Does the MILC program Affect Milk Supply Response in Individual States of the United States?

Cary W. "Bill" Herndon, Jr.
herndon@agecon.msstate.edu
John Mark Looney, Jr.
jml141@msstate.edu

Department of Agriculture Economics
Mississippi State University

Corresponding author: Cary W. Herndon, Jr.
Department of Agriculture Economics
Mississippi State University
P.O. Box 5187
Mississippi State, MS 39762
Tel (662) 325-7999
Fax (662) 325-8777

Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Dallas, Texas, February 2-5, 2008

Does the MILC program Affect Milk Supply Response in Individual States of the United States?

Abstract

The purpose of this paper is to analyze and evaluate the effects of the milk income loss contract program on U.S. dairy producers, specifically how does MILC effect decisions made on how much milk is produced, and how many milk cows are on the farm. This will be done by creating a milk supply response model to illustrate the relationship between MILC and the number of dairy cows in each state. The Milk Income Loss Contract was created through the 2002 farm bill, and provided dairy producers added income when domestic milk prices fall below a predetermined Boston Class I trigger price of $16.94.

Monthly data has been collected on milk cow numbers, milk prices, and cull cow price for years 1998 through 2005. Data analysis will be conducted using Ordinary Least Squares regression on each state. The dependant variable is milk cow numbers per state. Milk cow numbers were evaluated because of the long term investment required to increase cow numbers. Independent variables include a time trend based on months, MILC indicator variable, cull cow price, and the average price received by farmers for all milk. The coefficients for the MILC indicator variable and the all milk price were expected to be positive, and the coefficients for the cull cow price were expected to be negative. The 20 states with the highest milk production were evaluated.

OLS results varied widely, but with some vague results. Twelve of the twenty states' coefficients for the MILC indicator opposite of expected, and all coefficients for the all milk price were opposite of expected.

Key Words: MILC, milk supply response, milk prices

Introduction

The Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) started the Milk Income Loss Contract (MILC) to give dairy producers a hand in extended periods of low prices. The 2002 Farm Bill authorized this program until September 30, 2005. MILC was then extended through September 30, 2007 by the Agricultural Reconciliation Act of 2005. The MILC program provides dairy producers with added income when domestic milk prices fall below a set "trigger" price. The added income is intended to act as a "safety net" to prevent dairy operations from going out of business, and to reduce some of the volatility of milk prices (Price 2004). As is the case with any price floor, MILC was expected to have some effect on the supply of milk at the farm level by allowing producers to continue production when low prices would have otherwise prevented them from doing so.

The significance of the MILC program to the dairy industry was demonstrated by a study done by Price (2004). In his study, Price used market simulations to test the influence of various U.S. dairy policies on the dairy market. This was done by setting the trigger price to $0.00 in the simulation for the 2002-2005 period, removing all payments from the market place. Price found that the MILC program had the largest influence on milk production estimates in the earlier years. This was due to the fact that increasing efficiencies are concentrating dairy production into few larger farms. With larger farms, the 2.4 million pound limitation is met sooner, decreasing payments as farms grow larger. Price also argues that price strengthens over time, lessening the importance of MILC as an income-enhancing mechanism for dairy producers. Price's study led him to the conclusion that MILC does influence production decisions by providing income support payments on a portion of total production. By doing this, the program mutes the production response to lower market price.

In order to be eligible for the MILC program, producers must meet 5 criteria: first, they must have produced and marketed milk commercially in the U.S. anytime during the period of December 1, 2001 through September 30, 2005. Second, they must enter into a contract with the Commodity Credit Corporation (CCC) agreeing to the prescribed terms and conditions of MILC during the contract period. Third, they must provide production evidence of monthly milk marketings to the local FSA county office. Next, they must be actively be in the business of producing and marketing agricultural products at the time the Contract is signed for the program, and lastly, they must be in compliance with the Highly Erodable Land Conservation and Wetlands Conservation provisions (FSA 2007). The CCC is owned and operated by the government, and was

created for the purpose to support and protect farm income and commodity prices (USDA 1999). As specified by the 2002 Farm Bill, signed by the president in May 2002, the MILC program would be implemented from December 2001 until September 2005. The initiation of the MILC program was delayed until October 2002, in order to get the rules and procedures for distributing MILC payments in place. In November 2002, dairy producers received their first payments.

Payments for MILC are made on a monthly basis when the Boston Class I milk price falls below the "trigger" price of $16.94. If the Boston milk price is above the trigger price, no payments are made. The amount of the payment rate is determined by subtracting the Boston milk price in the current month from the trigger price of $16.94. The per hundredweight payment is then made equal to 45% of the difference of the two prices. In the event that a dairy's production exceeds 2.4 million pounds of milk per fiscal year, the excess milk is not eligible to be subsidized. Also, in months that there are no payments made, production of that month will not count towards the 2.4 million pound payment limitation. Farmers are allowed to choose which month to start payments for the fiscal year. The selected month will remain so throughout the duration of the contract, unless notification is made to the USDA by the producer. Payments will be made no later than 60 days after the Farm Service Agency receives production evidence for the applicable month (FSA 2007)

The Wisconsin Farm Bureau gives an example of how the payment rate is determined. The Boston Class I milk price is announced in July 2003 as $13.02 (WFBF, 2004). This number is then subtracted from the trigger price of $16.94: $16.94 - $13.02 = $3.92. The difference is then multiplied by 45% to get the payment rate: $3.92 * .45 =

$1.764. This rate is paid per hundredweight on all milk produced and marketed within the corresponding month. Once the fiscal year production has reached 2.4 million pounds, the producer is not eligible for any more payments for that fiscal year.

The dairy industry is an ever-changing thing. Eberle et al. have described changes at production, processing, and distribution sectors of the industry. Due to increased productivity, overall cow numbers have been slipping while overall milk production remains constant. Production per cow has increased by 2.2 percent per year, while the number of cows has decreased by 1 percent per year. Change is also evident on regional level. Western states, such as California, Idaho, and New Mexico, have seen an increase in the number of milk cattle, and have dramatically increased milk productivity. The Southeast and Northeast in contrast have seen dairy operations disappear, decreasing the number of milk cows. The shift of dairy operations from the eastern part of the United States to the western part can be attributed to new developments in technology, availability and cost of alfalfa hay, and weather conditions.

As mentioned before, Price (2004) found that the MILC program does in fact influence dairy producers' production decisions. Eberle, et al, projected that the MILC program is best suited for an operation with a 120-cow herd. With that in mind, the MILC payment would account for a smaller percentage of a larger farms income. Would a large dairy farm split into smaller farms to slip under the 2.4 million pound volume cap? This would allow for increased income from MILC payments as a result of illegal manipulation of the program.

Problem Statement

The purpose of this study is to determine if the MILC program altered the milk supply response of dairy producers in the top 20 milk producing states in the country. More specifically, determine whether MILC affected milk supply response to milk prices differently from state to state based on structural differences and varying characteristics of dairy operations in each state. Size based on the number of cattle is the characteristic of interest. Since the Volume cap for the MILC program is 2.4 million pounds per fiscal year, a dairy farm of 120-140 milk cows would produce enough milk to reach this cap. Having said this, dairy farms that are larger than this would have less than 100% of their yearly milk production eligible to receive MILC payments. For a large farm of 2,000 to 3,000 milk cows, the first 2.4 million pounds of milk is a drop in the bucket compared to the total amount of milk produced per year. Assuming that larger dairy farms don't decentralize into smaller farms, 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. Because of the small percentage of their milk that would be subsidized, larger dairies would be more responsive to low milk prices. Smaller dairies would have a greater percentage of their milk subsidized, so low prices would not affect them as much.

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. All other states located in the 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. Virginia had the highest production of the "small farm size" states with 2.011 million pounds per farm. This is well below the 2.4 million pound volume cap. The next largest average farm size is 5.907 million pounds in Texas. This is more than twice the size of Virginia's average farm size.

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

Regional Designation	**20 Major Milk Producing States**	**2002 Annual Production per Dairy Farm (millions of lb)**
Western	California	16.083
	Idaho	9.820
	Washington	8.485
Southwestern	Arizona	24.670
	New Mexico	35.580
	Texas	5.907
Northeast	New York	1.837
	Pennsylvania	1.163
	Vermont	1.809
Southeast	Florida	11.83
	Kentucky	0.931
	Missouri	0.913
	Virginia	2.011
Midwest	Illinois	1.507
	Indiana	1.223
	Iowa	1.363
	Michigan	1.965
	Minnesota	1.236
	Ohio	1.073
	Wisconsin	1.254

The hypothesis tested in this paper is does the MILC program have an effect on the milk supply response relative to milk price levels in the 20 largest milk producing states in the U.S. The expectation is that states with a larger average farm production than the 2.4 million pound volume cap will not be affected by the MILC program. Along

with this is the expectation that states with a smaller average farm production than the 2.4 million ton will be affected by the MILC program. The states are grouped into geographical regions, as mentioned before. The results of this paper should be similar within the geographical regions because of technology, availability and cost of alfalfa hay, and weather conditions of each region.

The issue of when the MILC program had its effect on the dairy industry was also considered. As mentioned in the Introduction, four dates are important in the history of the MILC program. May of 2002 was when the 2002 Farm Bill was signed, enacting the MILC program. The program itself covered production back to December of 2001, which is the second date. August of 2002 is the third important date of the MILC program because this is when producers could begin applying for MILC with the Farm Service Agency. They didn't receive the payments until October of 2002, which is the fourth important date.

Methods and Procedures

Econometric analysis was used to determine the effect of the MILC program on 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 twenty states for the 1998 through 2005 time period. Five variables were evaluated: Dairy cow numbers per state, the all-milk price received by farmers, cull cow price, a trend variable, and an indicator variable for the MILC program.

Each state was individually analyzed using Ordinary Least Squares (OLS) regression in Microsoft Excel. Within each state, 4 regressions were run for each of the four important

dates, which was repeated for each state coming to a total of 80 regressions. Milk cow numbers per state was the dependant variable. This was chosen because of the relative stability from month to month due to the long-term investment associated with increasing cow numbers. A trend line was included to account for some of the variation in the cow numbers over time, and is expected to have a negative value because of the increasing productivity per cow over time. The cull cow price was included because if the cull cow price was high, producers would have more incentive to sell a cow than keep her if she was not productive. This variable is also expected to have a negative relationship with the dependant variable. The all-milk price ultimately is the driving force behind production, and has a significant effect on cow numbers. The relationship between cow numbers and the all milk price is expected to be positive. The MILC indicator variable is a 0 on months when MILC was not in effect, and 1 on months when MILC was in effect. For the states with smaller production sizes, the relationship between milk cow numbers and the MILC indicator variable is expected to be positive. This is due to the fact that the MILC payment would increase income, and allow a more producers to stay in business, thereby that state would retain its number of milk cows. For states with larger production sizes, the relationship between the MILC indicator variable and the dependant variable is expected to be equal to zero.

As mentioned earlier, 4 regressions were done for each state, one for each of the four important dates. Each regression covered a time period of 3 years before the date in question, and 3 years after. For example, if the regression was for December 2001, the data for that regression began with December 1998, and included everything up to December 2004. For each month, there was a 1 or a zero assigned to account for MILC.

In this case, each month from December 1998 to November 2001 had a zero for the MILC indicator variable, and months after November 2001 had a one.

Results

The results of the OLS regression analysis found that August 2002 was the month when farmers began adjusting production to MILC payments. In December 2001, farmers did not know they would be getting any payments. Since the MILC program was retroactive, farmers received payments for December 2001, but at a later date. By May 2002, farmers knew they would get payments, but had no idea when. After analyzing the data for May 2002, there were not enough significant coefficients to justify May 2002 as the point in time when farmers made adjustments to their operations. At this time, the farmers knew they would get a payment, but did not know when. Based on the OLS results, the data shows that August is the date at which producers made adjustments to their operations.

The results of the OLS regression for all four dates were mixed, they were all similar. However, the results for August 2002 will be the only ones discussed. They can be found in Table 2 below. As mentioned earlier, the Western region was expected to have a coefficient of zero for the MILC indicator. The MILC coefficients for these regressions were negative, with Idaho and Washington at a 95% significance level, and California at a 90% significance level. The MILC coefficients for the Southwest region were all positive. With each of these states having an average farm size of more than 2.4 million pounds, the positive coefficients are surprising. All states in the Northeast were more within expectations for the MILC coefficient. All were positive except for

Vermont, which was not found to be significantly different from zero. In the Southeast, Florida was expected to have a coefficient of zero, while the rest of the states were expected to have positive MILC coefficients. This was not the case. Florida was found to have a negative coefficient along with the rest of the southeastern states, all being significantly different from zero except for Missouri. As was the case with the Southeast, the Midwest was also expected to have positive MILC coefficients. Of the seven states in the Midwest, four had a negative MILC coefficient. Two of the positive coefficients were not found to be significantly different from zero.

The trend line showed mixed results as well, but all can be attributed to changes in the structure of dairy operations. The overall trend in dairy cow numbers nationwide is downward, but individual states have seen growth in their dairy industries. The results show that California, Idaho, Arizona, New Mexico, Indiana, Michigan and Ohio have all seen growth over the time period covered by this study. All coefficient values were found significantly different than zero except for Washington.

All coefficients for the all-milk price were found to be negative. This was completely the opposite of what was expected. Of the twenty states, the data proved that 5 were not significantly different than zero. The cull cow price variable had mixed results. Eleven of the twenty states had negative coefficients, five of which were not found significantly different that zero.

Adjust R^2 values for the most part were pleasing. Fourteen of twenty were above 90%, four were less than 75%.

Table 2. OLS Estimated Regression Coefficients for the 20 Major Milk Producing States Including Adjusted R^2 Values

Region	State	Intercept	Trend	MILC Indicator	Cull Cow Price	All Milk	Adjusted R^2
Western	California	1244.969 **	4.661 **	-10.123 *	-1.719 **	-0.661 **	98.46%

	Idaho	202.065	**	1.870	**	-8.870	**	0.225	*	-1.007	**	98.76%
	Washington	264.750	**	-0.022		-2.611	**	-0.146	*	-0.736	**	63.39%
South-western	Arizona	113.288	**	0.314	**	6.337	**	0.095		-0.332	*	94.93%
	New Mexico	181.971	**	1.621	**	7.059	**	-1.178	**	-0.618		95.60%
	Texas	376.662	**	-0.968	**	11.419	**	1.310	**	-1.089	**	76.21%
Northeast	New York	768.560	**	-0.794	**	9.946	**	-0.090		-1.127	**	86.06%
	Pennsylvania	697.764	**	-1.012	**	1.951		0.152		-0.998	**	92.05%
	Vermont	180.617	**	-0.163	**	-0.550		-0.218	**	-0.178	**	95.95%
South-east	Florida	180.508	**	-0.235	**	-4.641	**	-0.060		-0.255	**	97.07%
	Kentucky	162.816	**	-0.336	**	-3.215	**	-0.016		-0.350	**	96.09%
	Missouri	201.162	**	-0.669	**	-0.117		0.174	**	-0.198	*	99.09%
	Virginia	149.817	**	-0.112	**	-3.727	**	-0.284	**	-0.664	**	90.71%
Midwest	Illinois	143.604	**	-0.224	**	0.312		-0.118	**	-0.134	**	98.20%
	Indiana	113.814	**	0.454	**	-13.328	**	-0.098		-0.013		71.29%
	Iowa	253.915	**	-0.311	**	-1.788	*	-0.083		-0.871	**	94.08%
	Michigan	282.973	**	0.115	**	-2.539	**	0.243	**	-0.157		53.30%
	Minnesota	624.135	**	-1.641	**	1.436		0.889	**	-0.159		97.38%
	Ohio	247.510	**	0.101	**	-3.082	**	0.292	**	-0.566	**	41.84%
	Wisconsin	1482.934	**	-2.571	**	15.368	**	1.609	**	-1.121		92.70%

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

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

Summary and Conclusion

Basic economic teachings tell us that the supply of a good is affected by variables such as the price of the good, input price, the price of substitute goods, and price subsidies. This study is an attempt to determine whether or not the MILC program affected the milk supply response by examining those variables and their relationship to milk price. Unfortunately, the research conducted in this study did not produce sufficient evidence for every state to base a concrete conclusion on. The research does, however, bring us one step closer towards a better understanding of the MILC program and its effect on milk supply. The results of the OLS regression analysis are enough to say that MILC does have an effect on dairy cow numbers per state. The results fail to show a consistent effect across all states. The coefficients show that the MILC program affected

the dairy industries of many states opposite of expected. They also showed that the MILC program had the expected effect on some state's dairy industry.

Overall, the regressions had high adjusted R^2 values, meaning that the variability in dairy cow numbers was explained by the variables considered. The average of the adjusted R^2 values was 86.66% and the standard deviation was 16.65%.

References

Collins, K. Statement made by U.S. Dept. of Agriculture Chief Economist to Senate Committee on Agriculture, Nutrition, and Forestry. 8 February 2000.

Commodity Credit Corporation (1999). Fact Sheet Electronic Edition. United States Department of Agriculture, Farm Service Agency. http://www.fsa.usda.gov

Eberle, et al. *Investment Analysis of Alternative Dairy Systems under MILC.* Selected Paper prepared for presentation at Southern Agriculture Economics Association Annual meetings. Little Rock, Arkansas. 5-9 February 2005.

Eberle, et al. *Promotional Efforts vs. Economic Factors as Drivers of Producers Decisions to Expand or Start a Dairy.* Selected paper prepared for presentation at the American Agriculture Economics Association Annual meetings. Denver, Colorado. 1-4 August 2004.

.

Farm Service Agency (2007). FSA Handbook: Milk Income Loss Contract Program Electronic Edition, Farm Service Agency. http://www.fsa.usda.gov

Milk Income Loss Contract Program. (2004) National Issues. Wisconsin Farm Bureau Federation. 1 December 2004.

Price, Michael J. *Effects of U.S. Dairy Policies on Markets for Milk and Dairy Products.* Electronic report from the Economic Research Service. Technical Bulletin Number 1910. www.ers.usda.gov. May 2004.