

## **Quality Dispersion Among Organic Milk Channels**

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# Quality Dispersion Among Organic Milk Channels

## Overview

**THE MOST WIDELY USED** measure of milk hygiene is Somatic Cell Count (SCC), where low SCC values indicate more wholesome milk. Dirt, often associated with grazing, carry bacteria and these bacteria can cause mastitis. Milk from cows with mastitis generally has higher SCC levels and cows with mastitis are most readily treated with antibiotics. Milk with high SCC is penalized by distributors as it is difficult to process and is not considered as wholesome in fluid markets. Grazing cows is common for many organic farmers. However, regulators prohibit antibiotic use under organic production. Intensive management protocols, maintaining equipment, and closely managing the herd's environment offer substitutes for antibiotics use.

Organic milk carries with it a substantial premium but may be at higher risk of discounts or penalties if the milk is more likely to have higher SCC levels. There are two forces at play concerning the quality of organic milk relative to conventional milk. For one, required and proscribed production practices create significant problems when managing milk quality. Secondly, a large premium exists to produce organic milk of high quality.

This research seeks to better understand these and other determinants of SCC for conventional milk and for organic milk.

## Models and Estimation

**WE DEVELOPED A THEORETICAL** framework to determine production choices when the dairy operation faces a combination of production constraints and a price premium for organic production. We show that these conditions can lead to more dispersion in the SCC measure among organic farms than among conventional dairy farms. The empirical model uses farm-level data to evaluate whether organic farms have production more dispersed in milk quality. Quantile regression methods enable comparison of quality estimates across quantiles, and is suited for detecting dispersion in the farms' quality performance.

The empirical model is written as

$$y_{it} = x'_{it}\beta + u_{\theta it}$$

with  $\text{Quant}_{\theta}(y_{it} | x_{it}) = x'_{it}\beta_{\theta}$

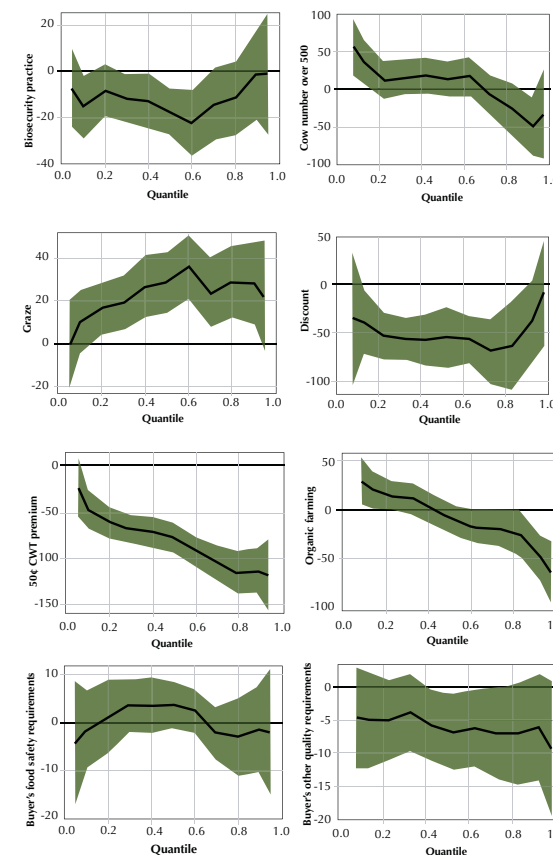
where  $y_{it}$  is the dependent variable,  $x$  is a vector of regressors,  $\beta$  is the vector of parameters to be estimated, and  $u$  is a vector of residuals which satisfies the quantile restriction  $\text{Quant}_{\theta}(u_{\theta it} | x_{it}) = 0$ .  $\text{Quant}_{\theta}(y_{it} | x_{it})$  denotes the  $\theta$ th conditional quantile of  $y_{it}$  given  $x_{it}$ .

The  $\theta$ th regression quantile,  $0 < \theta < 1$ , is defined as any solution to the minimization problem:

$$\hat{\beta}(\theta) = \arg \min_{\beta \in R^K} \left[ \sum_{t \in \{t: y_t \geq x'_t \beta\}} \theta |y_t - x'_t \beta| + \sum_{t \in \{t: y_t < x'_t \beta\}} (1 - \theta) |y_t - x'_t \beta| \right]$$

## Data

**DATA USED IN OUR** empirical analysis are from the USDA's 2005 ARMS Phase III, Dairy Costs and Returns Report. In the final analytic data set we included dairy farms that reported on whether their milk was tested for SCC during 2005. We deleted farms reporting SCC over 1 million cells/ml and those with missing values. The final data had 1,387 observations from 24 states.



Quantile regression curves with 95% confidence limits.

## Results

**THE MAIN RESULTS ARE** summarized here and several are illustrated in the figure.

### Herd Size

Larger herds have similar SCC milk on average compared to herds with no more than 50 cows, but also more dispersed values.

### Organic Farms

Organic farms are more likely to be in the highest SCC percentiles and also in the lowest SCC percentiles.

### Biosecurity

Having biosecurity guidelines in place reduces SCC for most quantiles.

### Investments

Investment in sanitary facilities and practices reduces SCC.

### Working off-farm

When operators work off-farm for half-time or more, SCC increases along the distribution. An operator's spouse working off-farm has less effect.

### Premiums/discounts

Premiums for low SCC values and discounts for high SCC values lead to lower SCC values. However, when the premium exceeds \$1/cwt, the effects diminish.

Discounts for high SCC only reduce SCC for dairy operations with low to medium levels of SCC; they are not effective for those with high levels of SCC.

### Grazing

Grazing dairy herds on pasture or cropland increases SCC levels.

## Conclusions

**ORGANIC FARMS DO TEND** to be more dispersed in milk quality output, consistent with our theoretical result. Furthermore, premiums for low SCC and discounts for high SCC provide incentives to improve milk quality. The effect of production structure on quality may be more subtle than has been suggested. We found that organic growers produce the worst quality milk and also the best quality milk. Effective ways to improve milk quality include:

- Having biosecurity guidelines
- Having good operation management and necessary milking equipment
- Providing a premium for low SCC and discounts for high SCC,
- Operators reducing off-farm work
- Buyers specifying certain quality tests.

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*The views expressed here are those of the authors and cannot be attributed to the Economic Research Service or the U.S. Department of Agriculture.*