Economic impact from the loss of a dairy farm in Minnesota

Rebecca Weir, University of Minnesota, weirx116@umn.edu
and
Joleen Hadrich, University of Minnesota, jhadrich@umn.edu

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Rebecca Weir & Joleen Hadrich
University of Minnesota, Department of Applied Economics

University of Minnesota | CFANS College of Food, Agricultural and Natural Resource Sciences

Background

As the dairy industry continues to experience price volatility, we observe annual decreases in the number of dairy farm operations, while the number of cows has been constant. The question that remains is how does the changing dairy industry impact local communities? Is the economic condition of a county impacted if the county serves inputs and services to 5 farms compared to 30 farms? What is the relationship between farm operations and rural communities?

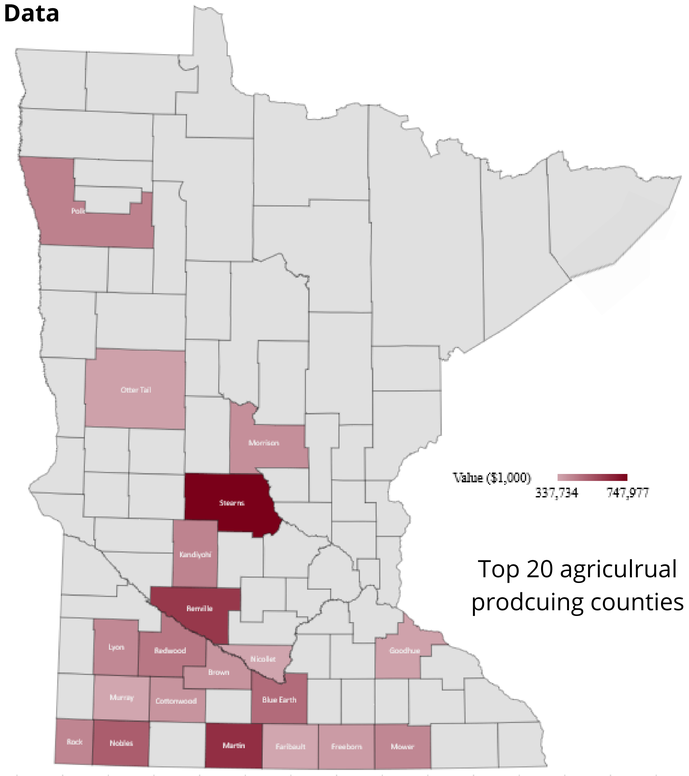
Objective:
Analyze how the loss of a dairy farm impacts a county's sales and use tax revenue, employment, total personal income, and GDP

Model - Two-way fixed effects

$$Y_{ct} = \beta_0 + \beta_1 F_{ct} + \eta_t + \alpha_c + \omega X_{ct} + \epsilon_{ct}$$

Three model specifications analyzing the impact on county economic indicators from a change in farm operations, cows, or herd size. **F** is the number of licensed farm operations in specification 1, total cows in the county for 2, and the third specification uses average herd size as the variable of interest. Average herd size is is calculated using tthe number of licensed dairy farms and total cows.

Data

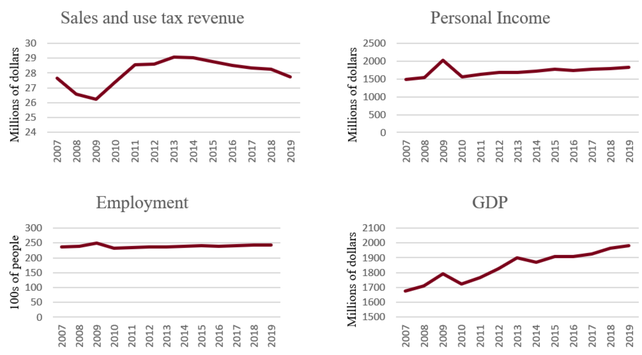


Top 20 agriculrual prodcuing counties

Data Sources (2007-2019)

- IMPLAN
  - Employment
  - Total personal income
  - GDP
  - Population
- USDA-NASS
  - Total cows
- FINBIN
  - Off-farm income
  - Acres
  - Organic
- MN Dept of Rev
  - Sales and use tax revenue
- MN Dept of Ag
  - Licensed dairy farms

Dependent Variables



Results

Table 1: Fixed effects Results, 3 model specifications

	Sales and Use Tax Revenue		Employment		Personal Income		GDP	
Licensed dairy farms	-0.0832	***	-0.2452	***	-4.2289	**	-4.7283	***
	(0.0058)		(0.0611)		(1.8470)		(0.5739)	
Cows	-0.0399	***	-0.0029		-1.1563		0.4938	
	(0.0132)		(0.1053)		(1.0937)		(3.1058)	
Herd Size	0.0014		0.0295		0.3336		0.0854	
	(0.0052)		(0.0404)		(1.1938)		(0.4215)	
N	247		247		247		247	

Notes: Sales and use tax revenue, personal income, and GDP are measured in millions of dollars. Employment is measured in hundreds of people. The model includes farm and county controls and year and county fixed effects.

Table 2: Fixed effects Results, Binary treatment definition

	Sales and Use Tax Revenue	Employment		Personal Income		GDP
Loss of 10 farms	0.5562	-34.4864	***	-965.2623	***	-173.5337
	(1.3640)	(10.4969)		(311.2409)		(108.4170)
10% loss of farms	-0.3226	2.5839		136.9900		-22.9429
	(0.7007)	(5.5396)		(163.5711)		(56.0498)
N	228	228		228		228

Notes: Sales and use tax revenue, personal income, and GDP are measured in millions of dollars. Employment is measured in hundreds of people. The model includes farm and county controls and year and county fixed effects.

Results

- Licensed dairy farms held an inverse relationship for all dependent variables
- Adding cows to a county decreased tax revenue
- Herd size had no relationship with economic indicators

Binary treatments were defined based on (1) a county lost 10 farms or more in a year or (2) a county lost 10% of farms or more in a year

- Counties losing 10+ farms had negative associations with employment and in
- No statistically significant relationship for counties losing 10% of farms or more

Discussion / Conclusion

- The inverse relationship found with number of licensed dairy farms and the economic indicators is likely the growth effect
- Binary treatment thresholds arbitrarily imposed
- County geographical borders could be improved upon with buffer rings
- Reverse causality and endogeneity may further bias results