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Producer Technology Use and the Value of Autonomy: The Case of rbST



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Introduction

- Consumers are increasingly sensitive to the conditions under which their food is produced. Consumers today are considering factors such as:
 - Environmental impacts
 - Animal Welfare
 - Other process attributes
- Production agriculture is facing increased pressure to adopt changes to production processes.
- Milk producers facing questions regarding willingness to produce milk without the use or rbST.

What is rbST?

Recombinant bovine somatotropin (rbST), also called recombinant bovine growth hormone (rbGH), was approved by the Food and Drug Administration in November 1993 for commercial use to increase milk production in dairy cattle. First made commercially available in the U.S. in February 1994, controversy continues today over the use of rbST in milk production



- In the legal arena rbST has been controversial since approval. The FDA failed to force Monsanto to devise a test for rbST, which has provided grounds for challenging the FDA's decision to approve rbST for commercial use.
 - The FDA determined that a tolerance level for rbST was not required due to the fact that "[i]t is undisputed that the dairy products derived from herds treated with rbST are indistinguishable from products derived from untreated herds."

- Regardless of the reasons retailers are demanding milk produced without the use of rbST, producers must respond to changes in their demand if they wish to continue to serve the market.

- This analysis analyzes the welfare impacts on Michigan dairy farmers when rbST was eliminated as a technology available for use

Michigan as a case study ...The decision by Kroger to procure rbST-free milk led to a chain of events occurring in the Michigan milk market as cooperatives and individual producers adjusted to meet changing demands. For the individual Michigan producer this is essentially a mandated change (regardless of the fact that it is market rather than legislatively driven).



Producer Survey Summary

A survey was developed to obtain information from Michigan dairy producers regarding preferences for changes in milk production practices.

- Mailed to 1,200 dairy farms in Michigan in December of 2007.
- Reminder postcard followed 2 weeks later.

In the survey introduction, dairy farmers were told, "Recently, there has been a movement towards rbST-free milk for beverage consumption. Several Michigan retailers have requested milk from cows not supplemented with rbST beginning February 1, 2008. With this in mind, please answer the following questions." Many questions on the survey incorporated preferences for or against rbST-free milk production. The timing of the survey was such that these questions were posed not only hypothetically on the survey, but were also being faced concurrently by producers in the Michigan dairy industry.



Producer Respondent Summary Statistics

- Gender: 95% male
- Average Age: 49.2 years old
- Average Herd Size: 229 cows
- % of herds using rbST in 2007: 37%
- % of herds having ever used rbST: 67%
- % of respondents indicating next generation is returning to the farm: 53%

Results and Discussion – Producer Welfare Implications

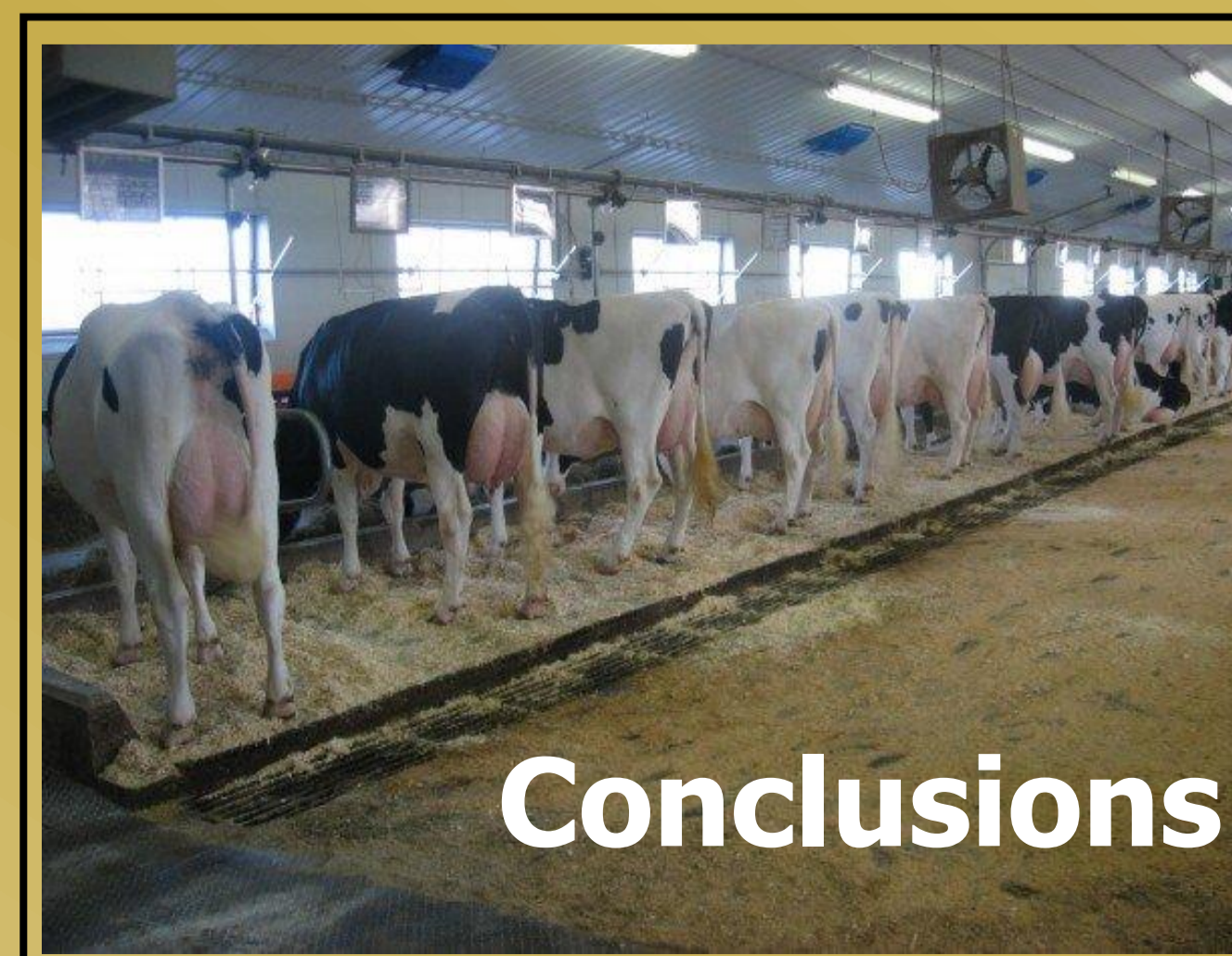
The welfare impacts for producers of going from a situation in which conventional, rbST free, and exiting the industry were options to the producer to a scenario in which the option of conventional production is eliminated are presented below.

Producer Group Characteristics	\$/cwt per choice scenario	Annual per cow welfare impacts for cow production level:	
		190 cwt/year	210 cwt/year
All Producers	-\$0.23	-\$43.70	-\$48.30
Producers using rbST in 2007	-\$0.32	-\$60.80	-\$67.20
Producers not using rbST in 2007	-\$0.18	-\$34.20	-\$37.8
Producers using rbST in 2007 (herd size of 100 cows)	-\$0.31	-\$59.90	-\$65.10
Producers using rbST in 2007 (herd size of 500 cows)	-\$0.33	-\$62.70	-\$69.30
Producers not using rbST in 2007 (herd size of 100 cows)	-\$0.18	-\$34.20	-\$37.80
Producers not using rbST in 2007 (herd size of 500 cows)	-\$0.20	-\$38.00	-\$42.00

The complete combinatorial test prescribed by Poe, Giraud, and Loomis (2005) was used to determine if the welfare impacts on producers with different characteristics were statistically different from one another. Results from the test prescribed by Poe, Giraud, and Loomis (2005) are shown below for the cases in which differentiation was based upon rbST use in 2007.

Testing if statistically significant differences in welfare impacts between:	P-Value	Interpretation (0.05 Significance Level)
Differentiation Based Upon rbST Use in 2007		
All producers using rbST in 2007 versus all producers not using rbST in 2007	.0384	Evidence of Heterogeneous Welfare Impacts
Small producers (herd size of 100 cows) using rbST versus small producers (herd size of 100 cows) not using rbST in 2007	.0412	Evidence of Heterogeneous Welfare Impacts
Large producers (herd size 500 cows) using rbST in 2007 versus large producers (herd size 500 cows) not using rbST in 2007	.0386	Evidence of Heterogeneous Welfare Impacts

Recognition of the heterogeneity of welfare impacts across producers, depending on whether or not a producer used rbST prior to the disadoption of rbST by the market, is important for determining the impacts of such market change on the industry.



Conclusions

As expected, those producers forced to make adjustments had larger welfare impacts than those not forced to make adjustments. Still, those not making adjustments had statistically significant welfare losses due to the loss of a choice of production system, even though it was a system that they had not used in the year preceding the change.

Forced disadoption of practices, in the case of rbST in milk production, was shown to have heterogeneous welfare effects. Similar analyses could be completed for welfare analyses of producers facing potential disadoption of other practices, such as tail docking or individual crates. Implications of heterogeneous welfare effects must be recognized when production systems are eliminated from producers' options, whether via legislative channels or through market changes.

Data and Methods

- A mail-based survey was used to obtain information from Michigan dairy producers regarding rbST usage, perceived benefits of rbST usage, and questions surrounding producers' perception of consumer desire for dairy products produced without the use of rbST.
- Choice experiments were used to elicit producers' preferences for attributes of the dairy industry, looking forward to 2013. In response to each situation presented producers were asked to choose which production option they preferred given described dairy industry environment as of January 2013. In each of the presented situations, producers were asked to select either one of two production options or could choose to stop milking cows. An example scenario from the choice experiment is:

	Option A	Option B	Option C
Milk price (\$/cwt)	\$18.00	\$18.00	
Corn price (\$/bu)	\$2.00	\$2.00	
Production Practice	Conventional	rbST-Free	Stop milking cows
Herd Milk Production	Trend	100%	
I choose ...			

Random Parameters Logit Model

The RPL model estimated in this analysis specified the systematic portion of utility as:

$$v_j = \beta_1(C) + \beta_2(IOFC) + \beta_3(C_{Gen}) + \beta_4(C_{Size}) + \beta_5(C_{rbST}) + \beta_6(Milk) + \beta_7(Prod) + \beta_8(Prod_{Age}) + \beta_9(Prod_{rbST}) + \beta_{10}(Prod_{Size})$$

where, *Prod* is identifying the production practice (conventional or rbST free). Interactions between operator age, whether rbST was used in 2007 and *herd size in 2007* with *Prod* were included. *Milk* is the increase in herd milk production presented in the choice experiment (increase of 1.5% 25% or 100% per year). *C* is a constant included to capture producer sentiment regarding stopping milking cows and *C*=1 if opting out is selected. *IOFC* is the income over feed cost that is calculated by incorporating the corn price and milk price presented in the choice experiment. Three variables were interacted with the constant to include whether there is a next generation expected to return to the farm (*Gen*=1 if next generation is expected), herd size in 2007 (*Size*), and whether or not that herd used rbST in 2007 (*rbST*=1 if rbST used in 2007), respectively.