

The Agricultural Act of 2014 and Prospects for the California Milk Pool Quota Market

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We find that the Agricultural Act of 2014 has mixed effects on the market for California milk pool quota. First, the new Margin Protection Program (MPP) likely lowers the expected price of quota by increasing future expected dairy profitability. However, the MPP likely mitigates temporary declines in the price of quota by increasing liquidity during financial stress. The proposed federal milk marketing order for California would also have mixed effects on the price of quota. Higher minimum prices cause slightly lower farm profits and thereby raise quota prices. However, de-pooling would reduce the amount of milk eligible for the pool and shift down the demand for quota causing a lower price. Finally, by reducing the perceived quota policy risk, the farm bill contributed to the rise in the price of quota in 2014.

Key words: Agricultural Act of 2014, MPP, California milk marketing order, California dairy quota, farm bill, dairy policy

After years of economic fluctuations U.S. dairy policy changed substantially with the Agricultural Act of 2014. These policy changes may affect markets nationwide and globally. California dairy farms have recently faced even more economic turmoil than those in most of the rest of the United States. As a result, in addition to supporting changes to federal dairy policy, many producers, processors and others, have suggested changes in California state milk pricing regulations.

California has had its own separate state milk marketing order since the 1930s. The California Department of Food and Agriculture (CDFA) operates a classified price and revenue pooling program that, while similar in many ways to the federal milk marketing order (FMMO) system, also has significant differences. One difference is that a portion of the pooled revenue under the California order is distributed to dairy producers in proportion to the ownership of California milk pool quota. California and the FMMOs also differ in how they set minimum prices by end use class. California minimum prices have often been well below the federal minimums, especially for the non-fat milk

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component used in cheese production. This deviation in milk prices stimulated renewed interest in California shifting to the FMMO system. In response, the Agricultural Act of 2014 specifically provides that California may join the FMMO system while maintaining some form of a California pool quota program.

This paper focuses on how the Agricultural Act of 2014 is likely to affect the market for and the value of California milk pool quota. The potential shift to the FMMO system is one influence on the quota market, but the removal of price supports and the adoption of the Margin Protection Program for Dairy Producers (MPP) also have the potential to influence the value of quota.

It is important to understand at the outset that the California milk pool quota program is distinct from typical agriculture quota programs since the quota does not impose any production or marketing limits. Total quantity of the quota asset and the flow returns have been fixed since 1994 by the state. The quota is strictly a financial asset that provides fixed monthly flow returns to “quota” owners. The quota asset is freely tradable among dairy producers in California.

About \$13 million dollars, about 2% of California milk revenue, is distributed through the milk pool quota system each month. The capital value of this quota is currently about \$1.1 billion. Thus dairy farmers have significant wealth and potential for financial losses when dairy policy changes in ways that may affect the quota market. Given the long history of the quota program and the stability of returns changes in quota returns or operations are highly controversial and major issues for farmers considering changes in the marketing order.

The Agricultural Act of 2014 and California Federal Milk Marketing Order

First consider the provision for California to join the federal marketing order system. Section 1410(d) of the Agricultural Act of 2014 amends section 143(a) of the Federal Agricultural Improvement and Reform Act of 1996 by eliminating its time limitation of final amendments so that California can still be included in a separate FMMO even though the original deadline passed years ago. Section 143(a) of the 1996 Act states: “The order covering California shall have the right to re-blend and distribute order receipts to recognize quota value.” This provision, which is now operative again, allows California to join FMMO and maintain a quota system of distributing milk pool revenue, but is silent on precisely how that might be done.

Even though they are similar, there are complications in actually shifting from the California rules to the FMMO rules. In our analysis below, we highlight implications of two differences between the California and FMMO systems that have been the focus of much discussion (Newton, Thraen, and Novakovic (2014)). Most important are the differences in the milk pricing formulas themselves. Differences in rules regarding de-



pooling, which means withdrawals from the pool of processing plants, can also have significant implications.

The regulated minimum prices of the solid-not-fat component for milk entering FMMO Class III and California Class 4b (milk used for cheese) have diverged widely in recent years with the California price much lower than the federal price. The value attributed to whey has been much lower in the California Class 4b price compared to that under the federal system. We show below that economic prospects for dairy investments have the potential to affect the market for quota, therefore higher milk prices in California under a federal order may be expected to affect the price of quota.

Under the FMMO milk processing plants typically have more flexibility to “de-pool” and “re-pool” than they have under the California milk marketing order. Under the federal system, plants processing dairy products such as cheese, dry milk powder or butter can be de-pooled and not be subject to the minimum prices of marketing order. Under prevailing quota rules only producers delivering to plants in the pool may withdraw additional revenue from pool. Therefore, the potential for de-pooling under a FMMO for California would be likely to imply adjustments to which farms would own quota.

Under the MPP a dairy producer receives indemnity whenever the national all-milk price minus a national feed price index falls below that farm’s selected coverage level. We do not yet know how lucrative the MPP will be (Balagtas, Sumner, and Yu (2013), and Bozic et al. (2014)). However, the program is likely to increase expected profitability and the liquidity of dairy producers, due to subsidy and insurance aspects of the program.

Statistics released by Farm Service Agency in January 2015 show 69% of California dairy farms enrolled in the MPP and 35% of those who enrolled chose to buy coverage above the minimum for 2015 (USDA FSA (2015)). The enrollment is high enough to potentially affect the demand for quota. We show how changes in the long run expected profitability and the short run liquidity affect the demand for quota.

With this background we turn to considering implications for the market for quota.

The Capital Value of Farm Program Benefits

Several studies have found high rates of return for Canadian milk quota, which limits the production or marketing of milk (Moschini and Meilke (1988), Barichello (1996), and Nogueira et al. (2012)). Capital value of quota depends on the flow of returns defined by farm programs, the risk of quota in the context of the portfolio of farm assets, and the policy default risk in the program. Barichello (1996) and Alston (1992) emphasize how studies of quota can shed light on capitalization of government program benefits in general.



Sumner and Wolf (1996) showed that unlike most other quota programs, California milk pool quota does not limit milk production or marketing, but only determines an additional revenue flow and in that sense is a financial asset tradable among California dairy farms with no effective limit on productions or marketings. Since the quota asset is a tradable financial asset with fixed flow returns, it is also different from other infra-marginal payments that deter exit decisions of firms. Exit deterrence is very unlikely since most of dairy farmers including quota owners are above marginal level. And even for infra-marginal farmers, their internal valuations of quota need to be a lot greater than the market price of quota to deter exit decisions since the quota asset is a tradable asset. Regarding exit deterrence and infra-marginal payments, de Gorter, Just, and Kropp (2008) provide an illustrative theoretical framework and empirical evidence on the old Milk Income Loss Contract program.

Sumner and Wilson (2005) show that by having returns that are either not correlated with or vary inversely with returns to farm investments, investment in quota lowers the variability of the typical portfolio of dairy farms in California and thus, the producers pay extra for quota. The plausible alternative explanation of the high rate of return for dairy quota is policy default risk. Wilson and Sumner (2004) specify the price of quota as a function of expected flow return, liquidity of dairy farmers, and policy events, and find evidence supporting the importance of these explanators and of policy default risk.

The Flow Return and Market Price of California Milk Pool Quota

Buyers contribute revenue to the milk pool based on minimum prices for each end use class. Before that pooled revenue is distributed per unit of milk marketed, quota owners draw revenue from the pool for each unit of quota they own. Thus, the weighted average (blend) price that farms receive per unit of milk is total pool revenue (after deducting some relatively small allowances) minus payment to quota owners over total quantity of milk supplied to the pool.

Since 1994 the flow return to dairy quota has been fixed and so has been (approximately) the quantity of quota. The pool revenue, R_i of a farm i that owns Q_i pounds of pool quota is

$$R_i = PM_i + FQ_i$$

where M_i is the quantity of milk supplied to the pool and flow returns to quota, F , are only paid up to the amount of M_i for farm i . In other words, farms cannot receive payments on more milk than they market through the pool. Also, note that the payments



are based on the SNF component of the quota milk. The weighted average (blend) price, P , is defined as

$$P = \frac{R - FQ}{M}$$

where R , Q , and M are the pool-wide totals of the terms defined above for individual farm, i , (Wilson and Sumner (2004)).

The flow return per unit of quota has been fixed at \$0.195 per pound of solid-non-fat (SNF) per day, which is approximately equivalent to the annual return of \$71 per pound of SNF. However, the capital value of quota varies with the *expected* future capital gains, (including expectations about program changes), and the relevant discount rate applicable to future returns. Expected flow returns could differ from the historical return if the program provision changes. Determinants of this capital value are discussed in more detail in the next section.

There is an active market in quota and prices of sales of quota are recorded each month by the CDFEA. Several dozens of farms buy or sell quota each year, and the market is active every month. Figure 1 shows California milk pool quota prices per pound of SNF from January 1994 through September 2014. Prices of quota have been highly variable even though the flow return itself has not changed.

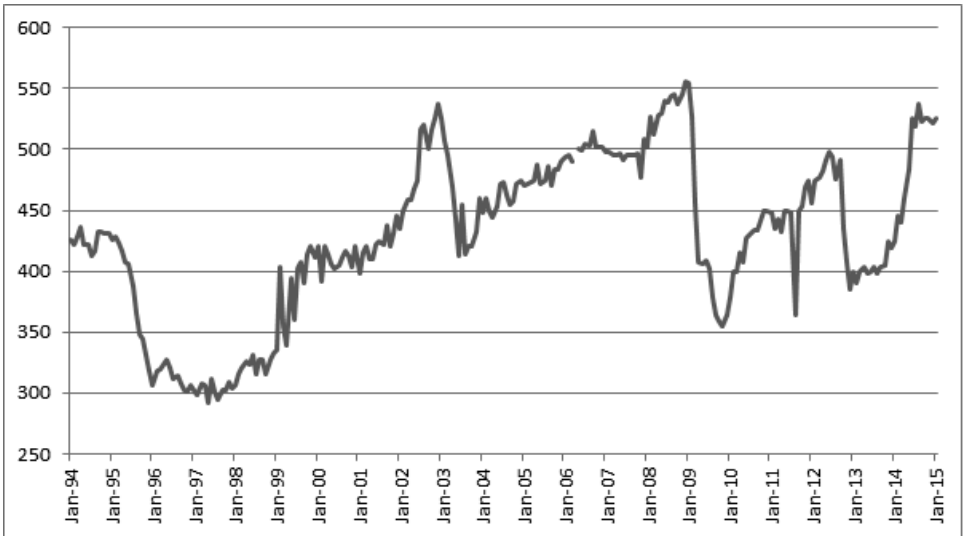


Figure 1. The Market Price of California Milk Pool Quota Varies Substantially from Month to Month



How Potential Policy Changes Affect the Market for Quota

We characterize the individual willingness to pay for a unit of milk pool quota, with a simple net present value model:

$$WTP_i = \sum_{n=0}^{N_i} \frac{F}{(1 + r_i)^n} \quad (1)$$

where F is again the fixed flow return to quota, r_i is the subjective discount rate of the individual i , and N_i is the subjective time horizon of the quota program of the individual i . We treat expectation of future F as fixed and assign the changes in the quota demand to r_i and N_i .

The subjective discount rate, r_i ; is an increasing function of the expected rate of return from alternative investments, π_i , which represents the opportunity cost of investment in quota. For the dairy producers, the most relevant driver of π_i is the expected rate of return to investments in dairy farming (cows, barns, equipment, etc.), which is a decreasing function of the rate of dairy investment, I_i . As the farmer shifts capital from quota ownership to the investments in dairy farm assets he faces a declining rate of return, which limits the size of the farm at some stage. Dairy producers face upward sloping supply functions for access to capital, which indicates that I_i is a decreasing function of the quantity of quota, Q_i , that individual i owns. Increasing the investment in quota lowers investments in farm assets and hence raises the rate of return from dairy farming and the subjective discount rate for owning quota. The higher long run expected rate of return to dairy farming, π_i , the higher the subjective discount rate and the lower the price of quota given fixed flow returns.

The discount rate also depends on the farmer's liquidity at the time of decision about investment in quota which we denote as $liquidity_i$. Liquidity indicates the producer's immediate access to capital including cash flow. We expect the higher the $liquidity_i$, the lower the subjective discount rate and the higher the price of quota.

The third factor affecting the subjective discount rate is the risk premium a farmer assigns to quota, $risk\ premium_i$. The risk premium, which does not include policy default risk, indicates how investment in quota contributes to the variability of the portfolio of the dairy producer. We expect the less the quota investment contributes to the total variability of the farm investment portfolio, the more one would value the flow return from the quota investment. The less returns to quota are correlated with returns to dairy farm investments the more farmers would be willing to pay for quota.

Therefore, we express the subjective discount rate as

$$r_i = r(\pi_i(I_i(Q_i)), liquidity_i, risk\ premium_i) \quad (2)$$



which is increasing in the amount of quota demand, Q_i . Substituting (2) into (1), we denote the willingness to pay for quota for the individual i is increasing in $liquidity_i$ and decreasing in π_i and $risk\ premium_i$.

The time horizon, N_i , measures how long the individual i thinks the program will last in its current form. We represent a higher policy default risk, including expectations about negative changes in the flow return, or other program adjustments that lower the value of quota, as a smaller value of N_i .

Since payment of quota revenue accompanies milk revenue from the pool, producers receive no revenue for quota in excess of the milk they market through the pool. That means the maximum *aggregate* demand for quota is total pool milk marketed in California, which we denote as \bar{Q} . Consider the distribution of WTP_i per unit of quota for an individual farm and across farms. We assign a willingness to pay for quota to each unit of milk marketed through the pool in California. The function $f(x)$ defines the density of the quantity of milk with a willingness to pay of x for an associated unit of quota. Thus, the market demand for quota may be expressed as

$$D(P) = \int_P^\infty f(x)dx,$$

where P is the market price of quota and $D(P)$ is quantity of quota that elicits a willingness to pay greater than or equal to that price.

Figure 2 shows the distribution of willingness to pay for quota. In Figure 2, the area under the density function is equal to \bar{Q} . The quantity of milk changes from month to month, while the quantity of quota is essentially constant. The quantity of quota has recently been equivalent to about 20% of the milk marketed in the California pool. We illustrate in Figure 2 that the market price of quota is at approximately 80% quantile of the willingness to pay distribution, with area A in Figure 2 equal to the total quantity of quota in California.

We use the framework of Figure 2 to explore how the Agricultural Act of 2014 is likely to affect the demand for California milk pool quota and therefore the market price and capital value of quota. The Agricultural Act of 2014 authorized the implementation of the MPP nationwide, whereas it only states the permission for California to join the FMMO system while maintaining the own milk pool quota program.



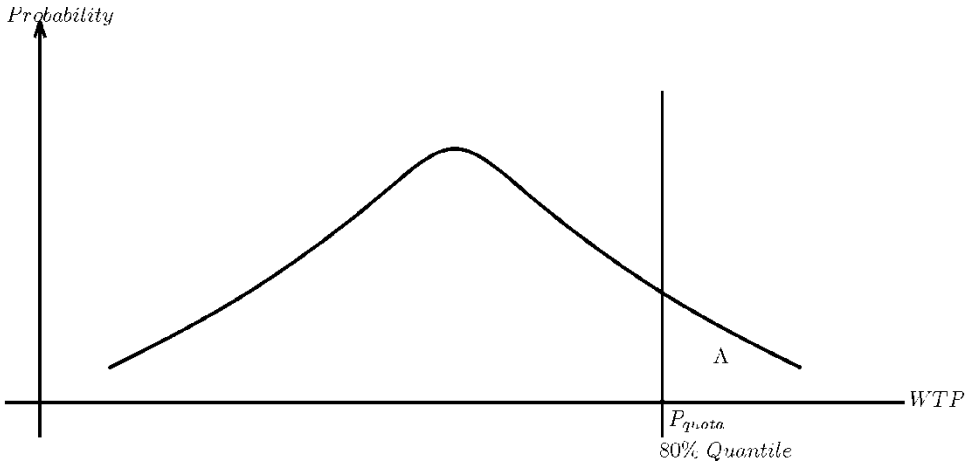


Figure 2. Distribution of the Willingness to Pay for California Milk Pool Quota

Expected Changes in the Price of California Milk Pool Quota from MPP

The MPP increases expected returns to dairy farm investments through the net subsidy element. To the extent that long run expected profit for the dairy operation increases due to the MPP, demand for quota falls. Willingness to pay for quota falls as dairy profitability, π_i , the opportunity cost of capital for investments in quota, increases.

Nicholson and Stephenson (2014) argue that the MPP may cause lower margins since dairy farms would not reduce production as much when dairy margins trigger the MPP indemnity payments. However, even if the MPP results lower margins, producers perceive dairy farming as more profitable with the MPP than otherwise due to its subsidy element. That means the impact on quota market also follows.

Through the insurance element, the MPP increases liquidity and access to capital in times of low dairy returns. The improvement of liquidity caused by the insurance element of the MPP has the opposite effect on the price of quota. With better access to liquidity, less quota is offered for sale in times of low returns from milk production. Dairy producers who would purchase quota but have a lack of liquidity and expensive credit will demand more quota under the MPP. Similarly, MPP reduces pressure to sell quota to raise capital when dairy cash flow is negative. In other words, MPP increases *liquidity*_{*i*} in equation (2), which in turn implies that dairy producers apply a lower discount rate on the future flow return from the quota investment and would therefore be willing to pay more for quota. We expect MPP to keep the price of quota (and other assets owned by dairy farms) from falling as much during periods when farmer liquidity is low, such as during periods of low margins.

A third effect of MPP follows from the role of quota in the farm portfolio. MPP may substitute for quota in producers' risk management plans. As Wilson and Sumner (2005) discuss, the investments in quota may reduce risk of the full investment portfolio of dairy producers. MPP also reduces the risk in the portfolio of dairy producers by eliminating the lower tail of the milk to feed price margin distribution, which suggests the potential substitution between quota and MPP. In this case, the introduction of MPP increases the *risk premium*_{*i*} in equation (2) and raises the subjective discount rate r_i . The price of quota would therefore fall.

In sum, introduction of MPP has three distinct effects on the price of quota. First, improved liquidity from the insurance element is expected to keep the price of quota from falling especially in times of financial stress as observed in 2009 (Figure 1). Second, any increase in the long run expected profitability of dairy farming would reduce the long term demand for and the average price of quota. And, third, the general risk management value of the MPP substitutes for quota and also reduces demand for quota. Empirical examination of the magnitude of these impacts is underway using 20 years of monthly data on quota, milk, and feed prices, and county quota quantities.

Expected Changes in the Price of Quota from Including California in the Federal Milk Marketing Order System

We consider the case of a federal order for California that keeps many of the current features and continues to distribute pool revenue to quota owners who deliver to the pool. We focus on two specific changes. First we consider the increase in the average pool price that is the main motivation for considering a federal order. Second we consider the increase in availability of de-pooling, which is an option that may become attractive to some proprietary processors in California.

Increase in Minimum Prices

Establishing a FMMO for California would likely increase the regulated minimum milk prices received by California producers. If the increases in the minimum prices mean that the profitability in dairy farming increases, the price of quota should fall for the reasons outlined above. To summarize, if the increase in the minimum prices due to FMMO adoption implies an increase in the rate of return of investments in dairy farming, the increases in the minimum prices would increase π_i in equation (2). If California dairy farmers expect the return from investments in dairy farm assets to be higher, given their finite access to capital, they would invest more in farm assets and less in quota. Or, as we

can see from equation (2), the willingness to pay for quota falls as π_i increases and the demand for quota shifts inward.

However, it is not clear whether higher regulated prices would be perceived by quota owners as increasing the profitability of dairy farming. Under current marketing order, the market for milk in California clears at prices slightly above the minimum prices, especially for Class 4b, where regulated minimums are most below their federal counterparts. In recent years in California larger over order premiums are more commonly paid by proprietary cheese plants than by other plants. Given linkages across components and minimums across end use classes, determining the effects of raising minimum prices on revenue and profits is complicated, but a few simple considerations are helpful. If the higher minimum prices are binding in the market, quantity of milk demanded falls and less milk is sold into that end use class. Since California producers almost surely face elastic long run demands for cheese (and milk used for cheese), increasing the minimum prices would reduce total revenue and producer surplus. In this context, we must be careful to consider how the market for milk clears when prices are set above market equilibrium. Of several potential options, one is for excess milk to be shipped at a loss out of the marketing order region and a second is for cooperatives or some other organization to limit access to the market with supply restrictions.

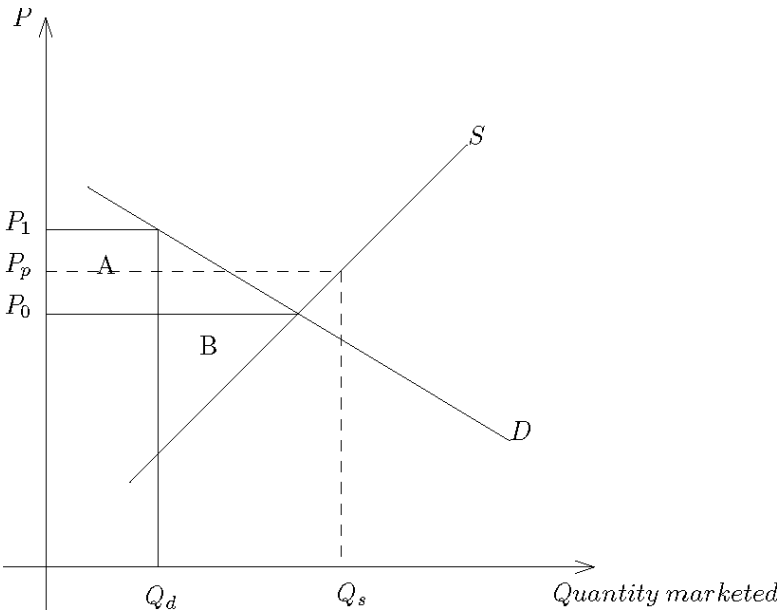


Figure 3. Increase in the Minimum Price of Milk and Industry Profit

Figure 3 illustrates a simple case of binding minimum prices. Before the higher minimum price, the market price is set where quantity demanded equals quantity supplied (at clearing price, P_0). If the demand elasticity facing milk from California is greater than 1.0, which is surely true because more than 90% of California milk is sold in national and global commodity markets, area A will be smaller than area B, and the producers lose from the new binding minimum price P_1 .

Moreover, unlike a monopoly supplier, the marketing order cannot control the quantity produced by individual farmers, which means that an increase in minimum prices leads to excess supply and, as noted above, the welfare effects depend on how the excess supply is handled. Individual farmers may face a perceived expected price with a probability of selling at the minimum price less than one. If we set the probability of milk selling at the minimum as the ratio of the market demand at the minimum price over the market supply at the perceived price, then the perceived expected price P_p satisfies

$$P_p = P_{min} \frac{D(P_{min})}{S(P_p)}$$

where we set a price of zero for milk not sold at the minimum price. We can then derive the possible range of the market supply at the equilibrium as

$$D(P_{min}) < S(P_p) < S(P_{min})$$

which clearly indicates the presence of excess supply. Extra losses occur from the excess supply $Q_s - Q_d$ in figure 3.

Under this example, California dairy farmers as a whole may expect lower profit under an FMMO. Lower rates of return to dairy investments on the farm, π_i , would lower the subjective discount rate for the capital value of quota, r_i , and raise the willingness to pay for quota. In that case, the price of California milk pool quota would rise because long term prospects for dairy farming fall.

De-pooling

Under the current California marketing order, all Grade A milk is subject to the minimum prices of the marketing order, so there is little incentive for a plant to leave the pool. Furthermore producers cannot receive quota benefits if their milk is delivered outside the pool. If de-pooling allows a plant to avoid paying minimum prices, raising minimum prices creates incentive for plants in California to de-pool so that they could pay their milk suppliers directly rather than indirectly through the pool.



Consider the potential effects of de-pooling under the assumption that milk supplied to de-pooled plants would not be eligible for quota returns. In that case, producers who wish to keep their quota would avoid delivering to de-pooled plants. Plants that wish to de-pool would need to offer incentives sufficient to compensate suppliers who own quota for selling their quota. In the context of our conceptual framework, the WTP_i would fall to zero if individual i decides to leave the pool. De-pooling would cause excess supply of quota in the market and the price of quota would fall. Those who previously valued quota more highly would need to find buyers who were unwilling to own additional quota at the prevailing price. Thus the price must fall to entice them to buy. Producers with quota may supply plants inside and outside the pool, so long as they supply to the pool a quantity not less than the amount of quota they own, but the same pressure on quota price applies. The price of quota falls with de-pooling, but the magnitude of the fall requires further data analysis. Data on the milk demanded by de-pooled plants and the milk produced by current quota owners who would shift to de-pooled plants are the key information to account for the magnitude of the fall in the price of quota.

Expected Changes in the Price of Quota from Changes in Policy Default Risk

Policy default risk represents the likelihood of a policy change that substantially lowers the return from policy-created assets. Sumner and Wilson (2005) conclude that the high rates of return to California milk pool quota could not be fully explained by high portfolio risk and default risk was a likely alternative. Wilson and Sumner (2004) provide empirical evidence supporting the importance of policy default risk for California milk pool quota. Nogueira et al. (2012) calculate the policy default risk for Canadian dairy quota and find the policy default risk increased until the Uruguay Round Agreement and decreased after the establishment of the World Trade Organization in 1994.

In the context of equation (1), we express policy risk as a lower N_i , which is the perceived time horizon over which quota returns are expected to last. Clearly, the willingness to pay is increasing in N_i . Therefore, a fall in N_i would shift the demand for quota inward and the price of quota would fall.

The provision in the Agricultural Act of 2014 that allows California to join FMMO without eliminating the current quota system likely caused a fall in the policy default risk, because it seems to provide for continuing quota even with a shift to a federal order. California producers who thought a federal order might be likely and would make the quota program vulnerable would have less concern after the legislation was signed into law. The rise in the price of quota in the spring and summer of 2014 is consistent with this hypothesis (Figure 1). Of course, the rise in price of quota is also consistent with

temporarily high milk margins that created a temporary rise in liquidity without raising long run expectations of profitability.

Conclusion and Further Research

We have discussed on how policy changes in the Agricultural Act of 2014 may affect the demand for California milk pool quota and the price of quota. The immediate change from the legislation was the authorization of the MPP. We expect the MPP to decrease the average price of quota in the long run, but lead to smaller declines in the price of quota in periods of financial stress. Another likely response to the legislation was a fall in perceived policy default risk, which may have caused a rise in the price of quota. Thus, the immediate change from the legislation itself would be to increase the price of quota.

We have raised several issues concerning prospects for the price of quota under a transition to a federal milk marketing order for California. If California joins the FMMO system, minimum prices would likely rise. Contrary to some expectations, we suggest that higher pool minimums would lower the profitability of dairy farming in the long run and raise the demand for and price of quota. We show that de-pooling under a federal order for California would likely lower demand for and the price of quota.

This paper has raised many questions about the market for California milk pool quota after the Agricultural Act of 2014. One of the most interesting issues surrounding a proposed Federal order for California would be the Federal order's effect on the price of quota. This question affects the value of an asset owned by California dairy farms that is now worth about \$1.1 billion. Therefore, it is worthwhile to develop further empirical information on these questions, which is one of the topics of our current research using monthly and county data on quota prices and quantities along with relevant dairy market information.

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