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The Effects of the Margin Protection Program for Dairy Producers

Tyler B. Mark, Kenneth H. Burdine, Jerry Cessna, and Erik Dohlman

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Abstract

The Margin Protection Program for Dairy Producers is a voluntary risk-management program for dairy farmers—it offers protection when the national average margin (the difference between the U.S. all-milk price and the estimated average feed cost) falls below a level selected by the dairy farmer. This study examines the potential impact of the program on average margins and risk at different levels of coverage for both the protected margin ($4.00-$8.00 per hundredweight) and the percentage of production history covered (25-90 percent). Margins are constructed for 13 major production regions, and risk-reduction levels are assessed using regional milk and feed prices as though the program had been in place during 2002-13. Results suggest that small operations (those with a 4-million-pound production history) would have seen increases in average margins and reductions in downside margin risk with more milk covered at higher coverage levels. Larger operations (those with a production history of 20 or 40 million pounds) would have generally seen increases in average margins when protected up to the $6.50 level, with margins being maximized at $6.00 coverage.

Keywords: Dairy, dairy policy, margin protection program, risk management, LGM–Dairy, insurance

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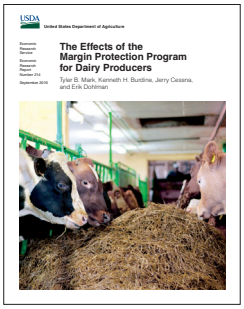

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The Effects of the Margin Protection Program for Dairy Producers

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What Is the Issue?

U.S. dairy farmers increasingly face highly variable milk prices and feed costs due to weather events, grain and dairy farm policies, fluctuations in global supply and demand, changes in currency valuations, and other factors. Introduced in 2014, the Margin Protection Program for Dairy Producers (MPP-Dairy) is a voluntary risk management program for dairy farmers, offering protection when the national average margin (the difference between the U.S. all-milk price and the estimated average feed cost) falls below a level selected by the dairy farmer. MPP-Dairy helps dairy farmers reduce the risks associated with highly variable milk prices and feed costs, which account for the largest share of operating costs for most dairy farms.

The Livestock Gross Margin for Dairy Cattle (LGM-Dairy), established in 2008, was the first Government program specifically designed to protect margins between milk prices received by dairy farmers and feed prices paid. While LGM-Dairy has historically been small and has limited enrollment at times, it remains an option for dairy farmers choosing not to enroll in MPP-Dairy. MPP-Dairy overcomes some of the limitations of LGM-Dairy by providing protection to all dairy operations on a countercyclical basis and by setting available margin coverage levels that will stay in place through 2018 (rather than allowing margin protection to evolve with market conditions as with LGM-Dairy).

This study addresses four key questions that farmers face in the dairy industry. First, what impact does MPP-Dairy have on realized margins? Second, how does downside risk reduction through MPP-Dairy differ by region and coverage levels selected? Third, are there likely to be supply impacts (increases in milk production) resulting from the MPP-Dairy program? Finally, how does the downside risk management of MPP-Dairy compare to LGM-Dairy for the same regions?

What Did the Study Find?

In order to understand potential impacts of the MPP-Dairy Program, this study estimates the effects of the MPP-Dairy program had it been in place during 2002-13. Key findings include:

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- Realized net margins for farmers participating in MPP-Dairy would have varied based on the amount of production covered.
  - Small dairy operations (designated in this study as those with potential coverage of 4 million pounds of production history per year) would have realized the highest average net margins if they had chosen coverage of $8 per hundred pounds of milk (cwt) for 90 percent of historic production. Small dairy farmers choosing this rate of coverage would have received an average net benefit of $0.35 per cwt more (about 4.7 percent of the margin as a simple average for all regions) than they actually received over the period.
  - Medium and large dairy operations (with potential coverage of 20 million and 40 million pounds of production history per year, respectively) would have realized the highest average net margins if they had chosen coverage of $6 per cwt covering 90 percent of historic production. Medium and large dairy farms would have received average net benefits of $0.12 per cwt and $0.11 per cwt more (about 1.6 and 1.5 percent of the margin, respectively) than they actually received over the period.
- Risk reduction from MPP-Dairy would have varied by region, margin coverage level, and share of coverage selected.
  - Dairy farmers would have reduced risk substantially if they had selected higher margin protection levels and higher percentages of historic production.
  - Differences in potential risk reduction by region are substantial. For example, dairy farmers choosing $8 per cwt of coverage for 90 percent of production history in New England and the Northwest would have reduced downside risk by 46 percent and 75 percent, respectively.
- The supply response to MPP-Dairy (the increase in milk production) due to risk reduction would have increased with greater margin-coverage levels and greater shares of production base covered.
  - While the premiums for MPP-Dairy are fixed for the life of the program, LGM-Dairy premiums are based on futures prices and change as the expectations of milk and feed prices change. Therefore, LGM-Dairy is likely to be more attractive to farmers when overall market conditions are favorable (higher margins) and MPP-Dairy more attractive when they are not favorable (lower margins).

How Was the Study Conducted?

Historical margins (farm milk prices minus feed values) were constructed using historical monthly data and mailbox milk prices (net pay prices received by dairy farmers) for each of the 13 regions. Regional feed values were constructed using multiple sources. Historical margins were compared with what margins would have been if farmers had been paying premiums and collecting indemnities under the MPP-Dairy program at the assumed levels, and changes in risk reduction (defined in this study as root mean squared downside deviation from the median margin) were also calculated for each region. MPP-Dairy to LGM-Dairy comparisons were made by examining results from this study and previous studies, and potential supply responses were examined per region based on risk-reduction percentages calculated under two supply-response scenarios.

The Effects of the Margin Protection Program for Dairy Producers

Introduction

U.S. dairy farmers increasingly face highly variable milk prices and feed costs due to weather events, grain and dairy farm policies, fluctuations in global supply and demand, changes in currency valuations, and other factors. The dairy sector recently faced several periods of very low margins (the difference between the U.S. all-milk price and average feed costs), particularly in 2009 and 2012. Margins in 2009 were primarily impacted by low milk prices while margins in 2012 were primarily impacted by high feed costs. Both periods were especially challenging for dairy producers.

Futures and options markets, through the Chicago Mercantile Exchange (CME), provide market-based alternatives for farmers to manage risk. In general, these tools are effective in reducing risk, although the large size of CME futures contracts prevents the majority of dairy farmers from using the contracts (Maynard et al., 2005). In addition, many dairy farmers do not view futures and options strategies as true risk management tools (Ibendahl et al., 2002).

Federal programs and policies, on the other hand, have historically played a large part in affecting farm-level milk prices and dairy farmer profitability. The Federal Milk Marketing Order system was established by the Agricultural Marketing Agreement Act of 1937 and has been amended several times—its aims are to stabilize market conditions, ensure an adequate supply of beverage fluid milk, and establish minimum prices by milk class.[1] From 1949 through 2013, the Dairy Product Price Support Program (DPPSP, formerly the Milk Price Support Program (MPSP)) set a floor on the prices of dairy products through Government purchases of dairy products. From 1985 through 2013, the Dairy Export Incentive Program (DEIP) helped exporters of U.S. dairy products meet prevailing world prices for targeted dairy products and destinations. Under the DEIP, the U.S. Department of Agriculture (USDA) paid cash to exporters as bonuses, enabling them to sell certain U.S. dairy products at prices lower than the exporters' costs of acquiring the products (Hanrahan, 2013).

Since the early 2000s, however, dairy farmers have been primarily supported through direct payments. The Milk Income Loss Contract (MILC) program, established by the Farm Security and Rural Investment Act of 2002,[2] provided some support for declining milk prices but not for rising feed costs. It provided countercyclical payments to dairy farmers when the Boston Class I milk price[3] fell below $16.94 per hundred pounds (cwt). Under the Food, Conservation and Energy Act of 2008 (the 2008 Farm Act), a feed-cost inflation adjustment triggered a larger MILC payment when the National Average Dairy Feed Ration Adjustment exceeded a specified level.[4] The MILC

[1]For information about Federal Milk Marketing Orders, see http://www.ams.usda.gov/rules-regulations/moa/dairy.

[2]The Milk Income Loss Contract program was initially called the Dairy Market Loss Assistance Program.

[3]Class I milk is milk marketed through the Federal order system used for fluid beverage purposes (http://www.ams.usda.gov/rules-regulations/moa/dairy).

[4]The National Average Dairy Feed Ration Adjustment was calculated each month using the price of feed ingredients needed to create a 16-percent protein dairy feed (http://www.fsa.usda.gov/Internet/FSA_File/fs_milkincom_fsa_fbfs40414.pdf).

program ended September 1, 2014. With the original legislation, payments were provided on the first 2.4 million pounds of production on the operation; the 2008 Farm Act raised the cap to 2.985 million pounds.

In years when milk prices were low, U.S. Government intervention through these programs was robust. For example, in fiscal year (FY) 2003, Federal spending on these programs totaled $2.5 billion, including $1.8 billion for MILC, $685 million for MPSP (gross outlays), and $49 million for DEIP (USDA-Farm Service Agency, 2010). Spending on these programs was substantially lower in the following years. In FY 2010, the last active year for DPPSP and DEIP, the former program's gross outlays totaled $62 million,[5] DEIP bonuses totaled $20 million, and MILC payments were $182 million (USDA-Farm Service Agency, 2010). The last MILC payments totaled $275 million in FY 2013 (USDA-Office of the Chief Financial Officer, 2015).

In 2008, U.S. dairy policy shifted more toward addressing margins, as opposed to focusing solely on the price of milk. The Livestock Gross Margin Insurance for Dairy Program (LGM-Dairy), administered by USDA's Risk Management Agency (RMA), represented a movement toward a more market-based risk management program, similar to other RMA crop and livestock programs. LGM-Dairy enables dairy farmers to purchase a premium-subsidized margin insurance product based on deferred futures prices for Class III milk,[6] corn, and soybean meal (USDA-Risk Management Agency, 2016a). The program provides flexibility on the scale of pounds covered, as well as on the quantities of corn and soybean meal per cwt of milk production. Participating farmers receive indemnities based on changes in their insured margins during the coverage period. The result is an insurance program similar to a bundled option (see glossary). Since 2011, premiums for LGM-Dairy have also been subsidized to attract more farmers. Previous research using a historical approach similar to the one utilized in this study found that LGM-Dairy had the potential to reduce risk and affect margins (Burdine et al., 2014b).[7]

Despite its potential benefits, LGM-Dairy has had limited participation due to the statutory livestock insurance limit in the Federal Crop Insurance Act. Unlike the funding for non-livestock insurance products, Government expenses to administer livestock insurance (premium subsidies plus administrative and operating subsidies paid to Approved Insurance Providers for selling and servicing policies) are currently limited to $20 million per fiscal year. Once this limit is reached in a fiscal year, sales of the insurance product must cease. Because of this statutory limit, funds for LGM-Dairy can be exhausted during the year, suspending LGM-Dairy until the start of the next year. Consequently, LGM-Dairy has not become a regular part of many farmers' risk management strategies, and some dairy farmers have struggled to understand its complexities (Wright, 2012). Last, since margins and premiums evolve with futures markets, the program is designed to provide insurance for the current year's margins and is not designed or intended to provide countercyclical support.[8]

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[5]There were no price support purchases after FY 2010 because market prices were sufficiently above support prices.

[6]Class III milk is milk marketed through the Federal order system used for cheese (http://www.ams.usda.gov/rules-regulations/moa/dairy).

[7]Burdine et al. (2014a) covered the period from January 2002–May 2010; Burdine et al. (2014b) utilized the period from January 2002–January 2012. Burdine et al. (2014b) found risk reduction from LGM-Dairy of 24-41 percent and increased margin of 0.7 to 1.0 percent.

[8]For more information on LGM-Dairy, see http://www.rma.usda.gov/livestock/.

Nevertheless, participation in LGM-Dairy has grown since its inception, and enrollment increased significantly when Government-paid premium subsidies were included in 2011. In 2015, premiums totaled $22 million ($12 million paid by dairy farmers plus $10 million in Government subsidies), and insurance indemnity payments paid to dairy farmers totaled $17 million (USDA-Risk Management Agency, 2016b). While LGM-Dairy has historically been small and funding has limited enrollment at times, it remains an option for dairy farmers who choose not to enroll in the Margin Protection Program for Dairy Producers (MPP-Dairy).

The MPP-Dairy, established as part of the Agricultural Act of 2014 (2014 Farm Act), is the most recent support program enabling dairy farmers to insure a margin (see box, "How Does MPP-Dairy Work?"). MPP-Dairy differs from LGM-Dairy in a number of key ways. For example, it provides margin protection on a countercyclical basis by setting the available margins (coverage levels) that will stay in place through 2018, rather than allowing those margin protections to evolve with market conditions (as with the LGM-Dairy program). The feed-cost index in MPP-Dairy includes alfalfa hay, corn, and soymeal, and the quantities of feed per cwt of milk produced are fixed rather than flexible (as in the case of LGM-Dairy). Further, the margins, coverage levels, and premiums are also fixed for the life of the 2014 Farm Act. Under LGM-Dairy, margins and premiums are calculated to be actuarially fair (which means that over a period of time the premiums collected will pay for the losses incurred) and use CME futures prices in order to set insurance guarantees (coverages) that can be expected by participating dairy farmers.

How Does MPP-Dairy Work?

USDA's Margin Protection Program for Dairy Producers (MPP-Dairy) guarantees margin protection based on the Actual Dairy Production Margin (ADPM)[1]—a calculated margin using average monthly prices received by farmers for U.S. all-milk, corn, soybean meal, and alfalfa hay. All milk, corn, and alfalfa hay prices are published by USDA's National Agricultural Statistics Service (NASS), while soybean meal prices are published by USDA's Agricultural Marketing Service (AMS). Specifically, the ADPM is calculated as the U.S. all-milk price minus the sum of the corn price per bushel multiplied by 1.0728, the (Decatur-Central Illinois) soybean meal price per ton delivered by rail multiplied by 0.00735, and the alfalfa hay price per ton multiplied by 0.0137. Based on hypothetical prices shown in box figure 1, the ADPM for this month would have been $12.25 per hundredweight (cwt).

MPP-Dairy provides a payment to each participating dairy farmer on covered milk production when the ADPM falls below the farmer's chosen coverage level during a 2-month period. The 2-month periods used are couplets: Jan./Feb., March/April, May/June, July/Aug., Sept./Oct., and Nov./Dec. For example, if the average ADPM for January and February were to fall below the coverage level to trigger a payment (indemnity) for covered production during that 2-month period, the farmer would receive a payment.[2] The next trigger would be based on the average of the March and April ADPM relative to the chosen coverage level.

continued—

[1]The term A*ctual Dairy Production Margin* could be confusing since each dairy farmer has his or her own margin that may be higher or lower than this national estimated average. Nonetheless, this is the terminology in the 2014 Farm Bill.

[2] $\frac{January\ ADPM + February\ ADPM}{2} < selected\ coverage\ level$

Dairy farmers make a series of choices with respect to participation in MPP-Dairy. The first choice is simply to participate. A participating operation must remain enrolled for the life of the program except in cases of extenuating circumstances (such as the death of the producer, sale of the operation, etc.). Enrollment in the program costs $100 per year, which provides automatic margin protection at the $4.00 per cwt level on 90 percent of a farmer's production history. At this level, if the ADPM falls below $4.00 per cwt for a 2-month couplet, a participating dairy operation receives a payment on one-sixth of covered milk equal to the amount below the $4.00 threshold of the ADPM. For example, if the ADPM for the couplet in question were $3.50, the participating operation would receive a payment of $0.50 per cwt on 2 months of their covered milk production. Box figure 2 depicts the U.S. all-milk price and the MPP-Dairy feed costs calculation from 2002 to 2015.

Second, farmers must choose the quantity of milk that they wish to cover through MPP-Dairy for each calendar year. Each dairy operation has an established production history equal to the highest annual level of milk marketings in the years 2011, 2012, and 2013. Provisions are also made for production history to be established for new dairy operations. In subsequent years, the production history of a participating dairy operation will be adjusted to reflect any increase in the national average milk production. Participating dairy farmers choose a level of coverage between 25 and 90 percent, in 5-percent increments of their production history.

Finally, farmers must decide if they want to pay a premium to purchase higher coverage levels for each calendar year (box table 1). Available coverage levels range from $4.00 to $8.00 per cwt in $0.50 increments. Premium costs per cwt increase as farmers choose higher coverage levels. Premiums will be calculated from Tier 1 for covered production history up to 4 million pounds and from Tier 2 for covered production history exceeding 4 million pounds.[3] Like share of production history, farmers choose coverage levels annually.

Box figure 1

Example actual margin calculation (dollars per hundredweight)

U.S. all-milk price	$23.50
Corn: $4.50 x 1.0728 = $4.83	
Soybean meal: $500 x 0.00735 = $3.68	
Alfalfa hay: $200 x 0.0137 = $2.74	
Estimate average feed cost	$11.25
Actual dairy production margin (ADPM)	$12.25

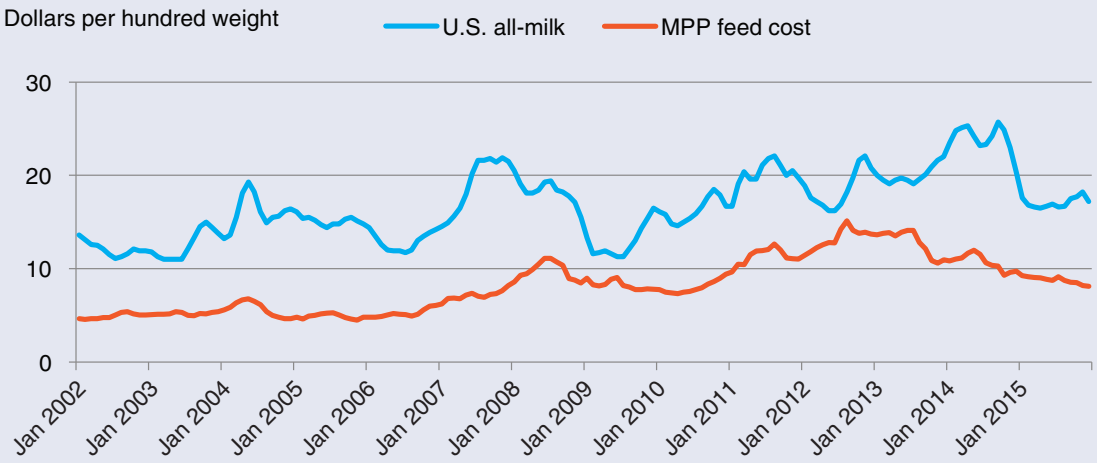
Source: USDA, Economic Research Service, Agricultural Act of 2014.

continued—

[3]MPP-Dairy premiums are structured such that premium rates are lower for the first 4 million pounds covered. Rates then increase for any pounds covered beyond the 4-million-pound level. For example, if 5 million pounds of milk were covered, the lower premium rate would be paid on the first 4 million pounds and the higher rate on the last 1 million pounds.

Box figure 2

Average U.S. all-milk price and feed cost for Margin Protection Program for Dairy Producers (MPP-Dairy)



Source: USDA, Economic Research Service calculations based on data from USDA, National Agricultural Statistics Service, Quick Stats (https://www.nass.usda.gov/Quick_Stats/, 2016) and USDA, Agricultural Marketing Service, Livestock, Poultry, & Grain portal (https://www.marketnews.usda.gov/mnp/ls-home, 2016).

Box table 1

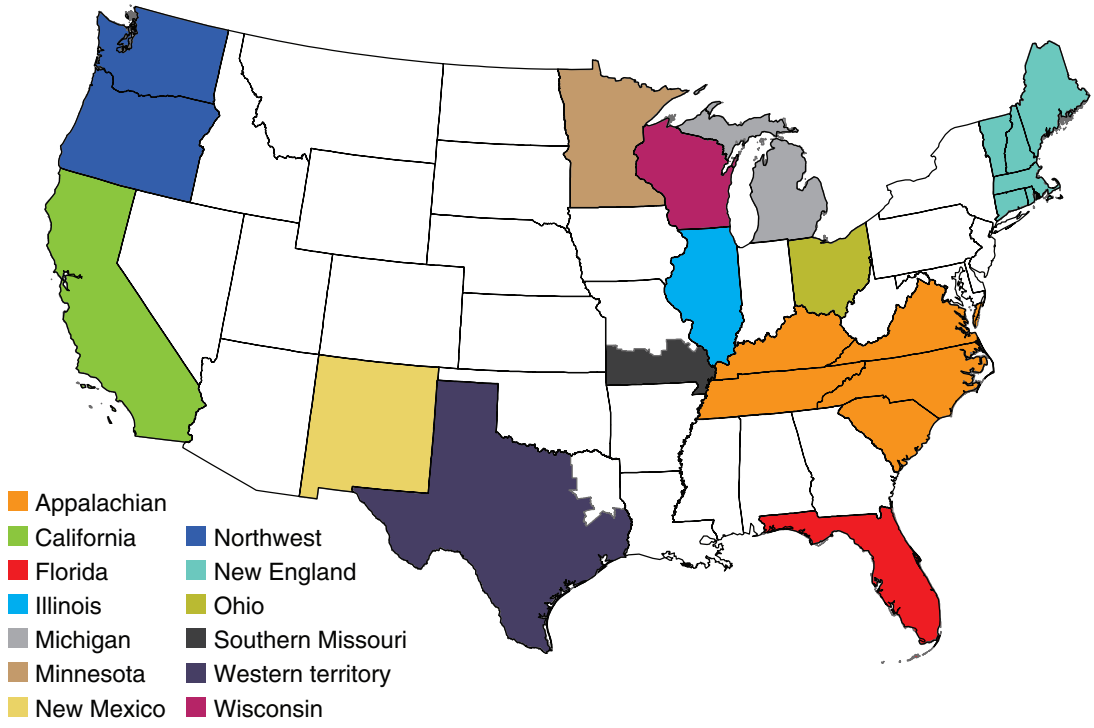
Margin premiums by coverage level and pounds covered

Coverage level (margin) per cwt	Tier 1 premium for 2014 and 2015	Tier 1 premium for 2016-18	Tier 2 premium for 2014-18
	Covered production history less than 4 million pounds with 25 percent reduction	Covered production history less than 4 million pounds	Covered production history greater than 4 million pounds
$4.00	None	None	None
$4.50	$0.008	$0.010	$0.020
$5.00	$0.019	$0.025	$0.040
$5.50	$0.030	$0.040	$0.100
$6.00	$0.041	$0.055	$0.155
$6.50	$0.068	$0.090	$0.290
$7.00	$0.163	$0.217	$0.830
$7.50	$0.225	$0.300	$1.060
$8.00	$0.475	$0.475	$1.360

Note: cwt = hundredweight.
Source: USDA, Economic Research Service, Farm Service Agency, 2014, Margin Protection Program for Dairy (MPP-Dairy) Fact Sheet, revised October 2014.

This study evaluates the potential impacts of MPP-Dairy using a historical approach (as if the program had existed during 2002-13) with a focus on net margins and risk reduction. In addition, it makes estimates as to the magnitude of potential supply response from MPP-Dairy's risk reduction impacts. At the same time, it provides a qualitative comparison of the potential effects of LGM-Dairy and MPP-Dairy.[9] Margins are evaluated across 13 regions to estimate the overall impact on profitability as well as risk reduction (fig. 1). The regions include Federal Milk Marketing Order areas[10] (in part or in whole, depending on the area) and California. Margins differ among regions according to supply and demand conditions, including the differing uses for milk by class in each region. Previous studies of LGM-Dairy (Burdine et al, 2014a, and Burdine et al, 2014b) used the same regions.

Figure 1
Milk-producing regions analyzed for effects of MPP-Dairy and LGM-Dairy



Notes: MPP-Dairy = Margin Protection Program for Dairy Producers; LGM-Dairy = Livestock Gross Margin Insurance for Dairy Program.
Source: USDA, Economic Research Service.

[9]The choice of years was somewhat arbitrary but covers a sufficiently lengthy period covering roughly proportionate periods of relatively stable margins and relatively volatile margins.

[10]The regions in this study were chosen to represent a wide distribution of supply and marketing conditions across the country. Not all regions with available data are included, and data are not available for some areas.

Assessing Margin Impacts, Risk Reduction, and Potential Supply Impacts

This study addresses four key questions that farmers face in the dairy industry. First, what impact does MPP-Dairy have on realized margins? This question is addressed by evaluating the historical gross margins and the impact this program would have had on those historical margins had it been available. Second, how does downside risk through MPP-Dairy differ by region and coverage levels selected? This question is addressed by examining historical margin risk with, and without, the existence of a program like MPP-Dairy. Third, are there likely to be supply impacts as a result of a program like MPP-Dairy? This question is addressed by examining the risk reduction potential of MPP-Dairy and utilizing realistic risk elasticity assumptions from previous studies. Finally, how does the downside risk management of MPP-Dairy compare to LGM-Dairy over the same periods and regions? This is evaluated by comparing the risk reduction potential of MPP-Dairy estimated in this study with risk reduction estimates for LGM-Dairy in previous studies.

The Actual Dairy Production Margin (ADPM), as defined in the 2014 Farm Act, is a calculated margin using monthly prices for U.S. all-milk minus U.S. costs for feed (corn, soybean meal, and alfalfa hay). Using the structure of the ADPM formula and regional milk, corn, soybean meal, and hay price estimates, hypothetical, average margins are calculated for each region from January 2002 to December 2013. In the evaluation of the risk reduction potential of MPP-Dairy, risk is defined as the root mean-squared downside deviation from the calculated median margin for the region.

An average regional margin is constructed using the regional mailbox milk price (net price received by dairy farmers), regional corn price where available, regional soybean meal price where available, and regional alfalfa price where available. This margin represents the *without MPP-Dairy* estimate. The estimate for each regional margin with MPP-Dairy is determined by subtracting the MPP-Dairy premium and adding the indemnity to the margin estimated without the MPP-Dairy margin protection, under each level of assumed coverage. The downside risk reduction associated with $4.00 to $8.00 per cwt margin levels and 25-, 50-, 75-, and 90-percent coverage levels are determined for each region. To simplify the analysis, the $100 annual fee to participate in MPP-Dairy is not considered in the premium calculation, and the 25-percent reduction in premiums for 2014 and 2015 is not taken into consideration.

To make the work applicable to a wider range of dairy operations and to examine the impact of the increased premium rates as covered milk production exceeds 4 million pounds, three representative dairy operation sizes were considered. To be consistent with the design of MPP-Dairy, operation sizes were based on established production histories. A small operation is assumed to have a production history such that it can cover up to 4 million pounds. Medium-sized and large operations are assumed to have production histories such that they can cover up to 20 million and 40 million pounds, respectively.[11] The average premiums paid by these three representative operations are affected by their scale.

[11]Assuming a herd average of 20,000 pounds of milk per cow annually, this would equate to roughly a 200-cow herd as a small operation, a 1,000-cow herd as a medium operation, and a 2,000-cow herd as a large operation.

While regional estimates for margins vary in part due to cost structures across regions, the same formula is used for all regions. Simply put, the analysis assumes that the same ration is used in all 13 regions analyzed, and that ration matches the MPP-Dairy ration perfectly. For the calculations in this study, differences in margins across regions result from different milk, corn, soybean meal, and alfalfa hay prices in each region, but not by the quantities of those feeds per cwt of milk. Further, within each region, milk prices per unit of milk produced and input costs (feed and other costs) are assumed to be identical for each operation size; therefore, margins differ only by region.

Risk reduction differences by size of operation are beyond the scope of this study. Admittedly, this is a limitation of this study. MacDonald, Cessna, and Mosheim (2016) point out that cost differences vary considerably by herd size and that cost advantages likely explain a great deal of the consolidation that has been seen in the dairy sector over the last several decades. They report total feed costs in 2010 of $8.59 per cwt of milk sold for dairy operations with more than 1,999 cows compared to $10.93 for dairies with between 200 and 499 cows, and $12.54 for dairy operations with less than 50 cows.[12] Differences across herd size when considering all costs (including capital, overhead, and labor) were even greater. Although costs differ considerably by herd size, it is important to understand that indemnities from MPP-Dairy result from changes in average milk and feed prices at the national level.

[12]Milk cost of production estimates from the MacDonald et al. report are USDA Economic Research Service (ERS) milk cost of production estimates based on the USDA Agricultural Resource Management Survey and exclude organic dairy farms. More details concerning ERS milk cost of production estimates for both conventional and organic farms may be found at http://ers.usda.gov/data-products/commodity-costs-and-returns/organic-costs-and-returns.aspx.

The Model for MPP-Dairy Margin Risk Analysis

Data for monthly milk, corn, and alfalfa hay prices came from USDA, National Agricultural Statistics Service, Quick Stats (https://www.nass.usda.gov/Quick_Stats/). The USDA Agricultural Marketing Service, Livestock, Poultry, & Grain portal (https://www.marketnews.usda.gov/mnp/ls-home) was used for historical soybean meal prices at seven locations. Historical local margins were constructed for 13 milk-producing regions—Florida, New England, California, the Northwest, New Mexico, Western Texas, Minnesota, Wisconsin, Illinois, Southern Missouri, Michigan, Ohio, and the Appalachian region—using the same formula structure used for the MPP-Dairy margin calculation.

To construct regional margins, mailbox milk prices were collected for each of the 13 regions. State-level corn and alfalfa hay prices were available in most regions, but when State-level prices were unavailable, the closest State prices were used, consistent with the approach taken in Burdine et al. (2014b). In regions containing multiple States, the most representative and available State corn and alfalfa prices were used. Soybean meal prices were available for seven locations, including Decatur and Chicago, IL; Kansas City and St. Louis, MO; Memphis, TN; Minneapolis, MN; and Portland, OR. For each region, the soybean meal price in the location closest to that region was used. A monthly local margin (mailbox price minus estimated feed cost) for each region was constructed from January 2002 to December 2013 using the structure of the MPP-Dairy feed-cost formula but substituting regional prices for national average prices. This value is an approximate average regional margin without participation in the MPP-Dairy program. Once constructed, these monthly regional margins were coupled into 2-month periods.

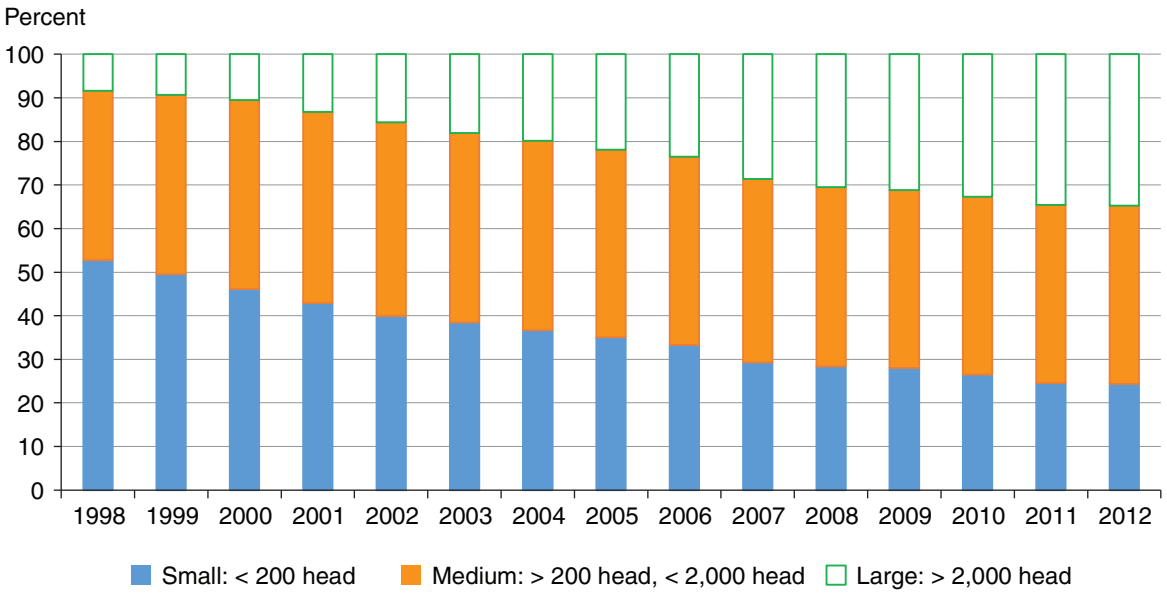
In similar fashion, historical monthly MPP-Dairy margins were constructed using the same formula, but with the actual prices relevant to the MPP-Dairy ADPM calculation. This includes the monthly U.S. all-milk price, the U.S. corn price, the U.S. alfalfa price, and the soybean meal price in Decatur, IL. Once monthly MPP-Dairy margins were constructed, they were coupled into 2-month periods, and indemnities were estimated for each potential MPP-Dairy coverage level during the same period. Premiums for each coverage level were subtracted from estimated indemnities to arrive at net payouts from hypothetical MPP-Dairy participation. Each net payment was then added to, or subtracted from, each corresponding local margin couplet to construct a local margin with participation in MPP-Dairy had it been available during that time.

Path dependency is a clear limitation of the ex-post approach that was taken in this analysis. Historical price data were used to construct margins with, and without, a policy that did not exist at the time. Note that this analysis assumes production decisions and prices would have been unaffected by the existence of an MPP-Dairy-like program. That is, even if their actual production margin would have been higher with MPP-Dairy than without it, the margin calculations assume that dairy farmers would not change production as a result of the program. Risk reduction as a result of the program is also assumed to have no impact on production level. These are not fully realistic assumptions—the program is likely to have at least some impact on milk supply. Since changes in milk supply bring about changes in prices, the program is likely to have at least some effect on prices as well. While this historical approach is valuable, it is important that results be interpreted with these limitations in mind.

Results of Margin Impact and Risk Reduction Potential of MPP-Dairy

This study examines all margin levels ($4.00-$8.00 per cwt) and four different coverage levels (25, 50, 75, and 90 percent) for three different dairy sizes (4, 20, and 40 million pounds of potentially coverable production) in evaluating the impacts of MPP-Dairy.[13] From 1998 to 2012, the share of dairy cows held by small operations (less than 200 cows—estimated to be roughly 4 million pounds of production per year) shrank at an average of 5 percent per year (fig. 2). Conversely, large operations (more than 2,000 cows—estimated to be roughly 40 million pounds of production annually) grew at almost 1 percent per year on average during the same period. It is likely that different-sized operations will enroll differently in MPP-Dairy given the two-tiered premium structure that exists. Operations that cover 4 million pounds or less face constant premium costs for all milk they choose to cover. However, operations that cover higher production levels will actually see higher average premium costs per cwt if they choose to cover more pounds of milk, as additional covered pounds are associated with greater premiums. This decision will affect the expected margin with MPP-Dairy and the potential for the MPP-Dairy to reduce margin risk.

Figure 2
Percentage of cattle inventory by size of dairy operation



Source: USDA, Economic Research Service, National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/).

[13]The selections of dairy sizes are at the authors' discretion and are used as representative dairy sizes to evaluate the MPP-Dairy premium schedule. Additionally, the study assumed average annual production of 20,000 pounds of milk per cow.

Impact on Margins

Small dairy farmers enrolling in MPP-Dairy between 2002 and 2013 would have seen increases in average margins, net of premiums paid, for any coverage selected (see table 1).[14] Further, these increases would have grown as farmers chose higher coverage levels and greater shares of their production history. This occurs because indemnities (payments from the Government) exceed premiums on average, which raises the average margin for smaller operations paying the lower premium rates. Maximum use of MPP-Dairy (90-percent coverage level, $8 per cwt margin) by a small dairy farm would have resulted in an average margin increase of $0.35 per cwt (4.7 percent on average across the 13 regions) from 2002 to 2013.

Table 1

Changes in net realized margins per production base, percent covered, and margin coverage level if MPP-Dairy had been in effect from 2002 to 2013

		Change in realized margin compared to no coverage ($ per cwt)								
Production base	Coverage percent	$4.00 coverage	$4.50 coverage	$5.00 coverage	$5.50 coverage	$6.00 coverage	$6.50 coverage	$7.00 coverage	$7.50 coverage	$8.00 coverage
Small, 4 million lbs	25	0.01	0.02	0.03	0.04	0.05	0.07	0.07	0.09	0.10
	50	0.03	0.04	0.06	0.08	0.11	0.14	0.14	0.18	0.20
	75	0.04	0.07	0.09	0.12	0.16	0.21	0.21	0.27	0.29
	90	0.05	0.08	0.11	0.14	0.19	0.25	0.26	0.33	0.35
Medium, 20 million lbs	25	0.01	0.02	0.03	0.04	0.05	0.06	0.04	0.05	0.05
	50	0.03	0.04	0.06	0.06	0.08	0.08	-0.04	-0.04	-0.07
	75	0.04	0.06	0.08	0.08	0.10	0.10	-0.12	-0.14	-0.19
	90	0.05	0.07	0.10	0.10	0.12	0.11	-0.17	-0.20	-0.27
Large, 40 million lbs	25	0.01	0.02	0.03	0.03	0.04	0.04	-0.02	-0.02	-0.03
	50	0.03	0.04	0.06	0.05	0.07	0.06	-0.10	-0.12	-0.16
	75	0.04	0.06	0.08	0.08	0.09	0.08	-0.18	-0.22	-0.28
	90	0.05	0.07	0.10	0.09	0.11	0.09	-0.23	-0.28	-0.35

Notes: MPP-Dairy = Margin Protection Program for Dairy Producers; cwt = hundredweight.
Sources: USDA, Economic Research Service calculations using data from USDA's National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/) and USDA Agricultural Marketing Service, 2016, Livestock, Grain, and Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

[14]USDA Farm Service Agency published a rule, effective April 13, 2016, clarifying that, for a participating producer, 90 percent of production history is covered below the $4 per cwt level even if a lower percentage was selected by the producer. This analysis was developed before the rule was published, and it does not account for the clarification. In calculations for this study, participating dairy farmers are assumed to be paid for the percent of production history they chose to cover and therefore do not receive indemnities on the additional production history (up to 90 percent) when the national average margin falls below $4 per cwt. This occurred for 6 couplets during the time period of this analysis (2002-2013). Had this clarification been taken into consideration, calculated realized margin changes would have been slightly higher for dairy farmers selecting coverage levels below 90 percent. However, the higher payments during the few couplets when the national margin fell below $4 per cwt would not make a material difference in the overall results or conclusions.

The impact on average margins is less clear for medium- and large-size operations. Since indemnities are based on a predetermined formula of representative milk and feed costs, rather than individual operations, changes in the average margins are due solely to the increased premiums paid on higher levels of covered milk production history. Because of this two-tiered premium structure, medium and large farmers have an additional consideration with respect to the margin and coverage level tradeoff. They may choose a lower percentage of coverage to avoid the higher premiums associated with covering milk beyond the 4-million-pound per-year level. The key decision is whether to select a higher margin level and lower coverage level or a lower margin level and higher coverage level.

Medium and large operations can cover up to 4 million pounds of milk at the lower level but pay the higher premium level on any production above this amount (see box table 1, "How Does MPP-Dairy Work?"). Table 1 demonstrates this tradeoff when one examines change in margin for the larger operations at all nine coverage levels and all four percentages of coverage. Note that average margin increases for both large and medium-sized operations when the $4 per cwt level is chosen; this is not surprising given the extremely low cost of the catastrophic coverage level and the potential for even small indemnities to exceed the enrollment cost of $100 annually.

In the cases of medium and large operations, maximum use of MPP-Dairy does not result in the highest average margins over the 2002-13 period. In both cases, average margins decrease as very high coverage levels are chosen due to the higher premiums paid by these larger operations for the higher coverage levels. Maximum use of MPP-Dairy (90-percent coverage level, $8 per cwt margin) from 2002-13 would have resulted in a margin decrease of $0.27 per cwt for medium farms to $0.35 for large farms.

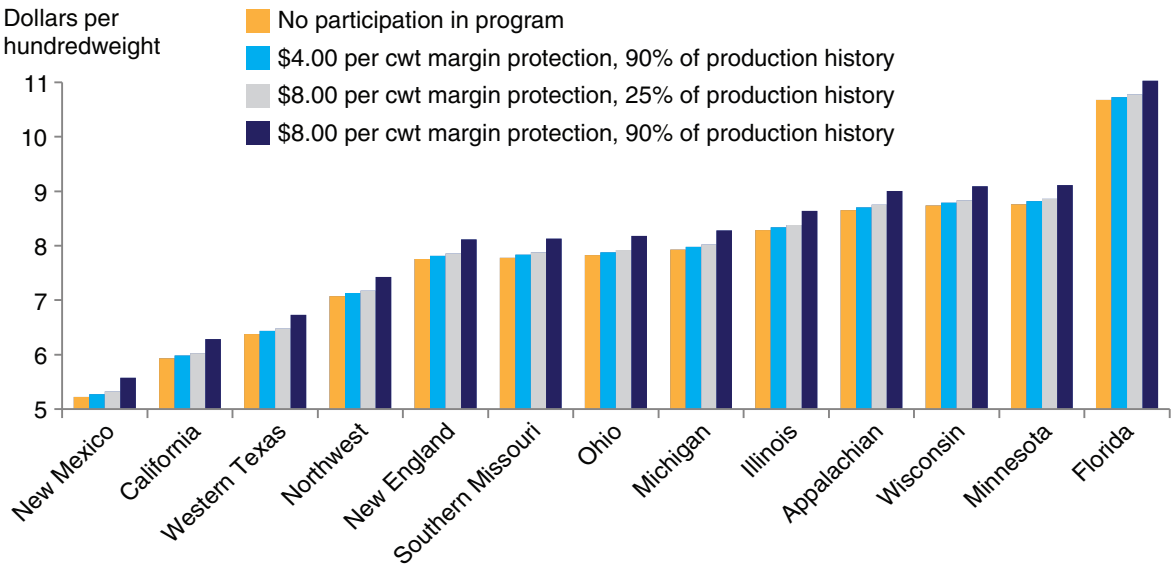
The optimum coverage levels for small, medium, and large operations (based on margin maximization during the period of this study) can be observed in table 1. For medium and large operations, margins are maximized at the $6.00 per cwt, 90-percent level, resulting in average annual margin increases of $0.12 for medium-sized dairies and $0.11 for large dairies. Averaged across all 13 regions, this is an increase of 1.6 and 1.5 percent, respectively, for medium and large operations. For almost all percentages of coverage, the margin-level choice with the highest net rate of return is $6.00 per cwt. The one exception is for medium-size operations choosing 25 percent coverage; in this case, the margin-level choice with the highest net rate of return is $6.50 per cwt. At the 25-percent coverage level, a medium-sized dairy is only covering 5 million pounds of milk—4 million pounds of this will be covered at the Tier 1 level, and 1 million pounds will be covered at the Tier 2 level. However, there is little difference between the $6.00 and $6.50 per cwt level of coverage for the medium and large operations.

Differences in realized margins are key as one compares the potential impact of this program on operations by size. Each regional margin was calculated monthly using the MPP-Dairy margin calculation and regional prices for milk, corn, soybean meal, and alfalfa hay. Therefore, no cost distinction was made for larger dairy operations, which likely have a lower overall cost structure. Effectively, this means that estimated margins will be higher for most of the larger operations than estimated here. However, payments received from MPP-Dairy are made based on margins calculated at the national level, so the change in average margins is the same across operation sizes.

Examination of the impact of MPP-Dairy, had it existed from 2002 to 2013, allows for comparison of margins by coverage level and across regions (figs. 3-5). Average margin levels

from 2002 to 2013 are broken out for the 13 different regions based on hypothetical use of a program like MPP-Dairy. Average margins are also shown for operations that do not enroll in MPP-Dairy. These margins differ by region primarily due to different pricing structures in each region (differences in Class I differentials, class utilization, and over-order payments[15]). Additionally, average margins are shown for each region for operations that choose the $4 per cwt coverage level on 90 percent of their production history, operations that choose the $8 coverage level and cover 25 percent of their production history, and operations that choose the $8 coverage level and cover 90 percent of their production history. Although margin levels differ by region, changes in margins due to the program do not vary by region since payments are determined by the national average margin calculation.

Figure 3
Average margin by region for small dairy operations, 2002-13

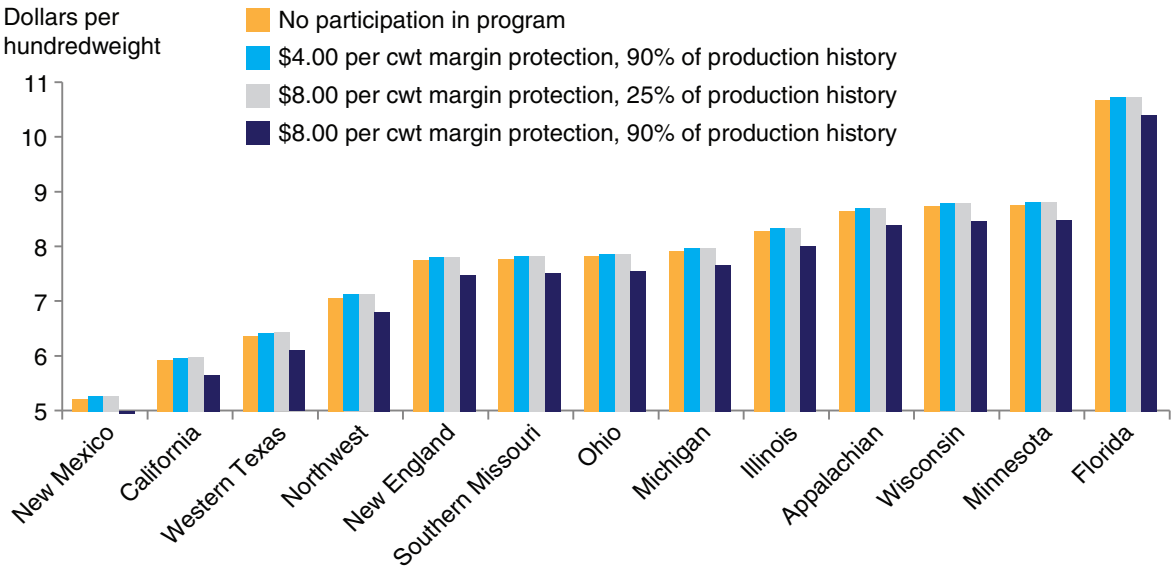


Source: USDA, Economic Research Service calculations using data from USDA, National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/), and USDA, Agricultural Marketing Service, 2016, Livestock, Grain, & Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

[15]For milk pooled in the Federal Milk Marketing Order system, milk processors are required to make minimum payments based on how milk is used. Milk used for fluid beverage purposes is Class I, the highest price class; Class II is for soft products such as yogurt and ice cream; Class III is for cheese; and Class IV is for butter and milk powders. A constituent of the Class I milk price is the Class I differential, which varies by location. Class utilization refers to the proportions of milk that are sold according to class. Over-order payments are amounts paid to dairy producers above minimum Federal order payments (http://www.ams.usda.gov/rules-regulations/moa/dairy).

Figure 4

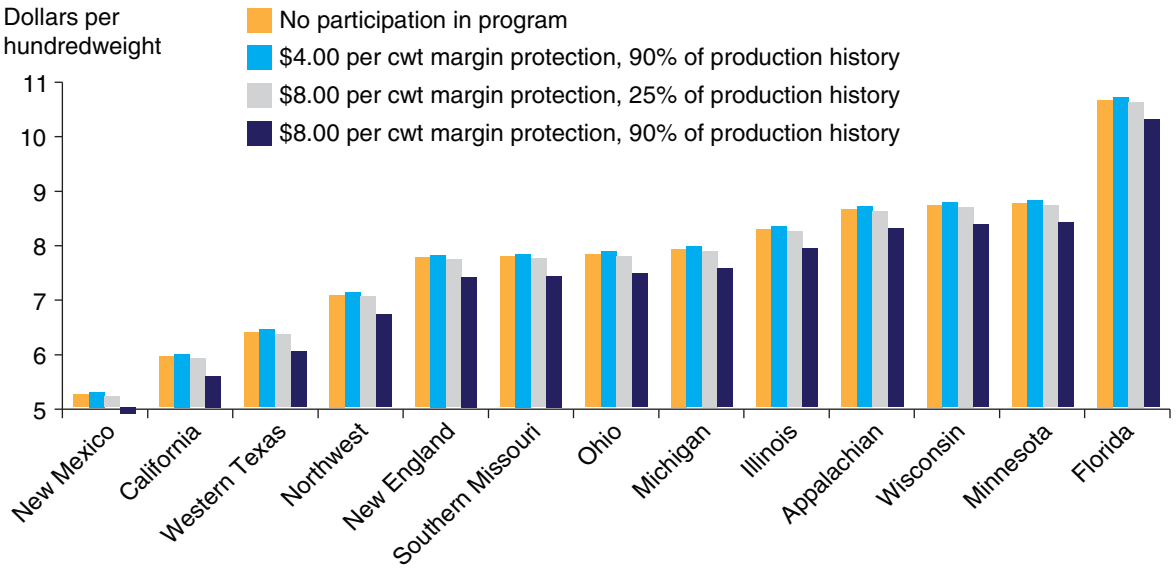
Average margin by region for medium dairy operations, 2002-13



Source: USDA, Economic Research Service calculations using data from USDA, National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/), and USDA, Agricultural Marketing Service, 2016, Livestock, Grain, & Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

Figure 5

Average margin by region for large dairy operations, 2002-13



Source: USDA, Economic Research Service calculations using data from USDA, National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/), and USDA, Agricultural Marketing Service, 2016, Livestock, Grain, & Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

Impact on Risk

In addition to evaluating the potential impact on margins, this study also evaluates the risk-reduction potential of the MPP-Dairy program had it been available in the past (risk is defined in this paper as the root mean-squared downside deviation from the median average margin, and risk reduction is the percentage reduction in that downside deviation). Table 2 summarizes results by showing potential risk-reduction levels by region for $4 and $8 per cwt coverage levels at 90-percent coverage for 2002-13. Since calculated margins are the same across operation sizes, risk reduction (as defined in this study) is the same for small, medium, and large operations, and the risk reduction estimates apply to all three sizes of operation.

The percentage risk reduction that can be achieved by moving from the minimum $4 coverage level to the maximum $8 coverage level can also be observed in table 2. Choosing higher coverage levels eliminates an increasingly larger portion of the low bimonthly margins, resulting in lower risk levels. For farmers choosing the minimum $4.00 coverage level, risk reduction ranges from 7-10 percent across regions. However, for a farmer choosing the maximum $8.00 level, risk is reduced from a low of 46 percent in New England to a high of 75 percent in the Northwest.

Table 2
Examples of risk reduction associated with MPP-Dairy

		Coverage: 90 percent, $4.00 per cwt		Coverage: 90 percent, $8.00 per cwt	
Region	Risk level without MPP-Dairy ($/cwt)	Risk level with MPP-Dairy ($/cwt)	Reduction in risk (percentage)	Risk level with MPP-Dairy ($/cwt)	Reduction in risk (percentage)
New England	$2.58	$2.39	8	$1.40	46
Wisconsin	$2.55	$2.36	7	$1.11	56
Florida	$2.43	$2.23	8	$0.98	60
New Mexico	$2.29	$2.08	9	$0.90	61
Minnesota	$2.59	$2.40	7	$1.01	61
Appalachian	$2.46	$2.25	8	$0.90	63
Ohio	$2.66	$2.46	8	$0.96	64
Western Texas	$2.22	$2.00	10	$0.76	66
California	$2.35	$2.14	9	$0.76	68
Southern Missouri	$2.76	$2.57	7	$0.85	69
Illinois	$2.36	$2.16	9	$0.69	71
Michigan	$2.23	$2.23	9	$0.71	71
Northwest	$2.49	$2.28	8	$0.62	75

Notes: Risk level is defined as the root mean-squared downside deviations from the median gross margin. MPP-Dairy stands for the Margin Protection Program for Dairy Producers; cwt stands for hundredweight.
Source: USDA, Economic Research Service calculations using data from USDA National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/, 2016) and USDA Agricultural Marketing Service, 2016, Livestock, Grain, and Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

The percent risk reduction for all potential margin coverage levels is in table 3. Depending on the coverage percentage, the margin coverage levels with the greatest net realized returns were $6.00 or $6.50 for medium and large dairies (see table 1); a margin coverage level of $6.00 or $6.50 would equate to an estimated risk reduction of 8-49 percent, depending upon the percent covered and region. In general, the New England region had the lowest level of risk reduction, while the Northwest had the highest (although this changes slightly depending on the percent covered).

Table 3

Risk reduction percentage per region, margin coverage selected, and share of base production selected if MPP-Dairy had been in effect from 2002-13

Coverage level selected	25 percent									50 percent								
	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
Region																		
New England	2	4	5	7	8	11	12	16	19	4	7	10	13	16	20	25	30	34
Wisconsin	2	4	5	7	9	12	15	18	20	4	7	10	13	17	23	29	33	37
Minnesota	2	4	5	7	9	11	13	17	19	4	7	10	13	17	22	27	34	38
Florida	2	4	6	8	10	13	16	19	23	5	8	11	15	19	25	31	36	40
Appalachian	2	4	6	7	10	13	16	19	22	5	8	11	15	19	24	31	38	40
New Mexico	3	4	6	8	11	14	17	21	22	5	9	13	17	22	28	34	40	41
Western Texas	3	5	7	9	12	15	18	22	24	6	9	13	17	23	29	36	39	41
Southern Missouri	2	3	5	6	8	11	14	17	21	4	7	10	12	16	21	27	34	41
Ohio	2	4	5	7	9	11	14	18	21	4	7	10	13	17	22	28	35	41
Michigan	2	4	6	8	10	13	16	18	21	5	8	11	15	19	25	31	37	43
Illinois	2	4	6	8	10	13	16	20	23	5	8	12	15	20	26	32	38	44
Northwest	2	4	6	8	10	13	16	20	23	5	8	11	15	19	25	32	39	44
California	3	4	6	8	11	14	17	21	24	5	8	12	16	21	27	34	40	46
Coverage level selected	75 percent									90 percent								
	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
Region																		
New England	6	10	14	18	23	28	35	36	41	8	12	17	22	27	33	36	43	46
Wisconsin	6	10	15	19	24	33	42	45	54	7	12	17	22	28	38	48	51	56
Florida	7	11	16	21	28	36	43	50	56	8	14	19	25	33	42	49	56	60
New Mexico	8	13	18	24	31	40	49	54	53	9	15	22	28	37	47	58	58	61
Minnesota	6	10	14	18	24	32	39	48	55	7	12	17	21	28	37	46	56	61
Appalachian	7	11	16	21	27	35	45	50	54	8	14	19	25	32	41	52	57	63
Ohio	6	11	15	19	25	32	41	51	57	8	13	18	23	29	38	48	59	64
Western Texas	8	13	20	26	33	42	49	53	56	10	16	23	30	39	49	56	62	66
California	7	13	18	24	31	39	49	58	62	9	15	21	28	36	46	58	63	68
Southern Missouri	6	10	14	18	24	31	40	50	60	7	12	17	21	28	36	47	58	69
Illinois	7	12	17	22	28	37	47	54	64	9	14	20	26	33	43	54	62	71
Michigan	7	12	17	22	28	37	44	55	64	9	14	20	25	33	43	52	65	71
Northwest	7	12	17	22	28	36	46	57	65	8	14	20	25	33	43	54	67	75

Note: Risk level is defined as the root mean-squared downside deviations from the median gross margin. MPP-Dairy stands for the Margin Protection Program for Dairy Producers.

Source: USDA, Economic Research Service calculations, data from USDA National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/, 2016) and USDA Agricultural Marketing Service, 2016, Livestock, Grain, and Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

While risk reduction was not examined across farm sizes in this analysis, previous work has examined how MPP-Dairy might impact dairies of different sizes. Prior to the establishment of MPP-Dairy, the cap payments under the MILC program (2.985 million pounds after the 2008 Farm Act) ensured that smaller dairies received a greater payment per cwt of milk produced than dairies whose production exceeded the cap. The year 2009 was one of the most challenging years ever faced by dairy producers due to extremely low farm-level milk prices and relatively high feed prices. MacDonald et al. compared MILC payments with MPP-Dairy payments, had they existed instead of MILC in 2009, for four sizes of farms: those with production of 2.9, 10, 20, and 50 million pounds. For MPP-Dairy, calculations were made for 90 percent of production at $4.00, $6.50, and $8.00 per cwt margin protection levels and 50 percent of production at the $6.50 and $8.00 per cwt levels. In all cases, except those of operations with 2.9 million pounds of production history choosing $4.00 or $6.50 coverage, MPP-Dairy payments, had they existed instead of MILC in 2009, would have exceeded the MILC payments that were made.

Supply Impacts of MPP-Dairy

Supply impacts from MPP-Dairy are also important considerations as increased production would put downward pressure on prices and raise payment levels over time. Government payments have different impacts on supply response depending upon how the programs are structured. Government payments linked, or coupled, to a farmer's current production level have the greatest impact on supply since the farmer receives payments on increased production levels. Government payments are considered fully decoupled if they do not depend on the farmer's production choices, output levels, or market conditions (Westcott and Young, 2004). Since MPP-Dairy payments are made based on a dairy farmer's production history and are not impacted by the individual farmer's changes in milk production, they can best be described as partly decoupled—they do not depend on a farmer's production level, but they are impacted by current market conditions (i.e., milk and feed prices), and the farmer must remain in production to participate.

The MPP-Dairy program is similar in some respects to the former Counter-Cyclical Payment Program, where payments for certain crops were partly decoupled since they were made to farmers on historical base acres but triggered by price movements.[16] Likewise, payments to large dairy farms through the MILC program were partly decoupled. With a cap on coverage at 2.4 million pounds of production per year and later at 2.985 million pounds, dairy farmers exceeding these production levels received the same payments regardless of any additional production above the cap. Decoupled payments such as this can have production impacts because they affect farmer wealth, risk attitudes, and liquidity (Westcott, 2005).

Risk reduction has the potential to increase supply by reducing income variability, as the probability of low returns is decreased. Reductions in risk levels have a positive impact on production levels, although risk elasticities (percentage production changes in response to percentage changes in levels of risk) have been found to be small (Burdine et al., 2014a; Lin and Dismukes, 2007; Luh and Stefanou, 1989). Since results of this work suggest potential for significant risk reduction (see table 3), potential for supply impacts also exists. Given that there are limited estimates of risk elasticities in the literature and considerable variation in their magnitude, two different risk elasticity levels were utilized to analyze sensitivity of supply impacts to risk reduction.

Supply response estimates are made for risk elasticities of -0.01 and -0.05. A risk elasticity of -0.01 implies that a 1-percent increase in risk would reduce output by 0.01 percent. Conversely, a 1.0-percent decrease in risk would be associated with a 0.01-percent increase in production. This range is chosen based on the existing literature, with the upper-bound level of -0.05 roughly equivalent to Lin and Dismukes (2007). Risk elasticity estimates from Burdine et al. (2014a) fall between zero and -0.01. Lin and Dismukes (2007) point out that risk affects were not observed for all commodities, and Luh and Stefanou (1989) found output price risk unimportant in dairy farmer production decisions.

[16]The 2014 Farm Act repealed the Counter-Cyclical Payment Program.

Estimated supply impacts for all nine coverage levels, all four sizes of operations, and all four of the percent of coverage levels were examined when assuming a risk elasticity of -0.01 are in table 4. The potential for supply impact is small given the small risk elasticity assumed. Note that supply impact from risk reduction never exceeds 1 percent in any region and at any coverage level. Unsurprisingly, estimated supply impact increases as both coverage level and percent of coverage increase. Maximum participation in MPP-Dairy, $8 coverage levels at 90 percent of production history, resulted in estimated supply response from 0.46 percent in New England to 0.75 percent in the Northwest.

Supply impacts using the higher risk elasticity level of -0.05 are in table 5. Maximum utilization of the program resulted in estimated production impacts that approach 4 percent in some regions. Estimates ranged from 2.29 percent in New England to 3.76 percent in the Northwest for operations covered at the $8 per cwt level and 90 percent of production history.

In addition to supply impacts from reduced risks, wealth effects could also induce supply response. The additional wealth from decoupled payments has the potential to impact production in several ways. First, these payments can be capitalized into the farm assets, which may have an impact on the overall viability of the operation or provide for easier access to credit. Second, these payments may provide liquidity and thereby reduce the need for credit and the associated interest expenses. Third, payments received can be reinvested into the operation, which can have a very direct impact on production levels (Westcott and Young, 2004).

This study did not estimate the impacts of wealth effects on production, and examples of empirical estimations of wealth effects relevant to MPP-Dairy did not appear to be available—however, the concept has been discussed theoretically (Westcott, 2005; Westcott and Young, 2004). For multiple reasons, wealth effects in the context of the MPP are likely to be smaller than responses due to price changes or some type of Government program coupled to current production. First, a farm household has many potential uses for the indemnity payments, and reinvestment into the farming operation is only one possible use of that increase in wealth. Since MPP-Dairy does not increase per unit net returns from additional production, the additional household wealth from the payments is more likely to be spread among many uses in addition to farming, such as household consumption, savings, and investments (Westcott and Young, 2004).

Second, supply impacts are limited because margin impacts are not robust across all operations and coverage levels. As was previously discussed, larger operations would have actually paid more in premiums than they would have received in payments once coverage levels exceeded $6.00, and net indemnities over the 2002-13 period would have been fairly trivial even at coverage levels receiving the highest rates of return. While net payments would have been positive and more substantial at an enterprise level for smaller operations, those dairies represent a relatively small share of total dairy production. Thus, supply and price impacts from these farms would have been fairly muted.

Third, this study examined average hypothetical margin impact over the period from 2002 to 2013. Indemnities did not exceed premiums every year, and supply effects are ambiguous in years when premiums would have exceeded indemnities as the negative wealth effect would have been somewhat mitigated by the decrease in risk level. Further, since farmers make individual coverage elections on an annual basis and do not have perfect foresight, some farmers will see positive wealth effects while others will see negative wealth effects in any given year, making supply impact estimation across the entire industry unclear.

Table 4

Estimated supply impact percentages assuming a risk elasticity of -0.01

Coverage level selected	25 percent									50 percent								
	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
Region																		
New England	0.02	0.04	0.05	0.07	0.08	0.11	0.12	0.16	0.19	0.04	0.07	0.10	0.13	0.16	0.20	0.25	0.30	0.34
Wisconsin	0.02	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.20	0.04	0.07	0.10	0.13	0.17	0.23	0.29	0.33	0.37
Minnesota	0.02	0.04	0.05	0.07	0.09	0.11	0.13	0.17	0.19	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.34	0.38
Florida	0.02	0.04	0.06	0.08	0.10	0.13	0.16	0.19	0.23	0.05	0.08	0.11	0.15	0.19	0.25	0.31	0.36	0.40
Appalachian	0.02	0.04	0.06	0.07	0.10	0.13	0.16	0.19	0.22	0.05	0.08	0.11	0.15	0.19	0.24	0.31	0.38	0.40
New Mexico	0.03	0.04	0.06	0.08	0.11	0.14	0.17	0.21	0.22	0.05	0.09	0.13	0.17	0.22	0.28	0.34	0.40	0.41
Western Texas	0.03	0.05	0.07	0.09	0.12	0.15	0.18	0.22	0.24	0.06	0.09	0.13	0.17	0.23	0.29	0.36	0.39	0.41
Southern Missouri	0.02	0.03	0.05	0.06	0.08	0.11	0.14	0.17	0.21	0.04	0.07	0.10	0.12	0.16	0.21	0.27	0.34	0.41
Ohio	0.02	0.04	0.05	0.07	0.09	0.11	0.14	0.18	0.21	0.04	0.07	0.10	0.13	0.17	0.22	0.28	0.35	0.41
Michigan	0.02	0.04	0.06	0.08	0.10	0.13	0.16	0.18	0.21	0.05	0.08	0.11	0.15	0.19	0.25	0.31	0.37	0.43
Illinois	0.02	0.04	0.06	0.08	0.10	0.13	0.16	0.20	0.23	0.05	0.08	0.12	0.15	0.20	0.26	0.32	0.38	0.44
Northwest	0.02	0.04	0.06	0.08	0.10	0.13	0.16	0.20	0.23	0.05	0.08	0.11	0.15	0.19	0.25	0.32	0.39	0.44
California	0.03	0.04	0.06	0.08	0.11	0.14	0.17	0.21	0.24	0.05	0.08	0.12	0.16	0.21	0.27	0.34	0.40	0.46
Coverage level selected	75 percent									90 percent								
	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
Region																		
New England	0.06	0.10	0.14	0.18	0.23	0.28	0.35	0.36	0.41	0.08	0.12	0.17	0.22	0.27	0.33	0.36	0.43	0.46
Wisconsin	0.06	0.10	0.15	0.19	0.24	0.33	0.42	0.45	0.54	0.07	0.12	0.17	0.22	0.28	0.38	0.48	0.51	0.56
Florida	0.07	0.11	0.16	0.21	0.28	0.36	0.43	0.50	0.56	0.08	0.14	0.19	0.25	0.33	0.42	0.49	0.56	0.60
New Mexico	0.08	0.13	0.18	0.24	0.31	0.40	0.49	0.54	0.53	0.09	0.15	0.22	0.28	0.37	0.47	0.58	0.58	0.61
Minnesota	0.06	0.10	0.14	0.18	0.24	0.32	0.39	0.48	0.55	0.07	0.12	0.17	0.21	0.28	0.37	0.46	0.56	0.61
Appalachian	0.07	0.11	0.16	0.21	0.27	0.35	0.45	0.50	0.54	0.08	0.14	0.19	0.25	0.32	0.41	0.52	0.57	0.63
Ohio	0.06	0.11	0.15	0.19	0.25	0.32	0.41	0.51	0.57	0.08	0.13	0.18	0.23	0.29	0.38	0.48	0.59	0.64
Western Texas	0.08	0.13	0.20	0.26	0.33	0.42	0.49	0.53	0.56	0.10	0.16	0.23	0.30	0.39	0.49	0.56	0.62	0.66
California	0.07	0.13	0.18	0.24	0.31	0.39	0.49	0.58	0.62	0.09	0.15	0.21	0.28	0.36	0.46	0.58	0.63	0.68
Southern Missouri	0.06	0.10	0.14	0.18	0.24	0.31	0.40	0.50	0.60	0.07	0.12	0.17	0.21	0.28	0.36	0.47	0.58	0.69
Illinois	0.07	0.12	0.17	0.22	0.28	0.37	0.47	0.54	0.64	0.09	0.14	0.20	0.26	0.33	0.43	0.54	0.62	0.71
Michigan	0.07	0.12	0.17	0.22	0.28	0.37	0.44	0.55	0.64	0.09	0.14	0.20	0.25	0.33	0.43	0.52	0.65	0.71
Northwest	0.07	0.12	0.17	0.22	0.28	0.36	0.46	0.57	0.65	0.08	0.14	0.20	0.25	0.33	0.43	0.54	0.67	0.75

Note: Risk level is defined as the root mean-squared downside deviations from the median gross margin.
Source: USDA, Economic Research Service calculations, data from USDA National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/) and USDA Agricultural Marketing Service, 2016, Livestock, Grain, and Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

Table 5

Estimated supply impact percentages assuming a risk elasticity of -0.05

Coverage level selected	25 percent									50 percent								
	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
Region																		
New England	0.11	0.18	0.25	0.33	0.42	0.54	0.62	0.78	0.96	0.21	0.35	0.50	0.64	0.81	0.98	1.25	1.48	1.68
Wisconsin	0.11	0.18	0.26	0.34	0.44	0.58	0.74	0.91	1.02	0.21	0.35	0.50	0.65	0.85	1.13	1.44	1.67	1.83
Minnesota	0.11	0.18	0.25	0.33	0.43	0.57	0.67	0.83	0.95	0.21	0.35	0.49	0.64	0.83	1.10	1.34	1.68	1.90
Florida	0.12	0.20	0.29	0.38	0.49	0.63	0.80	0.97	1.13	0.24	0.39	0.56	0.73	0.96	1.24	1.56	1.79	1.99
Appalachian	0.12	0.20	0.29	0.37	0.49	0.63	0.79	0.97	1.10	0.23	0.39	0.56	0.73	0.94	1.22	1.54	1.90	2.02
New Mexico	0.13	0.22	0.32	0.42	0.55	0.70	0.87	1.03	1.12	0.26	0.43	0.63	0.83	1.08	1.38	1.71	1.98	2.03
Western Texas	0.14	0.23	0.34	0.45	0.58	0.73	0.90	1.09	1.20	0.28	0.46	0.66	0.87	1.13	1.44	1.78	1.95	2.03
Southern Missouri	0.10	0.17	0.24	0.32	0.42	0.55	0.69	0.86	1.03	0.20	0.33	0.48	0.62	0.82	1.07	1.36	1.69	2.04
Ohio	0.11	0.18	0.26	0.34	0.44	0.57	0.72	0.88	1.06	0.22	0.36	0.51	0.67	0.86	1.11	1.41	1.74	2.05
Michigan	0.12	0.21	0.29	0.38	0.49	0.64	0.81	0.92	1.07	0.24	0.40	0.57	0.74	0.96	1.25	1.55	1.84	2.17
Illinois	0.12	0.21	0.30	0.39	0.51	0.65	0.82	1.01	1.15	0.24	0.41	0.59	0.76	0.98	1.28	1.61	1.91	2.19
Northwest	0.12	0.20	0.29	0.38	0.49	0.64	0.80	0.98	1.13	0.24	0.40	0.57	0.74	0.96	1.25	1.58	1.94	2.22
California	0.13	0.22	0.31	0.41	0.53	0.68	0.85	1.03	1.18	0.25	0.42	0.62	0.81	1.05	1.34	1.68	2.01	2.32
Coverage level selected	75 percent									90 percent								
	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
Region																		
New England	0.32	0.51	0.72	0.92	1.16	1.42	1.73	1.80	2.07	0.38	0.61	0.85	1.08	1.35	1.64	1.81	2.13	2.29
Wisconsin	0.31	0.52	0.73	0.93	1.22	1.63	2.08	2.27	2.70	0.37	0.61	0.86	1.09	1.42	1.89	2.38	2.57	2.81
Florida	0.35	0.57	0.82	1.07	1.39	1.80	2.15	2.51	2.78	0.42	0.68	0.97	1.25	1.63	2.10	2.46	2.81	2.99
New Mexico	0.38	0.64	0.92	1.21	1.57	2.01	2.46	2.68	2.63	0.46	0.75	1.09	1.42	1.84	2.36	2.89	2.91	3.05
Minnesota	0.31	0.51	0.72	0.92	1.20	1.59	1.97	2.42	2.75	0.36	0.60	0.85	1.07	1.39	1.85	2.29	2.78	3.06
Appalachian	0.35	0.57	0.82	1.06	1.37	1.77	2.24	2.52	2.72	0.41	0.68	0.96	1.24	1.60	2.07	2.61	2.85	3.17
Ohio	0.32	0.53	0.76	0.97	1.25	1.62	2.05	2.54	2.84	0.38	0.63	0.89	1.14	1.46	1.89	2.40	2.93	3.20
Western Texas	0.41	0.67	0.98	1.28	1.65	2.11	2.43	2.65	2.79	0.48	0.80	1.15	1.50	1.94	2.47	2.81	3.10	3.29
California	0.37	0.63	0.91	1.18	1.53	1.96	2.46	2.90	3.09	0.44	0.74	1.07	1.40	1.79	2.30	2.88	3.16	3.38
Southern Missouri	0.30	0.49	0.70	0.91	1.19	1.55	1.99	2.48	3.00	0.35	0.58	0.83	1.07	1.39	1.82	2.33	2.90	3.46
Illinois	0.36	0.60	0.86	1.11	1.42	1.85	2.34	2.71	3.20	0.43	0.71	1.01	1.30	1.66	2.16	2.72	3.11	3.53
Michigan	0.36	0.59	0.84	1.08	1.40	1.83	2.21	2.75	3.21	0.43	0.71	0.99	1.27	1.63	2.14	2.60	3.24	3.55
Northwest	0.35	0.58	0.84	1.08	1.40	1.82	2.32	2.87	3.27	0.42	0.69	0.99	1.27	1.64	2.14	2.72	3.37	3.76

Note: Risk level is defined as the root mean-squared downside deviations from the median gross margin.
Source: USDA, Economic Research Service calculations, data from USDA National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/) and USDA Agricultural Marketing Service, 2016, Livestock, Grain, and Poultry portal (https://www.ams.usda.gov/market-news/livestock-poultry-grain).

Of course, the overall supply impact across the United States will be small if participation in the program is small. In both 2015 and 2016, most U.S. milk production was covered by the program, but the most common margin selected was $4.00 per cwt. For 2015, only operations covered at the $8.00 per cwt level (about 0.4 percent of production history covered in the program) received any payments. Thus far, in 2016, the margin for the March-April couplet was low enough to trigger payments for operations covered at the $7.50 or $8.00 per cwt level (0.4 percent of covered production history). The margin for the May-June couplet was low enough to trigger payments for all coverage levels at $6.00 per cwt or above (9.3 percent of covered production history).

Comparison of MPP-Dairy to the Livestock Gross Margin for Dairy

Farmers have a choice between LGM-Dairy and MPP-Dairy through 2018—both programs aim to provide downside margin-risk protection to farmers but take very different approaches to doing so. For example, MPP-Dairy calculates margins using the U.S. all-milk price and national prices for feeds, whereas LGM-Dairy uses the futures prices for Class III milk, corn, and soybean meal to establish available margins. The use of different price series in the margin calculations means that farmers must adjust expectations for differences between those prices and the relevant milk and feed prices for their areas.

LGM-Dairy is more flexible in terms of feed costs and the amount of covered production. Farmers can adjust the quantities of corn and soybean meal they want included in the margin calculation within an accepted range. This effectively allows farmers to scale milk output and feed inputs appropriately to their operations, which allows them to tailor LGM-Dairy towards their individual feeding programs. LGM-Dairy is also more flexible in that a dairy farmer can cover all of the operation's production (subject to a limitation of 24 million pounds of milk per year); the maximum amount that operations can cover under MPP-Dairy is 90 percent of the established production history. Finally, LGM-Dairy allows farmers to choose the months they wish to insure, while MPP-Dairy requires farmers to make enrollment decisions that apply to the entire next calendar year.

While these features help distinguish the two programs, the primary differences lie in the design. Since LGM-Dairy is based on futures prices, margins and premiums will change as the expectations of milk and feed prices change. Farmers use LGM-Dairy to capitalize on current expectations of prices (Burdine et al., 2014b). As those expectations change, so will futures prices and the opportunity to use them for margin protection. When overall market conditions are good so that margins are larger, LGM-Dairy will allow dairy farmers to insure at higher levels, reflecting those favorable market conditions. In contrast, available MPP-Dairy margins, and the premiums associated with them, are fixed for the life of the 2014 Farm Act; they will not evolve with market conditions. During times when market conditions are not favorable, the fixed nature of MPP-Dairy margins and premiums will make the MPP-Dairy program more attractive to farmers. Therefore, LGM-Dairy is likely to be more attractive to farmers when overall market conditions are favorable (higher margins) and MPP-Dairy more attractive when they are not (lower margins). Note that producers choosing MPP-Dairy are not able to later switch to coverage under LGM-Dairy since MPP-Dairy participants must remain enrolled in the program until it expires at the end of 2018.

Results from the historical approach suggest that risk reduction impacts from full use of MPP-Dairy ($8 per cwt coverage at 90 percent) from 2002-13 would have had greater potential to reduce downside margin risk (46 to 75 percent) than LGM-Dairy (24 to 41 percent). However, risk reduction from MPP-Dairy gets progressively lower as lower margins and lower coverage levels are selected, falling to as low as 2-3 percent for $4 coverage at 25 percent. The inability of farmers to cover production growth through MPP-Dairy is also an important caveat to this finding.

Comparison of the two programs' effects on average margin is more complex due to the two-tiered premium structure of MPP-Dairy. For LGM-Dairy, both Burdine et al. (2014a) and Burdine et al. (2014b) (which used slightly different timeframes) found little impact (-1 to +2 percent) on overall

margins across regions. This study's findings suggest greater impact on margins, although those differences varied across the three sizes of operations considered. For small operations, full use of MPP-Dairy resulted in an increase in margins of 3.31 to 6.76 percent across regions.

Although the minimum $4 per cwt margin coverage resulted in small margin gains for medium and large operations, depending on the region, maximum use of MPP-Dairy resulted in reductions in average margins of -2.49 to -5.10 percent for medium-sized operations and -3.32 to -6.79 percent for large operations, at the highest level of coverage. (Note that these results assume continuous coverage at these levels throughout the entire timespan.) These estimated margin impacts for MPP-Dairy are not directly comparable to likely impacts for LGM-Dairy given that farmers under MPP-Dairy have the opportunity to elect coverage levels annually. MPP-Dairy participants may be more strategic in their approach by purchasing higher coverage levels when the likelihood of payment appears greater. In addition, margins for medium and large operations were improved from the no-MPP-Dairy case, with higher percentage levels of coverage for intermediate margins, and highest at $6.00 and $6.50 coverage levels with 90 percent of production history covered.

With respect to supply response, both MPP-Dairy and LGM-Dairy have the potential to induce expansion as both have the potential to provide protection for margins and to lower risk levels. Both this study and Burdine et al. (2014a and 2014b) make estimates of supply responses based on changes in risk levels. Risk reduction levels from full utilization of MPP-Dairy generally exceeded risk reduction levels from LGM-Dairy, which suggests that supply impacts from risk reduction are greater for MPP-Dairy. Further, while supply impacts from changes in average margins are likely to be small and were not quantified in this analysis, it is worth noting that net margin changes were generally larger for MPP-Dairy than for LGM-Dairy. However, the LGM-Dairy premiums and indemnities are not as decoupled from current production as with MPP-Dairy because payments with LGM-Dairy are tied to expected marketings at the time of the contract, rather than a historical production base. In this aspect, LGM-Dairy may have a greater supply impact for some participating producers. However, this is an ex-post analysis, and these findings would not necessarily hold looking forward.

MPP-Dairy in 2015 and 2016

Statistics concerning the MPP-Dairy program are available from USDA's Farm Service Agency (FSA) for 2015 and 2016 (USDA-Farm Service Agency, 2015, 2016b, and 2016d).[17] In 2015, 55.2 percent of licensed dairy operations—representing 80.7 percent of U.S. milk production—participated in the program (table 6). In 2016, 58.9 percent of licensed dairy operations representing 85.8 percent of milk production participated in the program. The change in the distribution of elected coverage was substantial (tables 7 and 8)—in 2015, 44.0 percent of participating operations chose $4.00 per cwt coverage, and there was a significant cluster (41.6 percent) choosing $6.00 and $6.50 coverage. In contrast, a majority of operations (77.4 percent) chose $4.00 per cwt coverage in 2016, and the $6.00-$6.50 cluster was 16.7 percent. For coverage distribution by milk production history, the preference for $4.00 per cwt catastrophic coverage was more pronounced—the share of covered production history at the $4.00 level was 61.5 percent in 2015 and 88.1 percent in 2016.

In 2015, small payments were made to farmers who signed up for the maximum coverage level of $8.00 per cwt (table 9). Only 261 operations (about 1.1 percent of participating operations, which represents only about 0.4 percent of the covered production history of participants) elected coverage at the maximum level. Premiums paid by dairy farmers for 2015 totaled $68.3 million, and indemnity payments received by dairy farmers in 2015 were $0.7 million. For the 2016 March-April couplet, payments were triggered for farmers who selected $7.50 or $8.00 per cwt coverage. This included 385 operations, about 1.5 percent of participating operations, representing about 0.4 percent of the covered production history of participants. The largest payments, thus far, were triggered by the May-June couplet for farmers who selected coverage of $6.00 per cwt or more. This included more than 4,800 operations, about 18.9 percent of participating operations, representing 9.3 percent of the covered production history of participants. The indemnity payments for the May-June couplet totaled about $11.2 million (USDA, Farm Service Agency, 2016c).

Table 6
Participation levels for Margin Protection Program for Dairy Producers (MPP-Dairy)

	Units	2015	2016
Dairy operations			
Number of licensed dairy operations in previous year	Number	44,809	43,584
Number electing coverage	Number	24,748	25,663
Percent of dairy operations electing coverage	Percent	55.2	58.9
Milk			
Milk production in previous year	Thousand pounds	206,054	208,633
Covered production history	Thousand pounds	166,319	179,103
Percent of milk production covered	Percent	80.7	85.8

Note: For each year, previous year numbers are shown for licensed dairy operators and milk production because dairy operators sign up for the program in the previous year.
Source: USDA, Economic Research Service, USDA Farm Service Agency, 2015, Results of 2015 MPP-Dairy Enrollment; USDA Farm Service Agency, 2016d, Results of 2016 MPP-Dairy Enrollment; USDA National Agricultural Statistics Service, 2016, Quick Stats (https://www.nass.usda.gov/Quick_Stats/).

[17]FSA may update and revise data periodically.

Table 7

Margin Protection Program for Dairy Producers (MPP-Dairy) enrollment data summary, 2015

	Units	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	Total enrolled
Operations											
Number of operations	Number	10,888	136	741	505	3,828	6,457	502	1,430	261	24,748
Percent of total operations	% of total	44.0	0.5	3.0	2.0	15.5	26.1	2.0	5.8	1.1	100
Milk											
Enrolled production history	Thous. pounds	97,091	482	6,534	2,803	29,584	22,306	1,007	4,229	1,007	166,319
Percent of total enrolled	% of total	58.4	0.3	3.9	1.7	17.8	13.4	0.6	2.5	0.6	100
Covered production history	Thous. pounds	87,382	426	5,747	2,368	24,591	17,119	826	3,020	583	142,063
Percent of total covered	% of total	61.5	0.3	4.0	1.7	17.3	12.1	0.6	2.1	0.4	100
Avg. % of production covered elected per level	% covered of enrolled	90.0	88.4	88.0	84.5	83.1	76.7	82.0	71.4	57.9	85.4

Note: Totals may not add precisely due to rounding.
Source: USDA, Economic Research Service, USDA Farm Service Agency, 2015, Results of 2015 MPP-Dairy Enrollment.

Table 8

Margin Protection Program for Dairy Producers (MPP-Dairy) enrollment data summary, 2016

	Units	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	Total enrolled
Operations											
Number of operations	Number	19,864	108	482	357	1,991	2,307	169	236	149	25,663
Percent of total operations	% of total	77.4	0.4	1.9	1.4	7.8	9.0	0.6	0.9	0.6	100
Milk											
Enrolled production history	Thous. pounds	155,773	278	3,502	1,081	10,924	6,340	320	571	314	179,103
Percent of total enrolled	% of total	87.0	0.2	2.0	0.6	5.8	3.6	0.2	0.3	0.2	100
Covered production history	Thous. pounds	140,195	238	3,109	850	9,161	4,798	248	389	223	159,210
Percent of total covered	% of total	88.1	0.1	2.0	0.5	5.5	3.0	0.1	0.3	0.1	100
Avg. % of production elected covered per level	% covered of enrolled	90.0	85.8	88.8	78.6	83.9	75.7	77.4	68.1	70.8	88.9

Note: Totals may not add precisely due to rounding.
Source: USDA, Economic Research Service, USDA Farm Service Agency, 2016d, Results of 2016 MPP-Dairy Enrollment.

Table 9

Milk margin per pay period for Milk Margin Protection

Pay period		Milk margin per pay period (dollars per hundredweight)
2015	Jan-Feb	7.99554
	Mar-Apr	7.50415
	May-Jun	7.99534
	Jul-Aug	7.69510
	Sep-Oct	9.08207
	Nov-Dec	9.88705
2016	Jan-Feb	8.00928
	Mar-Apr	7.14868
	May-Jun	5.76277

Note: At a milk margin minus feed costs of $8 or less, payments are possible depending on the level of coverage chosen by the dairy producer.
Source: USDA Farm Service Agency, 2016b, Dairy Margin Protection Program (http://www.fsa.usda.gov/programs-and-services/Dairy-MPP/index).

In early 2016, FSA made three significant changes to the MPP-Dairy program in order to make the program more attractive and increase participation:

- Dairy farmers may pay premiums through milk-check deductions if their handlers participate in this payment option (USDA-Farm Service Agency, 2016c).
- FSA clarified that, for a participating producer, 90 percent of production history is covered at the $4 per cwt level even if a lower percentage was selected at a higher margin by the producer (USDA-Farm Service Agency, 2016f).
- A participating dairy operation is allowed to update production history when an eligible family member joins the operation (USDA-Farm Service Agency, 2016f).

Conclusions

In general, a program like MPP-Dairy would have reduced downside risk had it been in place during January 2002 to December 2013. However, the level to which it would have reduced margin risk would vary by region, coverage level, and share of coverage selected by individual farmers. In general, regions with less variation in local margins were associated with greater percent reductions in risk levels from MPP-Dairy participation. Selecting higher coverage levels and higher percentages of coverage resulted in greater risk reduction. Results suggested that maximum utilization of the program (90 percent coverage at $8.00) would have resulted in risk reduction of 46 percent to 75 percent across regions.

Small operations would have benefited most from full participation in MPP-Dairy. At the lower premium structure, indemnity payments exceeded premiums for all coverage levels. Therefore, as more production history was covered and a higher protection level chosen, the average margin for a small farmer would have increased. Results suggested that small dairies maximizing their participation in the MPP-Dairy program would have seen average margin increase by $0.35 per cwt of milk covered. In short, for small operations, choosing the highest coverage level and maximum percent of coverage would have resulted in the highest margin and greatest reduction in risk level.

Once production histories move beyond levels where more than 4 million pounds per year can be covered, the decision to participate and the level of participation becomes less obvious from a historical perspective. At the $4 per cwt level, average margin is impacted only by indemnities received (not taking into account the annual $100 administrative fee). However, premiums at higher coverage levels increase as more milk falls into the higher premium structure. For medium (20 million pounds) and large (40 million pounds) operations, payments continued to exceed premiums up to the $6.50 level.

Historical margins were maximized for large and medium-sized operations at the $6.00, 90-percent coverage levels. At these participation levels, average margin impacts on medium and large dairies were $0.12 and $0.11, respectively. Once coverage moved beyond these levels, average margins decreased, which meant purchasing those higher coverage levels only made sense if the increased risk reduction was more desirable than the higher average margins. For larger operations, the question is whether to trade some level of expected margin for some level of margin risk reduction. If large producers favor increased risk reduction over higher program payments, individual farmers may find themselves examining coverage levels that exceed $6.00.

As for production impacts, decreases in risk level have the potential to induce a supply response. While the potential for risk reduction from the MPP-Dairy program is significant, risk elasticities are likely small, suggesting a small overall supply response, limited price impacts, and little change to the thrust of the realized margin results presented in this study when comparing MPP versus no-MPP scenarios. Examination of potential wealth effects and the potential for the program to attract new farms will likely be key subjects for further research if MPP-Dairy enrollment is sufficiently high. Enrollment for 2015 and 2016 may be telling in that overall enrollment in MPP-Dairy was relatively high (80.7 and 85.8 percent of U.S. milk production in 2015 and 2016, respectively). However, the majority of covered milk production in both years was covered at the $4.00 level. In 2015, only 1.1 percent of participating producers (those participating at the $8.00 per cwt level) would have actually received a payment for the year; thus far in 2016, payments have been triggered for 18.9 percent of participating producers (those participating at the $6.00 per cwt or higher level).

While this study provides an analysis of MPP-Dairy had it been in place from 2002-13, optimal levels of coverage and risk reduction during the study period may not be the same for future years. In making decisions regarding the program, individual farmers need to examine their own unique financial situations with respect to risk, since milk prices and costs differ from one operation to the next. Financial situations, market opportunities, market outlook, and attitudes toward risk in making decisions about coverage through the MPP-Dairy program will likely be key criteria for dairy farmers going forward.

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Glossary

Bundled option insurance: In the case of LGM-Dairy, similar to buying both call options on multiple feeds to limit higher feed costs and a put option to set a floor on milk prices.

Coverage level: The annually selected dairy farmer margin level—this can range from $4.00 to $8.00 per cwt in $0.50 increments.

Downside deviation from median: The median is the middle value in a series of numbers arranged from the smallest to the largest. The downside deviation from that median is the difference for numbers that are smaller than the median. For numbers that are the same or greater than the median, the downside deviation is zero.

Elasticity: The measure of a percentage change in one variable brought about by a 1-percent change in another variable.

Futures contract: An agreement priced and entered into on an exchange to trade at a specified future time a commodity, or other asset, with specified attributes (or in the case of cash settlement, an equivalent amount of money).

Indemnity: The compensation received by an individual for qualifying losses paid under an insurance policy. The indemnity compensates for losses that exceed the deductible up to the level of the insurance guarantee.

Mailbox prices: The net price received by dairy farmers at their farm gates. This includes all payments received for milk sold less the cost associated with marketing the milk.[18]

Options contract: A contract that gives the holder the right, without obligation, to buy or sell a futures contract at a specific price within a specified period, regardless of the market price of the futures.

Percentage of coverage: The percentage of *production history* milk that will be covered on an annual basis. This can range from 25 percent to 90 percent in 5-percent increments.

Premium: An amount of money paid to secure risk protection. The purchaser of an insurance policy pays a premium to obtain coverage.

Production history: The base from which a determination is made on how many pounds of milk can be covered through MPP-Dairy. For existing dairy operations, *production history* is the highest level of milk production marketed during the calendar years 2011, 2012, or 2013. Production history is adjusted each year to reflect the percentage increase in U.S. milk production.

Risk: Uncertainty about outcomes that are not equally desirable. Risk may involve the probability of making (or losing) money, harm to human health, negative effects on resources (such as credit), or other types of events that affect welfare.

Risk elasticity: Measures quantity change associated with changes in the risk environment without any change in price—i.e., a shift of the supply curve.

[18]Additional information on mailbox prices at http://www.ams.usda.gov/resources/marketing-order-statistics.