Commodity Policies and Product Differentiation: the California Milk Marketing Order and the Organic Dairy Sector

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Abstract
This paper evaluates the economic consequences of milk marketing orders for producers and consumers in organic and conventional milk markets. We develop a multi-market equilibrium displacement model that disaggregates the organic and conventional segments of the California milk market in order to evaluate the economic effects of alternative policies. We find that exemption of organics from marketing order regulation would make organic farmers better off at the expense of conventional farmers, but that complete deregulation would make both organic and conventional farms worse off.

Keywords: California, cartel, dairy, equilibrium displacement model, milk marketing orders, organic

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Milk marketing orders have been a central element of dairy policy in the United States since they were established as part of the Depression-era farm programs of the 1930s. Marketing orders set minimum prices that processors must pay for milk based on end use, implementing a price discrimination scheme (a higher price is set for milk used in beverage products) with revenue pooling. A substantial literature on the economic of milk marketing orders shows that they effectively raise the farm-level price, and thus increase economic surplus for participating dairy farmers (e.g., Ippolito and Masson; Cox and Chavas; Sumner and Wolf).

The finding that all dairy producers benefit from milk marketing orders depends on the assumption that dairy farmers produce a homogeneous product. Indeed, the rationalization for revenue pooling is that all Grade A dairy farms produce the same product and thus should receive a similar price. However, the assumption of a homogenous product has become increasingly tenuous as producers and processors within the dairy sector increasingly use product differentiation (e.g., organic, "traditionally" farmed, grass-fed, regional denominations, etc.) as a means to increase profits (Lansink, Pietola and Backman 2002). This gradual transition away from commodity-oriented agriculture raises questions about the economic consequences of milk marketing orders and other commodity-based farm programs. Specifically, commodity-oriented regulation such as milk marketing orders may have differential effects on different types of producers.

Notably, organic dairy products are differentiated from conventional products by a set of regulations that affect the production process. The National Organic Program (NOP), which was established by the USDA in 1990, restricts the use of certain inputs (e.g., non-organic feed, antibiotics) and mandates the use of other inputs (e.g., organic feed and pasture) (Rawson 2005).

Consumers do not view organic and conventional products as perfect substitutes, as evidenced by significant premiums for organic products (Dhar and Foltz 2005). According to Dhar and Foltz, consumers are willing to pay as much as $3.00 per gallon more for milk from cows not treated with genetically-modified hormones and antibiotics, and fed organic feed. Yet milk marketing orders do not recognize organic milk as a distinct product. Rather, marketing order regulations apply equally to organic and conventional products. Given that the organic milk market differs from the conventional market in both supply and demand, milk marketing order regulations likely have different implications for prices, quantities, and welfare in organic and conventional milk markets.

Milk marketing order regulation is not the only commodity-oriented policy that may have different implications for producers of differentiated products. Recent manifestations of this conflict include legal challenges to commodity check-offs from producers, and different commodity policy preferences for small and large producers. Generic commodity promotion funded by check-offs have come under legal challenge from producers who are attempting to produce a differentiated product and do not want to be associated with a commodity. In two recent court cases, producers argued that generic advertising hurts producers of higher quality products by sending an unintentional signal to consumers that all generically-advertised brands are of the same quality (Crespi and Marette 2002).

In 2002, a dairy farm filed a lawsuit challenging the constitutionality of the USDA's mandatory dairy promotion program. The farm argued that it uses "traditional" dairy farming methods, meaning no hormones or antibiotics are used on the cows and the cows are grazed feed, and objected to paying the check-off which funded generic advertising for milk because the advertising does not differentiate between conventional and non-conventional milk. The courts ruled in favor of the plaintiffs stating that "the government may not compel individuals to fund speech or expressive associations with which they disagree" (Pittman 2004). These types of arguments have been made against other commodity based programs including California peach and nectarines, the national beef check-off, and the national pork check-off (Becker 2005). The 2002 Farm Bill contained provisions that exempted any person who produced and marketed only 100 percent organic products from paying assessments under a commodity promotion law.

The California milk marketing order has faced similar legal challenges. In 2002, two organic processors in California filed suit against the California Department of Food and Agriculture to allow for the exemption of organic milk from the California milk marketing order. The plaintiffs argued that the state-imposed pooling fees required them to "subsidize" the conventional dairy industry. Furthermore, one of the companies argued that organic consumers pay about $0.50 per gallon more due to the pooling fees (Johnston 2002). However, in late 2003 the courts ruled against the organic processors and decided that marketing order regulation should treat organic milk similarly as non-organic milk (CDFA "California Dairy Review").

This paper attempts to answer the question: Do marketing orders have differential economic effects on organic and conventional producers and consumers? The paper lays out the quantitative effects of organic milk and the California milk marketing order regulation on producers and consumers. Unlike previous studies, we disaggregate organic milk from conventional milk, and simulate counterfactual scenarios against which we measure organic milk's effects.

Background: Federal and California Milk Marketing Orders

The federal milk marketing order is organized into ten regions. Each of these federal marketing orders regulates milk within a geographically defined marketing area. As of 2005, the ten federal marketing orders regulated the sale of 60 percent of all milk produced in the country. California, which operates its own marketing order, regulates the sale of 21 percent of the country's milk. Most of the remainder is regulated by other state orders (Maine, Montana, Virginia), and a small portion is unregulated (CDFA, "2005 Dairy Statistical Annual").

Milk marketing orders use price discrimination and revenue pooling to increase returns to dairy farming for participating producers. Marketing orders set minimum prices that processors must pay for raw farm milk based on end-use, raising farm revenue for milk by setting a higher minimum price for milk in the fluid market which has relatively inelastic demand. An average or blend price is then paid to all producers regardless of the use of the milk. Price discrimination and pooling of milk effectively raise the farm-level price, and thus economic surplus, for participating dairy farmers (e.g., Ippolito and Masson 1978; Sumner and Wolf 1996; Cox and Chavas 2001).

Although the California is administered independently of the federal milk marketing orders, it mirrors the federal order in that it has a classified pricing system (prices based on end-use, with fluid milk receiving the highest price), pools the revenues from all milk sales (fluid and manufacturing milk), and distributes the revenues to California dairy producers. As in the federal order, the California order pays producers a monthly blend price that reflects the poolwide (i.e. statewide) milk utilization of all classes. The main difference between the California and Federal order is California's milk quota system. California producers who own quotas receive $0.195 per pound of nonfat solids, or $1.70 per hundredweight of milk (Sumner and Wilson 2000). California's quota system can be viewed as a modified pooling mechanism in which the quota is used to distribute rents created by price discrimination. With the use of price discrimination and pooling, California's milk marketing order also raises the farm-level price and producer surplus for participating California dairy producers.

Because marketing orders raise prices to benefit producers, they have been described as a government-sponsored cartel (see, for example, Pindyck and Rubinfeld, p. 456). Unlike other cartels, milk marketing orders do not control supply but raise the average price by law through price discrimination. However, like textbook examples of cartels, the ability of marketing orders to raise the price of milk depends on keeping producers and processors within the order. Defection of producers from marketing orders undermines the regulatory structure. Government enforcement of milk marketing order regulations prevents such defection.

Several authors have examined the effects and social costs associated with milk marketing order regulation. Ippolito and Masson (1978) developed a widely used model of the federal milk marketing order regulation, which built from Kessel's (1967) model of price discrimination. Both Kessel (1967) and Ippolito and Masson (1978) found that marketing orders increase the Class 1 (fluid milk) price at the farm level, which increases the blend price for regulated producers and decreases the Class 2 (manufacturing milk) price. With the increase in the price of Class 1, consumption for fluid milk decreases, but with higher blend prices total milk supply increases. Price discrimination effectively taxes the sale of fluid milk. Class 2 production is subsidized as the supply of milk to manufacturing uses increases because of increased total production and decreased fluid milk consumption. The higher incentive price for producer makes them better off.

The same basic framework used by Ippolito and Masson (1978) has been adopted by the subsequent literature. Most recently, Cox and Chavas (2001) and Balagtas and Sumner (2003) extend the basic framework to consider the regional implications of marketing orders. These papers examine the spillover effects that each regional milk marketing order has on producers and consumers in other regions. A key result here is that each marketing order benefits producers in that marketing order at the expense of producers outside the marketing order, including producers regulated by other marketing order. Sumner and Wolf (1996) used a similar framework to evaluate the economic implications of the California milk marketing order. The authors modeled how the California policy of classified pricing, blend prices, and quota compared with two alternative dairy models 1) federal–style marketing orders which have a blend price but operate without quota and 2) a traditional marketing quota (production limiting) program. Sumner and Wolf found that in aggregate, the quota program lead to more milk production than a typical marketing quota program (i.e. production limiting), but less milk production then blend pricing without milk quota (i.e. the federal milk marketing order). The California order generates more producer surplus and smaller welfare losses than a federal-style milk marketing order. Additionally, the authors found that when Class 1 milk sales expanded, production increased less under the quota program than with the federal-style milk marketing order.

Nearly the entire extant literature on milk marketing order regulation treats assumes dairy farms within each marketing order are homogeneous, with the implication that higher incentive prices for milk make all producers better off. However, farms exhibit heterogeneity in many dimensions, including farm size, production technology, and milk quality, and these differences may have implications for the distribution of welfare effects of milk marketing orders, or other policies, across producers. We derive an equilibrium displacement model that allows for a particular type of heterogeneity that is of growing importance in U.S. dairy markets; namely, we distinguish between organic dairy farms and conventional (i.e., not organic) dairy farms. As discussed above, there has been some pressure from organic producers to be exempted from marketing order regulation, which is itself an indication that marketing orders may have different implications for organic and conventional farms. We apply our model to quantify the effects of California milk marketing order regulation on prices, quantities, and welfare in markets for organic and conventional milk.

Conceptual Model of the California Dairy Industry

Consider a stylized model of the California milk market in which farm milk is sold to two uses, fluid milk and manufacturing milk. Moreover, dairy farms produce two types of milk: conventional milk, which may be used in conventional fluid or manufacturing products, and organic milk which is used only in organic fluid products. Conventional and organic fluid milk are imperfect substitutes in consumption.

Current California milk marketing order regulation sets the minimum price paid by fluid milk processors as a fixed differential over the processor price for (conventional) manufacturing milk. The fixed differential is, in essence, a per unit tax levied on conventional and organic fluid milk. The regulation does not distinguish between conventional and organic milk. Rather, all fluid milk processors pay the differential into a pool. A portion of the tax revenue collected from the fluid milk market is given to owners of quota. The remaining revenue is pooled and paid out to producers in the form of a blend price.

Figure 1 illustrates equilibrium in the conventional and organic milk markets under current California milk marketing regulation. In panel a, $D_{cf}^{0}(W_{cf})$ is the relatively inelastic demand at all prices for conventional fluid milk, and demand for manufacturing milk is assumed to be perfectly elastic at price W_{cm}^{0}. Under marketing order regulation $W_{cf}^{0} = W_{cm}^{0} + D$ and is the minimum price that conventional processors must pay for fluid milk. In panel b, $D_{nf}^{0}(W_{nf})$ is demand for organic milk. Price discrimination drives a wedge, D, between the price organic processors pay, W_{nf}^{0} and the price received by organic producers, WB_{n}^{0}. Equilibrium quantity in the organic market is M_{nf}^{0}. Tax revenue from the organic market, DM_{nf}^{0}, is equal to the area marked by horizontal hash markets.

In panel a, revenue pooling is modeled in by adding tax revenue generated from the organic market (again represented by the area with horizontal hash marks) to the tax revenue from the conventional market, DM_{cf}^{0}. Of the total pooled revenue from both fluid markets, the portion allocated to quota owners is represented by the area marked by diagonal hash marks. The remaining pool revenue is paid out as an average price to all producers. Thus, the curved line labeled "Blend Price" is average revenue, and is the incentive price for conventional milk producers. (It is assumed here that the price paid to organic producers, WB_{n}^{0}, is higher than the blend price, the difference representing a premium that organic processors pay for organic milk relative to conventional milk). Conventional market equilibrium is found where the blend price intersects marginal cost of conventional milk (MC_{c}), at WB_{c}^{0}, resulting in conventional production M_{c}^{0}. At this point, M_{cf}^{0} is supplied to the fluid market and M_{cm}^{0} to the manufacturing market.

Figure 2 graphically depicts market equilibrium under Scenario 1, exemption of organic milk from the milk marketing order. In panel b, elimination of the implicit tax, D, decreases the price processors pay for raw organic milk and increases the organic farm price. Organic market equilibrium is price W_{nf}^{1} and quantity M_{nf}^{1}. Both organic producers and consumers benefit from the policy change. Producer surplus increases as farm prices rise and consumers benefit from reduced prices.

In Panel a of Figure 2, exemption of organics reduces pool revenue, resulting in a lower blend price. The downward shift of the blend price curve causes the blend price to drop in the equilibrium from WB_c^0 to WB_c^1, and a reduction in conventional milk production from M_c^0 to M_c^1.

This graphical analysis makes two simplifying assumptions that mask some of the effects of exempting organics from the marketing order. First, demand for conventional manufacturing milk is taken to be perfectly elastic. In fact, with downward-sloping demand for manufacturing milk, the reduction in conventional milk production, which causes a reduction in the quantity of milk sold to the manufacturing market, would cause an increase in the price of manufacturing milk. The conventional fluid milk price would also rise, given the fixed fluid milk differential.

Second, the graphical analysis ignores the cross-price effects in demand for conventional and organic fluid milk. Allowing for substitution in demand for organic and conventional fluid milk, the lower price of organic milk resulting from organic exemption would cause a reduction in conventional fluid milk demand, and thus exacerbate the negative effects of organic exemption on conventional dairy farms. The higher price of conventional fluid milk would, in turn, increase demand for organic milk, and thus make organic exemption even more beneficial to organic dairy farms.

Both of these simplifying assumptions are relaxed in the numerical simulation model developed below.

Figure 3 illustrates the impact of the elimination of the California milk marketing order. Elimination of the marketing order removes price discrimination, milk quota, and revenue pooling. In this scenario it is assumed that there is an absence of market power from cooperatives, processors, and retailers. With this in mind, all conventional milk should receive the same price regardless of end-use. Equilibrium in each market is found at the intersection of supply and demand. In the organic market, the equilibrium is similar to that in Figure 2. In the conventional market, total demand is the horizontal sum of the two demand curves, resulting in price W_{cm}^{0}, production M_c^2, and conventional fluid milk consumption M_{cf}^2.

The graphical analysis suggests that elimination of the marketing order makes conventional producers worse off and organic producers better off relative to the status quo. Here, however, the simplifying assumptions discussed above—perfectly elastic demand for manufacturing milk, and no cross-price effects of demand—have important implications for the economic effects of deregulation. First, with perfectly elastic demand, elimination of the marketing order must lower the marginal price of conventional milk. If demand for manufacturing milk is downward-sloping, the effect of marketing order regulation on the marginal price of manufacturing milk is ambiguous.

Second, the assumption of no cross-price effects in demand can be important, given the relative large changes in fluid milk prices. Allowing for cross-price effects, the reductions in prices of conventional milk causes a decrease in demand for organic milk, and the reduction in the price of conventional milk causes an increase in demand for conventional milk.

In the numerical simulation model that follows, both of these simplifying assumptions are relaxed.

Empirical Model of the California Dairy Industry

We develop a multi-market equilibrium displacement model (EDM) of the California milk market for the purpose of measuring the implications of removing organic milk from the marketing order and the full elimination for the California marketing order (see Alston, Norton, and Pardey 1995 for a thorough treatment of equilibrium displacement models). In this section we describe the model and in the next section we parameterize and simulate the effects of the organic milk market on the California milk marketing order.

In our model, we disaggregate horizontally-linked dairy markets, with explicit supply and demand equations for conventional fluid milk, conventional manufactured products, and organic fluid milk. For each of these products, the vertical relationships that link farm production to retail demand are modeled (i.e. farm, processor, and retail levels). The link between the conventional and organic markets is that consumers view the two as imperfect substitutes. Finally, milk marketing order regulation—price discrimination, the California milk quota, and revenue pooling—are all represented in the model.

In the EDM, we disaggregate the milk by production method, conventional, *c,* and organic, *n*. Then to keep the explanation relatively simple, we specify the model with milk used in the manufacture of two distinct dairy products, fluid products, *f*, and manufactured products, *m*, for conventional milk. For organic milk we assume that all raw milk is being used to meet fluid demand. This assumption abstracts from the small portion of organic milk used to produce manufactured products. However, the vast majority of organic milk is sold to the fluid market. Additional assumptions of the model include fixed proportions production technology of dairy products and milk markets, and that dairy product markets are perfectly competitive in the absence of marketing order regulation. That is, it is assumed that neither producers, processors, nor consumers exercise market power in unregulated dairy markets.

The multi-market model, with one input and two dairy product outputs is written in general form as follows:

(1) *Conventional milk supply* $MT_c = M_c\ (WB_c)$

(2) *Organic milk supply* $MT_n = M_n\ (W_{nf})$

(3) *Production of conventional fluid products* $X_{cf} = \gamma_{cf}(M_{cf})$

(4) *Production of conventional manufactured products* $X_{cm} = \gamma_{cm}(M_{cm})$

(5) *Production of organic fluid products* $X_{nf} = \gamma_{nf}(M_{nf})$

(6) *Conventional fluid product demand* $X_{cf} = X_{cf}(P_{cf}, P_{nf})$

(7) *Conventional manufactured product demand* $X_{cm} = X_{cm}(P_{cm})$

(8) *Organic fluid product demand* $X_{nf} = X_{nf}(P_{nf}, P_{cf})$

(9) *Conventional milk adding up condition* $MT_c = M_{cf} + M_{cm}$

(10) *Organic milk adding up condition* $MT_n = M_{nf}$

(11) *Pricing of conventional fluid products* $W_{cf} = \gamma_{cf} [P_{cf} - MAKE_{cf}]$

(12) *Pricing of conventional manufactured products* $W_{cm} = \gamma_{cm} [P_{cm} - MAKE_{cm}]$

(13) *Pricing of organic fluid products* $W_{nf} = \gamma_{nf} [P_{nf} - MAKE_{nf}]$

(14) *Conventional price discrimination* $W_{cf} = W_{cm} + D_c$

(15) *Milk Price Incentive* $W_{nf} = WB_n + \theta D_n$

(16) *Pooled quantity of milk* $MPOOL = MT_c + \theta MT_n$

(17) *Total Revenue* $TR = M_{cf}W_{cf} + M_{cm}W_{cm} + \theta(M_{nf}W_{cf})$

(18) *Pool Revenue* $PR = TR - QR$

(19) *Conventional blend price of milk* $WB_C = PR / MPOOL$

Equation (1) expresses the supply of conventional milk, M_c, as a function of the farm price of milk, WB_c, and equation (2) represents the supply of organic milk, M_n, as a function of the price of organic milk at the processing level, W_n. Equations (3)-(5) are the production functions that transform raw milk into dairy products, X_{ij}, where γ_{ij} is the yield factor for production method i and product j, $i = (c, n)$, $j = (f, m)$.

Equations (6)-(8) are the retail demands for dairy products. Demand for fluid dairy products is interdependent as each demand function is a function of the retail prices for both fluid products (i.e. conventional and organic), P_{cf} and P_{nf}. Conventional manufacturing demand is expressed as a function of the retail price of milk used in manufacturing products, P_{cm}, and fluid and manufacturing products are assumed to be unrelated in demand.

Equations (9) and (10) are adding-up conditions that make supply of milk equal demand for milk in all uses. Equations (11)- (13) express the competitive equilibrium condition for milk, that the processor price of milk in fluid or manufactured products is equal to the value of the marginal product of milk minus the manufacturing costs, or make allowance (*MAKE*), for that particular dairy product, where γ_{ij} is the marginal product of organic or manufacturing milk in product j. Equation (14) captures price discrimination by the California milk marketing order, which raises the price of milk paid by conventional fluid processors by a fixed mark-up, D_c, relative to that paid for manufacturing milk. Similarly, equation (15) expresses price discrimination by the marketing order in organic markets. Under our assumption of no manufacturing organic milk, price discrimination essentially acts as a tax that drive a wedge between the price processors pay for organic milk and the price organic farms receives. θ is a dummy variable that equals one if organic milk is included in the marketing order, as it is in the status quo, and zero otherwise. Equation (16) calculates the total quantity of milk in the California marketing order, or as it is commonly referred to as "the pool." Under current policy the pool is the sum of both conventional and organic milk produced within the state. However, when we model the elimination of organic milk the pool includes only conventional milk. Equation (17) is the total revenue generated by the pool. When organic milk is included in the marketing order, the quantity of organic milk is multiplied by the processor's price for conventional fluid milk. Equation (18) is pool revenue, or the residual revenue after the quota revenue, *QR*, has been removed. When we model the full elimination of the California marketing order, *QR*, total revenue and pool revenue will be eliminated as all three are artifacts of the marketing order regulation. Equation (19) defines the blend price of milk paid to conventional producers under the California milk marketing order.

Measuring the Effects of Alternative Policies

Simulation of the model is used to quantify the effects of California milk marketing regulation. The status quo policy is compared to two alternative policies:

1. Exemption of organic milk from the California marketing order, with the regulation applied only to conventional milk.
2. Full elimination of the California marketing order.

Exemption of organics from the marketing order (alternative policy scenario 1) is simulated by setting $\theta = 0$. Full elimination of the California marketing order (alternative policy scenario 2) is simulated by eliminating price discrimination ($D_c = 0$) and eliminating quota revenue ($QR = 0$), in addition to $\theta = 0$.

The model is calibrated to 2005 data on California milk markets, and parameterized using supply and demand elasticities drawn from agricultural economic literature, wherever possible. Data, reported in Table 1, were obtained from the California Department of Food and Agriculture. No data are available on the actual production of organic milk; however, estimates on market share are available. The California Certified Organic Farmers Association (CCOF) estimates that the current organic market share in California is about three percent. For the purpose of this study we estimate that organic production is three percent of the conventional farm production. Additionally, no data is available for organic prices. The organic processor price for organic fluid milk is estimated to be a fixed mark-up of 45 percent over their conventional counterpart, a figure we obtained from private correspondence with officials at the CDFA. Using this mark-up, the organic farm price in the base model is $21.51 per hundredweight which is within the range provided by the Dairy Marketing Branch. Based on observed retail prices, the organic retail price is estimated to be $7 per gallon.

An intermediate time range for supply elasticity of three to seven years is used to allow producers to adjust to permanent regulation changes. With this time frame, adjustments in milk production due to changes in prices and regulation modifications should be seen. Chavas and Klemme (1986) estimated supply elasticities to range of 0.22 and 1.41 for this time period. In their research, Ippolito and Masson (1978) used an estimated range of 0.4 to 0.9. Sumner and Wolf (1996) used a range of 0.5 to 2.0 for their 1996 study on California dairy policy. Cox and Chavas (2001) used a milk supply elasticity estimate of 0.37. Balagtas and Sumner (2003) used an elasticity of supply of 1.0 for their study. Chen, Courtney, and Schmitz (1972) estimated supply elasticity to be 2.53. For this study, a supply elasticity of 1.0 is used, which is within the range of previous studies.

Estimates of own-price elasticity of demand for fluid milk range from -0.34 (Ippolito and Masson 1978) to -0.076 (Helmberger and Chen 1994). For manufacturing milk, demand elasticities range from -0.35 (Helmberger and Chen 1994; Dahlgran 1980) to -0.2 (Ippolito and Masson 1978; Balagtas and Sumner 2003). In this analysis the regional fluid demand elasticity is assumed to be -0.3 and the elasticity of the national demand for manufacturing milk is assumed to be -0.3.

The elasticity of manufacturing demand facing California is calculated ad the elasticity of excess demand facing California:

(20) $$\eta^{CA} = \frac{1}{s^{CA}}\eta^{US} + \left(1 - \frac{1}{s^{CA}}\right)\varepsilon^{ROC},$$

where η^i is the demand elasticity in i (i = California, United States), ε^{ROC} is the milk supply elasticity from all United States producers minus California, and s^{CA} is California's share of United States manufacturing milk. Given a supply elasticity of 1.0 and a national demand of -0.3, the elasticity of demand for manufacturing milk facing California is -5. Manufacturing milk demand elasticity facing California is more elastic than the United States because California producers face a higher level of competition that includes the United States and the world.

According to research done on organic milk, the supply and demand for organic milk are more inelastic than conventional milk (Dahr and Foltz 2005; Glaser and Thompson 2000). We have assumed the elasticity of farm supply of organic milk to be 0.5, elasticity of retail demand for organic fluid milk to be -0.2. Cross-price elasticities of demand for organic and conventional fluid milk are not available. We assume that the elasticity of demand for organic milk with respect to conventional milk is 0.1, while the elasticity of demand for conventional milk with respect to organic milk is 0.2.

Supply and demand elasticities used in the model are reported in Table 2. The numerical results from simulation analysis depend on our choice of supply and demand elasticities parameters, the quantity of organic milk produced in California, and retail price for a gallon of fluid organic milk. In an appendix available from the authors, we examine the sensitivity of our results to our assumptions on parameters for elasticity, organic production, and organic retail price.

Results

Table 3 reports the simulated annual effects of the two alternative dairy policies: scenario 1 (exemption of organic milk from the marketing order), and scenario 2 (the full elimination of the

California milk marketing order). For both scenarios, the table reports the equilibrium changes in prices and quantities of milk and dairy products, as well as in producer and consumer surplus for both conventional and organic markets, relative to the status quo.

Exemption of organic milk from the California milk marketing order would eliminate the implicit tax on the sale of organic milk, thus increasing the price received by organic farmers and decreasing the price paid by organic processors. Farm-level prices of organic milk rise by $0.202 per hundredweight, or 0.93 percent. Organic processors see a decrease of $1.838 per hundredweight, or 8.44 percent. Organic milk production rises by 0.05 million hundredweight, or 0.46 percent. In turn, lower processor prices for organic milk and increased farm production result in lower prices and increased production of organic milk at retail. Retail prices decrease by $0.159 per gallon, or 2.32 percent. Under the assumption of fixed proportions production technology, consumption of organic milk increases by 0.6 million gallons, or 0.46 percent.

Exemption of organics from the marketing order causes a net reduction in the conventional blend price of $0.041 per hundredweight, or 0.3 percent, and reduces conventional production by 1.08 million hundredweight, or 0.30 percent. Minimum class prices for manufacturing and fluid milk rise by $0.02 per hundredweight, or 0.1 percent for fluid milk and 0.2 percent for manufacturing milk. With the subtle increase in farm prices, retail prices of conventional milk and dairy products rise almost imperceptibly. The subtle increase in retail prices, together with a decrease in demand for conventional dairy products, causes a reduction in consumption of conventional dairy products. Consumption of conventional fluid milk falls by 1.5 million gallons, or 0.25 percent and consumption of conventional manufactured dairy products made in California falls by 9.6 million pounds, or 0.31 percent.

Exemption of organic milk from the marketing order makes both organic producers and organic consumers better off. Organic dairy producers see an increase in producer surplus, or net revenue, of $2.2 million per year. Organic consumer surplus increases by $20.8 million per year. However, conventional dairy producers are made worse off, as producer surplus for conventional farms decline by $14.6 million annually. Conventional consumers are also made worse off by the higher retail prices. Conventional fluid milk consumer surplus falls by $14.6 million per year, and conventional manufactured products consumer surplus falls by $7.1 million per year.

Full elimination of California's milk marketing order regulation removes the price differential between conventional fluid-use and manufacturing-use milk, so that a single price prevails for conventional milk in all uses. The price paid by conventional fluid milk processors falls by $2.053 per hundredweight, while the price paid by manufacturing processors falls by $0.013 per hundredweight. The retail price of conventional fluid milk falls by $0.177 per gallon, or 6.82 percent, and consumption of conventional fluid milk increases by 10.0 million gallons, or 1.60 percent. The quantity of manufacturing milk increases by 0.51 million hundredweight, or 0.17 percent, and the quantity of manufactured products increases by 5.2 million pounds, or 0.17 percent. As depicted in panel a of figure 3, demand for manufacturing milk is perfectly elastic and elimination of the marketing order causes a reduction in the farm price of milk. In contrast, the numerical simulation reflects the more realistic scenario in which demand for manufacturing milk is less than perfectly elastic, so that the increase in the consumption of conventional fluid milk (caused by the elimination of the marketing order) results in an increase in aggregate demand of conventional milk. The increase in aggregated demand is enough to cause farm-level prices of conventional milk to increase. The price received by conventional dairy farms increases by $0.052 per hundredweight, or 0.38 percent. Higher conventional farm prices cause farm production to increase by 1.37 million hundredweight, or 0.38 percent.

Elimination of the California milk marketing order regulation causes a reduction in the retail price of conventional fluid milk, which, in turn, causes a reduction in demand for organic milk. As a result, consumption of organic milk falls by 0.9 million gallons, or 0.71 percent, at the retail level despite a lower price. Farm production of organic milk falls by 0.07 million hundredweight, or 0.71 percent. Elimination of price discrimination, together with reduced demand for organic milk, causes the farm price for organic milk to fall by $0.302 per cwt., or 1.42 percent.

Higher conventional farm prices create the appearance that conventional farms are better off in the absence of the marketing order; producer surplus rises by $18.7 million. Indeed, producers that do not own quota would be better off without the marketing order. However, the gain in producer surplus caused by the slight increase in farm prices, does not take into account the elimination of the welfare transfer to quota owners. Eliminating the marketing order would cause a decrease in quota-owners wealth equal to the value of quota—$153.2 million per year. Attributing quota rents to conventional producers, elimination of the marketing order reduces producer surplus for conventional farms by $134.5 million per year.

Consumers of fluid and manufacturing products made from conventional products benefit as consumer surplus increases by $131.2 and $3.7 million annually, respectively. This corresponds with previous research that has shown that marketing orders harm the consumer, thus without the marketing order conventional consumers would see a benefit. Although organic dairy producers gain from being exempted while the California marketing order remains in place (i.e., scenario 1), organic producers are made worse off when the order is fully eliminated. With full deregulation, the price of conventional fluid milk falls, causing a decrease in demand for organic milk; as a result, organic producer surplus falls by $3.1 million per year. Consumers of organic milk also are worse off under deregulation, with organic consumer surplus decreasing by $32.1 million. However, aggregating consumer surplus for conventional and organic fluid milk, fluid milk drinkers as a group are better off without the marketing order, although the consumption mix tilts towards conventional milk and away from organic milk.

The magnitude of the price-, quantity-, and welfare effects of milk marketing order regulation differ under different assumptions on model parameters. A full sensitivity analysis is available from the authors.

Conclusion

This study examines the likely economic consequences of changes in California milk marketing order regulation for two related market segments: conventional and organic. An equilibrium displacement model is developed that explicitly allows for differentiated products (conventional and organic) in order to evaluate the effects of policy on the two markets. Results from the simulation analysis indicate that both producers and consumers of organic milk would be made better off by a policy that exempted organics from milk marketing order regulation. Exemption of organics from marketing order regulations results in higher farm prices of organic milk, lower processor prices of organic milk, lower consumer prices for organic products, and increased production and consumption of organic milk. At the same time, exemption of organics from marketing order regulation reduces pool revenue, thereby decreasing the blend price received by conventional producers. That is, exemption of organics from marketing order regulation reduces the regulatory benefits for conventional producers.

However, a different story emerges from results from a simulation in which the California marketing order regulation is eliminated for both conventional and organic markets. We find that elimination of the marketing order makes organic producers worse off. This result is driven by the substitution of conventional fluid milk and organic fluid milk in consumption. Previous research has shown that marketing orders raise the price of fluid milk which in turn causes fluid consumption to fall (Kessel 1967; Ippolito and Masson 1978). Organic producers benefit from the high price of conventional fluid milk caused by the marketing order. However, elimination of the marketing order causes a reduction in retail prices for conventional fluid milk, which, in turn, causes a reduction in demand for organic milk. In addition to making organic producers worse off, the elimination of the California marketing order also harms quota-holding producers. Elimination of the marketing order also results in a slight increase in the conventional farm price, thereby increasing returns to conventional farmers that do not own quota. However, the loss of quota rents out-weighs the benefits of a small increase in the conventional farm price. Thus, deregulation makes both organic and conventional producers who own quota worse off. However, conventional producers who do not own quota would be better off without the marketing order.

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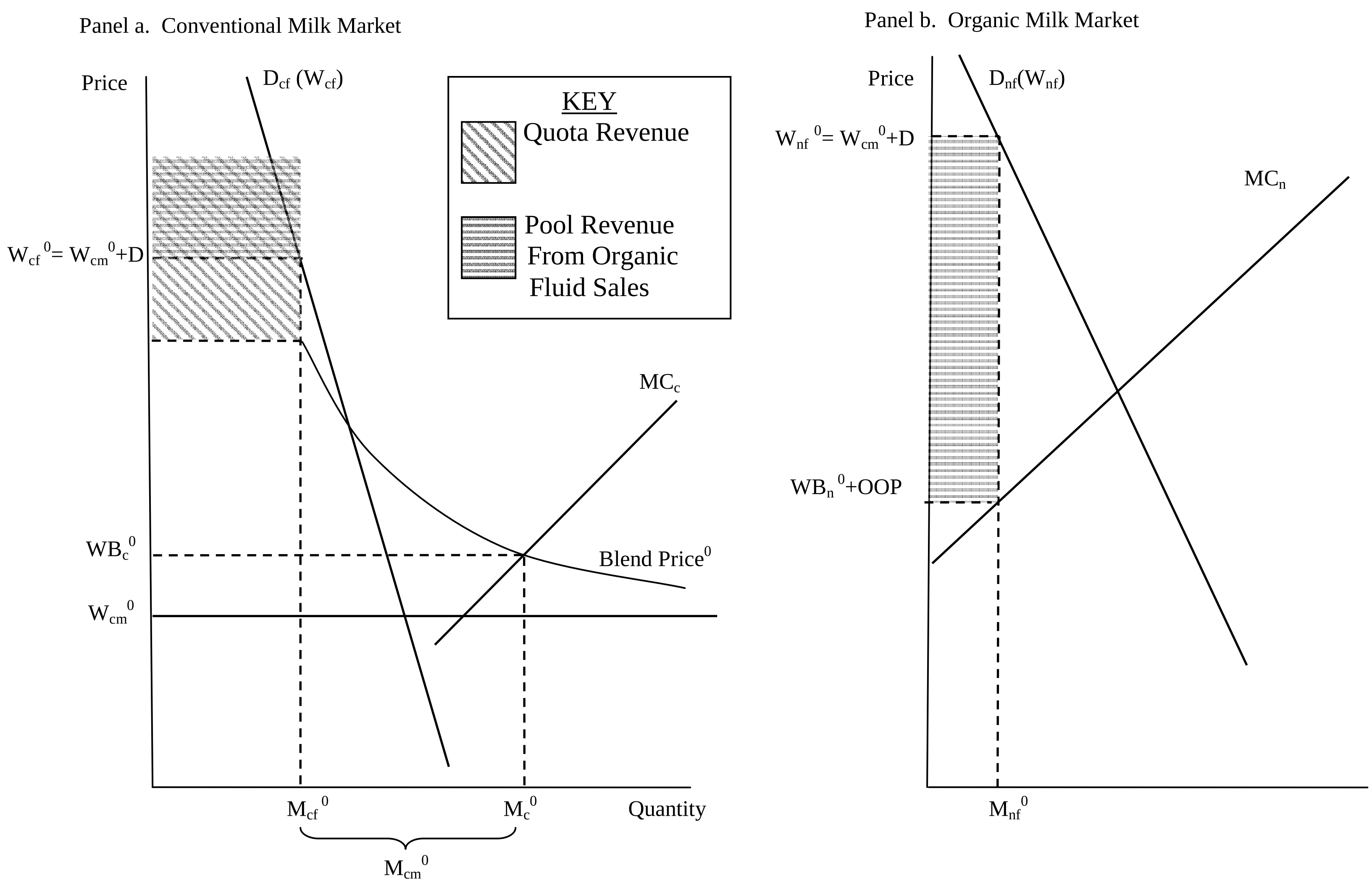

Figure 1 Graphical Depiction of the Current California Milk Marketing Order Regulation

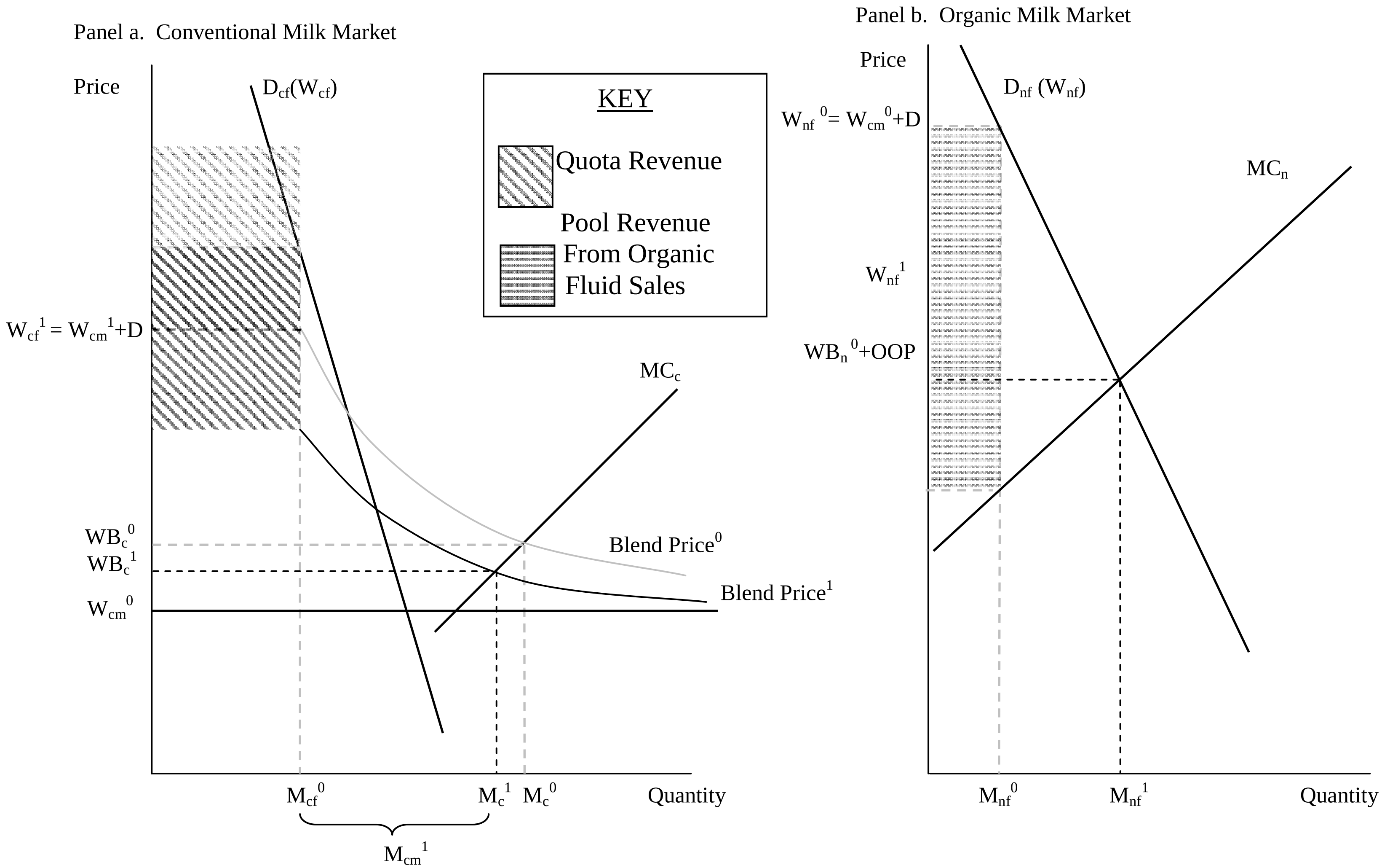

Figure 2 Graphical Depiction of Scenario 1 – Exemption of Organic Milk from the California Marketing Order

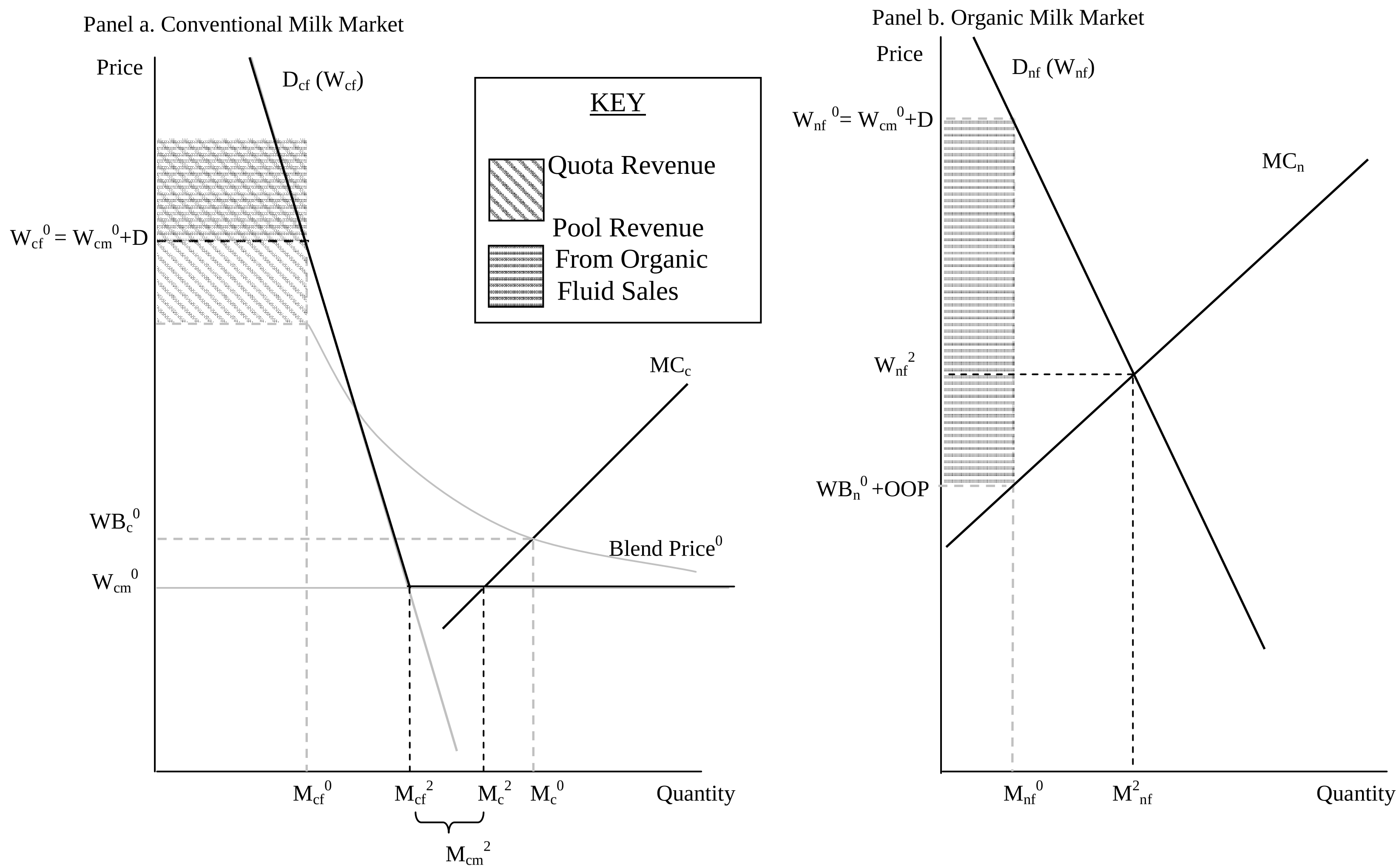

Figure 3 Graphical Depiction of Scenario 2 – Elimination of the California Marketing Order

Table 1. California Dairy Market Data, 2005

PRICES	
Retail Organic Fluid ($/gal)	3.84
Retail Conventional Fluid ($/gal)	2.77
Retail Conventional Mfg ($/lb)	3.66
Processor Organic Fluid ($/cwt)	23.61
Processor Conventional Fluid ($/cwt)	15.74
Processor Conventional Mfg ($/cwt)	13.70
Farm Organic ($/cwt)	21.46
Farm Conventional ($/cwt)	13.59
Organic Premium ($/cwt)	7.87
QUANTITY	
Retail Organic Fluid (millions of gallons)	41.39
Retail Conventional Fluid (millions of gallons)	611.26
Retail Conventional Mfg (millions of lbs.)	3101.57
Production Organic Fluid (millions of cwt)	3.57
Production Conventional Fluid (millions of cwt)	52.70
Production Conventional Fluid (millions of cwt)	304.08
Milk Supply Organic (millions of cwt)	3.57
Milk Supply Conventional (millions of cwt)	356.77
REVENUE (millions of $)	
Total Revenue	5051.41
Pool Revenue	4898.24
WELFARE (millions of $)	
Quota	$153.2

Source: CDFA, and authors calculations.

Table 2. Supply and Demand Elasticities Used in Simulations

	Organic Milk	Conventional Milk
Elasticity of:		
Farm Supply of Milk	0.5	1.0
Retail fluid Milk Demand		
Own price	-0.2	-0.3
Cross price	0.1	0.2
Retail Manufacturing Milk Demand		
National Demand		-0.3
Regional Demand		-5.0

Demand and supply elasticities reflect published estimates based on Chen, Courtney, and Schmitz 1972; Ippolito and Masson; Dahlgran 1980; Chavas and Klemme 1986; Helmberger and Chen 1994; Cox and Chavas 2001; Balagtas and Sumner 2003.

Table 3. Simulated Effects of Scenarios 1 and 2 on Prices, Quantities, and Welfare in California Milk Markets Relative to the Status Quo

	Scenario 1: Organic Exemption		Scenario 2: Deregulation	
	LEVEL CHANGE	% CHANGE	LEVEL CHANGE	% CHANGE
PRICES				
Retail Conventional Fluid ($/gal)	0.002	0.07	-0.177	-6.82
Retail Organic Fluid ($/gal)	-0.159	-2.32	-0.202	-2.97
Retail Conventional Mfg ($/lb)	0.002	0.06	-0.001	-0.03
Processor Conventional Fluid ($/cwt)	0.023	0.15	-2.053	-15.00
Processor Organic Fluid ($/cwt)	-1.838	-8.44	-2.342	-11.01
Processor Conventional Mfg ($/cwt)	0.023	0.17	-0.013	-0.09
Farm Conventional ($/cwt)	-0.041	-0.30	0.052	0.38
Farm Organic ($/cwt)	0.202	0.93	-0.302	-1.42
OOP ($/cwt)	0.243	2.97	-0.355	-4.68
QUANTITY				
Retail Conventional Fluid (mil. gal.)	-1.5	-0.25	10.0	1.60
Retail Organic Fluid (mil. gal.)	0.6	0.46	-0.9	-0.71
Retail Conventional Mfg (mil. lbs)	-9.6	-0.31	5.2	0.17
Conventional Fluid Utilization (mil. cwt)	-0.13	-0.25	0.86	1.60
Organic Fluid Utilization (mil. cwt)	0.05	0.46	-0.07	-0.71
Conventional Mfg Utilization (mil. cwt)	-0.94	-0.31	0.51	0.17
Conventional Farm Milk Production (mil. cwt)	-1.08	-0.30	1.37	0.38
Organic Farm Milk Production (mil. cwt)	0.05	0.46	-0.07	-0.71
Producer Surplus (mil. $)				
Organic Dairy Farms	2.2		-3.2	
Conventional Dairy Farms	-14.6		18.7[a]	
Consumer Surplus				
Organic Fluid Milk Consumers	20.8		-33.6	
Conventional Fluid Milk Consumers	-14.3		131.2	
Conventional Mfg. Milk Consumers	-7.1		3.7	

a/ Does not include the foregone quota rents worth $153.2 million per year. Attributing quota rents to conventional producers, elimination of the marketing order reduces producer surplus for conventional farms by $134.5 million per year.