Are All Farms Better-off Growing Organic? An Unconditional Quantile Regression Approach

Aditya R. Khanal, Tennessee State University
Ashok Mishra, Arizona State University

Agricultural and Applied Economics Association
Boston 2016

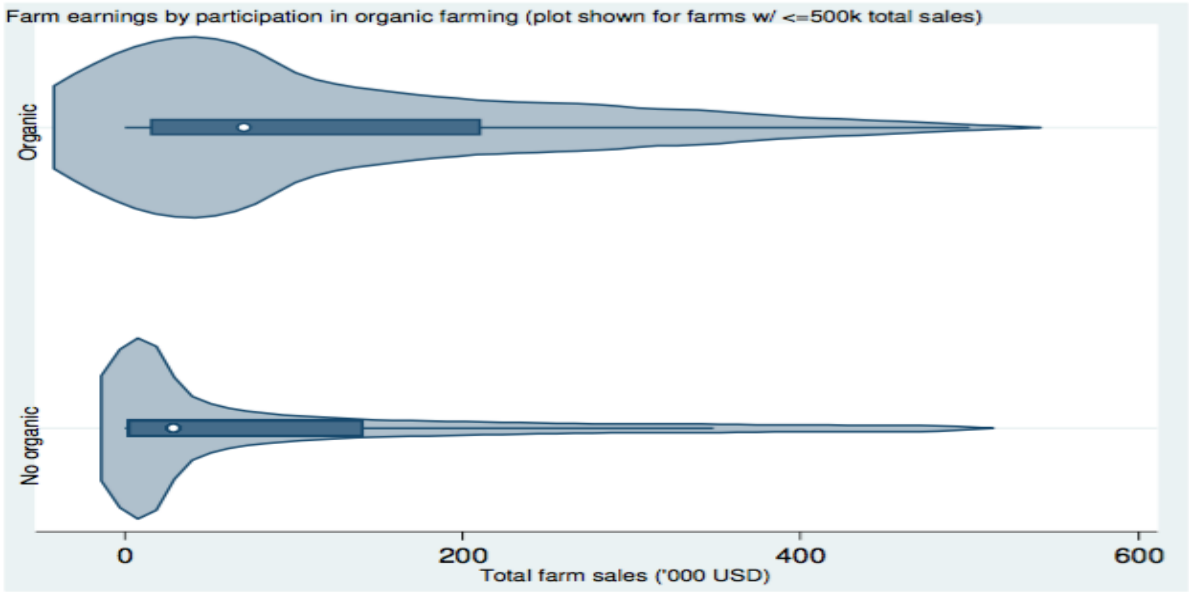
Organic Production

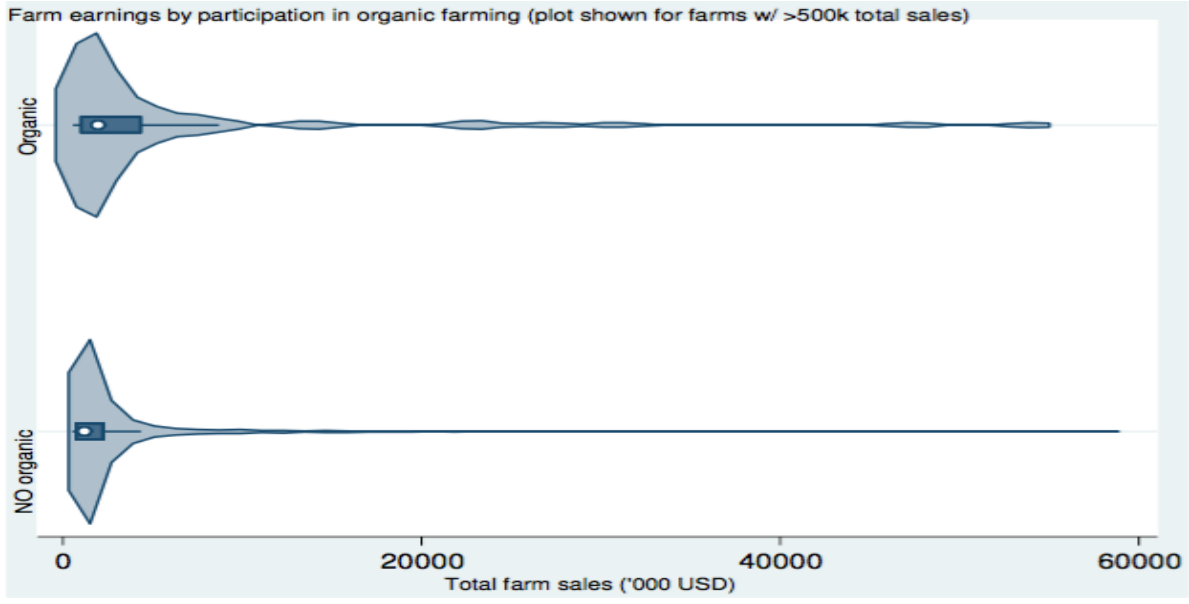
- The demand for organically grown food products has been increasing in the US
  - total sales of organic products increased from $11 billion (2004) to about $28 billion (2012)
  - food retailers and wholesalers are experiencing significant increases in the demand and sales of organically produced foods in recent years
- United States Department of Agriculture (USDA) has a goal to promote certified organic producers and local food systems
- Q: Is this increase in demand for organic foods pushing American farmers to switch to organic food production?
- Q: Do all farmers derive economic profits?

Literature

- Many farmers are undergoing transitions from conventional to organic: 3.6 million acres of certified organic land–but just 0.8% of US cropland
- Most of the past studies are concentrated into consumer side
- Very few studies are focused on producer perspectives: production, certification, cost structure
- Methodologically, previous studies have relied on average estimates or mean-based coefficients
- Uematsu and Mishra (2012)
  - uses average treatment effect to evaluate the impact of organic certification
  - lacks to disentangle the effect on different spectrum of farm sales and net income distribution
- Differential impacts of organic farming on different spectrum of farm earnings allows us to understand the most benefited types of farms from organic farming

Motivation: violin plots





OLS to Quantile Regression

- Significant degree of heterogeneity in the earnings distribution and cluster in lower and upper tails
- OLS is pure locations shift model
- Quantile regression estimates different estimates at different spectrum of distribution and more robust against outliers.
- Differential impacts of organic farming on different spectrum of farm earnings allows us to understand the most benefited types of farms from organic farming

Conditional Quantile (CQR) Vs. Unconditional Quantile (UQR)

- CQR model assesses the impact of a covariate on a quantile, conditional on specific values of the other explanatory variables in the model
- UQR estimates the impact on a quantile, irrespective of the values of other explanatory variables in the model
- We used Re-centered Influence Function (RIF) introduced by Firpo et al. (2009); parameter estimates from RIF are unconditional quantile marginal effects

Data

- 2012 Agricultural Resource Management Survey (ARMS)
- Organic: Farmers who participated in certified organic crops production and generated organic sales.
- 18,728 farm households, 306 organic certified producers

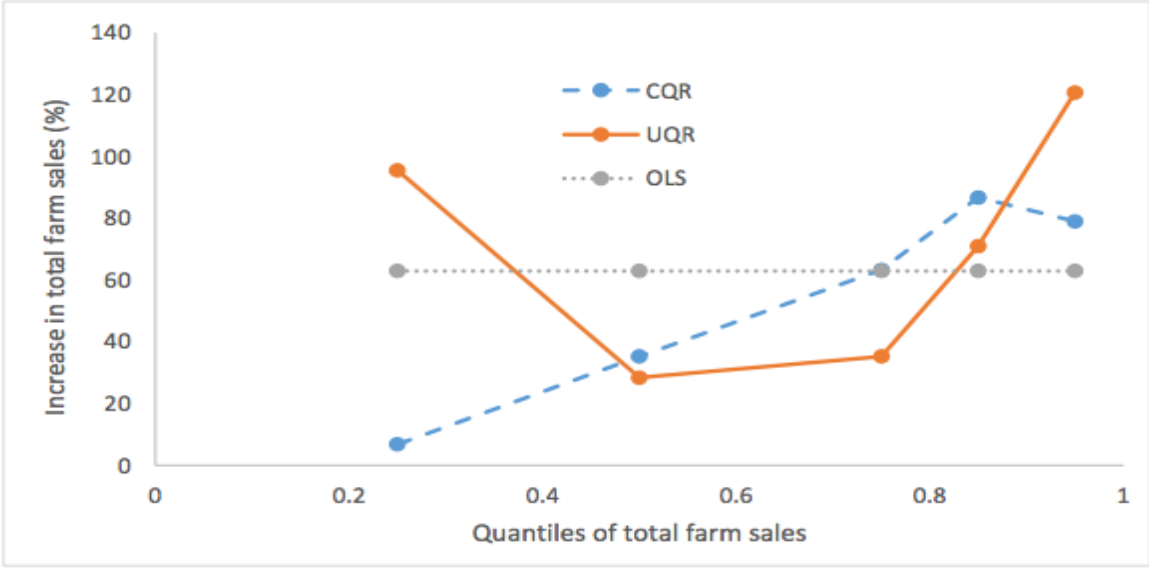
Mean Comparison

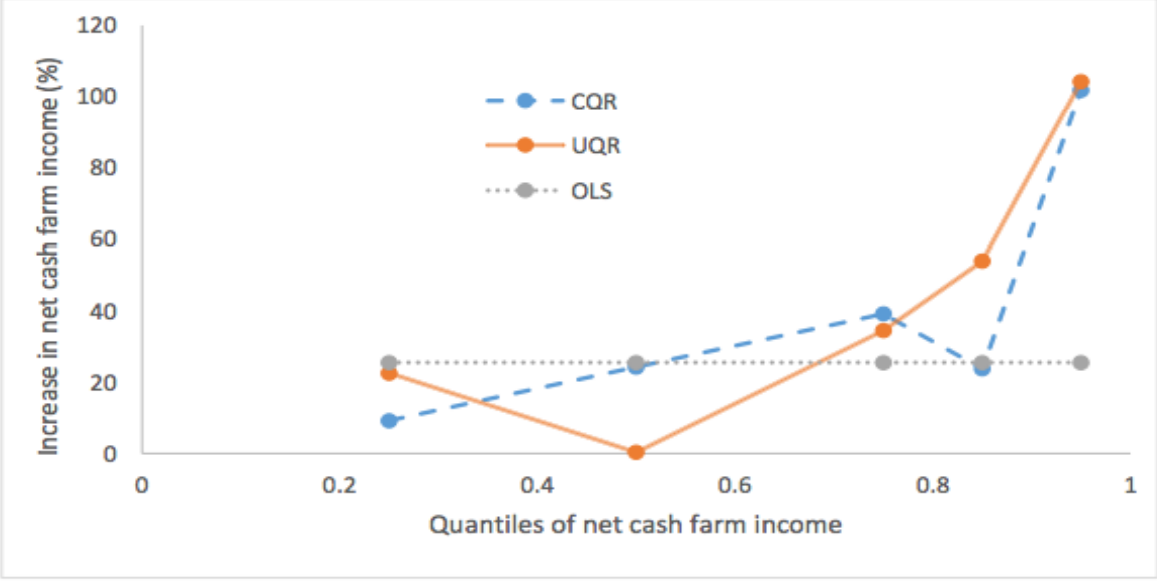
- Certified organic farms had higher total farm sales, had relatively younger and more educated operators, were more diversified than the conventional farms
- Significantly higher proportion of organic farms (28%) were involved in direct sales than conventional (5%)
- Higher proportion of organic farms had an access to Internet and were involved in marketing contracts

Results

- Overall the impact of the participation on organic farming is positive on total farm sales and net cash farm income
  - involvement in organic farming is associated with an increase in total farm sales
- UQR suggests that the top quantiles (75th, 85th and 95th) have the highest impact of the organic participation
  - the impact is higher for the farms generating higher farm sales–35% in 75th and 71% in 85th quantiles
- Farms generating smaller total sales but involved in organic farming (the bottom 25th quantile) could generate significantly higher total sales but not necessarily the higher net farm income, as compared to farms not involved in organic farming.

Results: OLS, CQR, and UQR





Results: other explanatory variables

- Negative effect of age: one more year of the age of operator is associated with 2% decrease in total farm sales and net cash farm income on smaller farms and around 0.7 to 0.9% decline in large farms
- the negative effect of the off-farm works is larger for smaller farms than larger farms: households engaged in off-farm work may receive up to 99% less farm sales and 60% less net cash farm income compared to those not involved
- Direct to consumer marketing is negatively related to total farm sales and net incomes (consistent with Park (2015)
- The positive or negative effect of crop diversity depends on the distribution quantile–smaller farms may benefit from crop diversification while larger farms benefit from specialization

Summary and Conclusion

- Unconditional effect allows us to understand the sole impact due to involvement in organic farming, irrespective of the effect of other covariates used in the regression.
- Smaller operations have low or no significant effect as compared to larger operations–these effects are masked when we use OLS regression
- Effect of certified organic production is positive across the unconditional quantiles but the most benefited are the farms with larger operations
- Easing organic farming for small farmers, for example, by easing cost and certification procedures, loan and facilities for small to medium sized farmers
- We found that small to medium sized farms also benefit more from crop diversification, marketing contracts, and the use of Internet as compared to larger operations

Thank You

Thank you for your kind attention !!