). In this case, 45 percent of the difference between the two prices ($16.94- $13.02) is $1.76. So, theJuly 2003 MILC payment rate was $1.76 per cwt for all milk produced on each eligible farm. The total MILC payment for July 2003 would be equal to $1.76 times the number of cwt of milk produced on the farm. These payments are issued no later than 60 calendar days after the Farm Service Agency receives production evidence for the applicable month.

Eberle, et al, research describe how the dairy industry has experienced structural changes at the farm, processing, and distribution sectors of the industry. Most analysts have projected that the number of dairy operations and milking cattle will decline, but actual quantity of milk should remain constant due to increased productivity. Milk production per cow has increased by 2.2 percent per year, and national milk production increased about 1.2 percent per year (Collins, 2000). Collins also reported that the number of cows has been declining about 1 percent per year and this analysis indicated that there were significant regional changes in dairy production. Western regions have witnessed dramatic increases in the milk productivity generated by growing numbers of milking cattle, whereas the Southeast and Northeast regions have seen significant reductions in productivity caused by smaller herd sizes and fewer dairy operations. Technology, availability and cost of alfalfa hay, and weather conditions have been primary factors that have precipitated this regional shift of U.S. dairy farms and related industries from the eastern regions to the southwestern and western states of California, Idaho, New Mexico, and others.

Does the MILC program influence farmers in production decisions? As mentioned there is a volume cap of 2.4 million pounds of milk production per fiscal year for eligible producers. Eberle, et al, projected that this program would be best suited for an operation with a 120-cow dairy herd. This shows that the program will be more beneficial to smaller producers compared to larger operations, which raises another question. Will a larger farm that just exceeds the volume cap, de-centralize into smaller farms to meet the requirements for this program? Granted, it is illegal to manipulate the program in this manner, but could the MILC payment program be an additional factor that producers acknowledge in their production decisions?

Price (2004) used an approach in an analysis where dairy support programs were removed, and then re-analyzed the market. In the analysis, Price terminated the MILC program by setting the program trigger price of $16.94 per cwt to zero ($0.00) over the 2002-05 period. This parameter assumption would remove all income-enhanced aspects of the program. The model results showed that the MILC program had the largest influence on milk production estimates during the initial years of the program. One of Price's arguments was since price strengthens over time; the program became less important as an income-enhancing mechanism for the sector. Also, an increase in production becomes subject to the volume cap limitation on the milk quantity that is eligible for payments on dairy operations. Price concludes that the MILC program influences production decisions by providing income support payments on a portion of total production. Finally, this study found that the MILC program acts to mute the production response to lower the market prices.

Problem Statement

The general purpose of this investigation is to determine if the MILC payment program altered the milk supply response of dairy producers across the major milk producing states of the country. Specifically, determine whether MILC affected milk supply response to milk prices differently across states where the characteristics of dairies vary between states or regions of the country. The structural characteristic of particular interest is the size, or amount of milk production, of farms. Since the volume cap for the MILC program was designed to limit these payments for a maximum of 2.4 million pound per fiscal year, a dairy farm with 120-140 milking cows would produce enough milk to reach this volume cap. Thus, dairy farms having more than this targeted number of dairy cattle would have less than 100% of its yearly milk production eligible to receive MILC payments. For the largest dairy farms with 2,000 to 3,000 dairy cows, a very small portion of their annual milk output would be eligible for MILC payments. The MILC volume cap leads to the assertion that smaller dairy farms are much more likely to be influenced by MILC than larger dairy operations. Additionally, smaller dairy farms would tend to be less responsive to low market milk prices when the MILC program is in place than larger dairy farms.

A simple review of the average annual milk production per dairy farm for each of the 20 major milk-producing states for fiscal year 2002 (see Table 1) found that all of the western (CA, ID, and WA) and southwestern (AZ, NM, and TX) states produced quantities well above the 2.4 million pound MILC volume cap. Conversely and except for Florida, all of the other states in located in northeast (NY, PA, and VT), southeast (KY, MO, and VA) and Midwest (IL, IN, IA, MI, MN, OH, and WI) had an average productivity per farm below the MILC volume cap. Coincidently, Table 1 illustrates the substantial differences in average productivity per farm between the smaller farm and the larger farm states. For instance, this gap is clearly demonstrated by the fact that "most productive" smaller farm size state (VA) had a 2002 annual milk output of 2.011 million pounds compared to the "least productive" larger state (TX) of 5.907 million pounds.

Table 1. Annual Milk Production per Farm for the 20 Major Milk-Producing States during Fiscal Year 2002, in Millions of Pounds

20 Major Milk-Producing States	2002 Annual Production per Dairy Farm (Millions of lb)	Regional Designation
New York (NY)	1.837	Northeast
Pennsylvania (PA)	1.163	Northeast
Vermont (VT)	1.809	Northeast
Florida (FL)	11.830	Southeast
Kentucky (KY)	0.931	Southeast
Missouri (MO)	0.913	Southeast
Virginia (VA)	2.011	Southeast
Illinois (IL)	1.507	Midwest
Indiana (IN)	1.223	Midwest
Iowa (IA)	1.363	Midwest
Michigan (MI)	1.965	Midwest
Minnesota (MN)	1.236	Midwest
Ohio (OH)	1.073	Midwest
Wisconsin (WI)	1.254	Midwest

Arizona (AZ)	24.670	Southwest
New Mexico (NM)	35.580	Southwest
Texas (TX)	5.907	Southwest
California (CA)	16.083	West
Idaho (ID)	9.820	West
Washington (WA)	8.485	West

The hypothesis tested in this paper was whether MILC decreased the milk supply response relative to milk price levels in those states whose average milk output per farm is less that the 2.4 million pound volume cap. However, those states with per farm milk production greater than the MILC cap would experience no changes in supply response to farm-level milk prices before and after implementation of the MILC program. To test this hypothesis, this paper analyzed the statistical significance of milk prices on milk production in each of the 20 selected states.

Methods and Procedures

Econometric analysis was used to determine if the MILC program affected milk production decisions and if the average milk production per farm influenced the sensitivity of milk supply to changes in milk prices. Monthly data were collected for each of the 20 states for the 1995 – 2004 time period. The following variables were evaluated: monthly milk production for each state, the state's monthly All Milk price, each state's annual milk production per farm, and a dummy variable representing the implementation of MILC.

Each of the 20 major milk-producing states were analyzed using Ordinary Least Squares (OLS) regression analysis package described as LIMDEP Version 8.0 and created by William Greene. A total of 20 regression equations were estimated where the dependent variable was monthly milk production by state and the independent variables were: (1) monthly All Milk price for each state; (2) annual milk output per dairy farm in each state; and, (3) a zero-one dummy variable indicating that farmers began receiving MILC payments in November 2002. These state-level regression models were expected to indicate that the All Milk price variable was not significantly different from zero in each of the smaller dairy farm states located in the Northeast, Southeast (except Florida) and Midwest regions. Conversely, the OLS equations for Florida and states in the Southwest and West representing states with dairy farms exceeding the MILC volume cap are anticipated to observe that the estimated parameter for the All Milk price variable to be significantly different from zero.

Results

The OLS regression analysis conducted for each of the 20 major milk-producing states found in Table 2 indicates that our hypothesis expecting the All Milk Price estimated regression parameter to *not* be significantly different from zero in the smaller dairy farm states located in the northeast, southeast and midwest to be generally true. However, these models report mixed results for the larger dairy farm states in the southwest and west, specifically; the southwestern states of AZ, NM and TX all had All Milk price coefficients that were not significantly different from zero even at the 90% level of significance. Another set of unexpected results coming from the AZ, NM, and TX models was that all three of the MILC coefficient parameters were positive and were significant at the 95% or 99% level. The positive MILC coefficient indicates that the implementation of the MILC program caused monthly milk production to increase, which was not anticipated a priori because to the larger dairy farms in these states would not realize much of the “safety net” benefits provided by MILC payments. The only explanation that may be employed to account for these unforeseen regression results was the fact that the dairy industry in each of these states had undergone substantial structural adjustments. For example in Texas, smaller dairy farms in the eastern part of the state rapidly exited the industry and milk production was moving to larger dairies that were rapidly developing in western sections.

The MO, IL and OH models also provided some surprises by reporting positive and significant All Price parameter estimates. However, this was considered justified for IL and OH after closer consideration due to the influx of large dairy operations in both of these states during the analysis period. This finding for the MO model failed to be vindicated by the authors. Another startling outcome from these regression models was the findings that the MILC coefficient was significantly different from zero at either the 95% or 99% level in 16 of the 20 states. But, the signs of these MILC estimated coefficients possessed the wrong sign (negative, indicating the MILC caused milk production to decline) in 12 of the 16 state models. Average production per farm was found to be an important variable explaining variation in monthly milk production in 19 of the 20 states where these OLS coefficient estimate had the correct sign (positive indicating as average milk output per farm increased that monthly milk production would increase, too) and all 19 were significant at the 99% level. Once again, Texas was the only state where Average Farm Production was not significant and this author cannot devise any economic justification for this result. In general, the TX model was unable to account for variations in milk output because of the transformation of the state's dairy industry.

Table 2. OLS Estimated Regression Equations for the 20 Major Milk-Producing States Displaying Adjusted R^2 E and Estimated Parameter Coefficient with t-values

20 Major Milk-Producing States	Intercept	Average Farm Production	All Milk Price	MILC	Adjusted R^2
New York (NY) (t-value)	743.82 (14.34)***	2141.67 (7.96) ***	-3.01 (-1.65)	-28.88 (-3.61)***	46.5%
Pennsylvania (PA) (t-values)	637.92 (11.82)***	3564.96 (7.73)***	-3.62 (-2.34)*	-61.74 (-8.94)***	61.0%
Vermont (VT) (t-values)	117.16 (11.82)***	405.33 (11.82)***	-0.61 (-1.57)	-15.28 (-6.59)***	36.6%
Florida (FL) (t-values)	105.50 (3.57)***	84.14 (5.54)***	1.31 (-1.17)	1.23 (0.20)	30.7%
Kentucky (KY) (t-values)	104.28 (6.50)***	489.84 (3.74)***	0.16 (0.26)	-17.60 (-7.25)***	49.2%
Missouri (MO) (t-values)	34.86 (1.35)	1377.90 (6.31)***	3.15 (3.45) ***	-17.56 (-4.33)***	47.7%
Virginia (VA) (t-values)	130.63 (15.82)***	208.24 (5.25)***	-1.95 (-1.38)	-7.88 (-4.13)***	45.8%
Illinois (IL) (t-values)	140.39 (8.10)***	102.52 (2.89)**	0.05 (0.08)	-9.39 (-3.24)**	13.4%
Indiana (IN) (t-values)	73.34 (9.30)***	1260.39 (21.76)***	1.41 (4.13)***	8.36 (3.48)***	94.0%
Iowa (IA) (t-values)	267.78 (16.98)***	564.59 (5.20)***	-0.50 (-0.80)	-12.42 (-3.00)***	24.8%
Michigan (MI) (t-values)	301.83 (18.93)***	1288.03 (17.43)***	-0.48 (-0.76)	-3.75 (-0.84)	89.6%
Minnesota (MN) (t-values)	748.78 (11.43)***	479.05 (0.94)***	-2.33 (-1.03)	-84.76 (-5.88)***	36.8%
Ohio (OH) (t-values)	41.92 (1.74)	3316.80 (17.32)***	4.14 (4.03)***	-26.04 (-5.43)***	75.9%
Wisconsin (WI) (t-values)	1720.75 (15.76)***	2049.95 (2.29)**	-1.76 (-0.48)	-80.20 (-3.00)**	8.1%
Arizona (AZ) (t-values)	136.45 (3.77)***	61.81 (5.84)***	-0.12 (-0.08)	56.27 (10.47)***	62.0%
New Mexico (NM) (t-values)	292.00 (4.22)***	47.56 (4.00)***	0.24 (0.07)	155.09 (11.91)***	60.3%
Texas (TX) (t-values)	524.65 (7.63)***	1.87 (0.28)	-4.41 (-1.32)	22.94 (-1.99)**	4.0%
California (CA) (t-values)	790.32 (14.30)***	1658.77 (50.21)***	-9.86 (-4.43)***	-42.13 (-3.36)***	98.2%

Idaho (ID) (t-values)	129.54 (5.42)***	604.05 (30.43)***	4.70 (3.63)***	12.31 (1.54)	95.5%
Washington (WA) (t-values)	321.45 (14.53)***	184.64 (8.49)***	1.45 (1.70)*	-1.95 (-0.58)	45.1%

* Indicates estimated regression coefficients that are significant at 90% level
** Indicates estimated regression coefficients that are significant at 95% level
*** Indicates estimated regression coefficients that are significant at 99% level

Summary and Conclusions

The findings obtained from the 20 state-level regression equations point out that the northeast and southeast state models did validate our hypothesis that the MILC program contributed to dampening the importance of All Milk price in explaining variations in monthly milk production. However, models for states located in the southwest region certainly did not confirm the a prior expectation that MILC would not affect milk output and also not interfere with the impact of All Milk price of monthly production. The amount of state-level milk output variation explained by these models ranged from a low of 4% (TX) to 98% (CA) with another eight models accounting for 45% to 65% of the variations in production.

These OLS regression results indicate that the selected explanatory variables were note effective in explaining variation in state-level milk productions. Thus, further analyses and much more work is needed to properly and effectively model the impact of the MILC program on monthly milk production in the 20 major milk-producing states. These models failed to capture the evolution occurring in the U.S. dairy industry that has and is continuing to witness a general movement of milk production away from the eastern states, especially the southeast, to states located in the southwest and west. Further analyses will be required to account for these regional shifts in national milk production.

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