

## Extended Abstract

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<b>Paper/Poster Title</b>	<b>How Economic Conditions Changed the Number of U.S. Farms, 1960-88: A Replication and Extension of Gale (1990) to Midsize Farms in the U.S. and Abroad</b>
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<b>Abstract</b>	<b>200 words max</b>
<p>We replicate and extend the analysis of Gale (1990) to find that economic factors like population pressure, financial stress, and infrastructure play an important role in explaining the growth rate in the number of farms by farm size. We do not find support for the disappearing middle hypothesis, despite a declining trend in the number of midsize farms in the U.S. over time. Economic factors are also important to explain the increase in small and midsize farm numbers in Brazil, and the decreasing small farm numbers in the Eurozone, showing opposite trends in farm numbers globally.</p>	
<b>Keywords</b>	farm numbers, midsize farms, farm exits
<b>JEL Code</b>	Q12, Q14 see: <a href="http://www.aeaweb.org/jel/guide/jel.php?class=Q">www.aeaweb.org/jel/guide/jel.php?class=Q</a> )
<b>Introduction</b>	<b>100 – 250 words</b>
<p>“What role is played by economic conditions in influencing changes in the number of farms?” (Gale 1990, p.22). A question answered in Gale (1990) for the period of 1960-88 for U.S. farms. Is the role of economic conditions on the changes in U.S. farm numbers still the same? Is this role the same for changes in the number of midsize farms in the U.S. and in other countries? To answer these questions, we replicate Gale (1990) time series regression, expand the model to include more variables and more years, and apply the model to farm numbers by farm size categories and for other countries and regions.</p> <p>Our objectives are two-fold: 1) to understand the role of economic factors on the decline of farm numbers in the U.S., specifically in the case of midsize farms, and 2) to investigate whether these economic factors identified in 1) have the same effect in other countries. Results from the latter objective can justify the use of agricultural policies from one country in other countries. We provide insight into the role of economic conditions on farm distributions in the U.S. and abroad. In this study, we apply our analysis to farm numbers in Brazil and the Eurozone, as they are large economies representing different regions of the world. Our underlying hypothesis is that the effects of the economic factors on the change in farm numbers remain the same (in terms of direction) over the years and are independent of farm size category and country/region.</p>	

<b>Methodology</b>	<b>100 – 250 words</b>
<p>Gale (1990) examines the decline in U.S. farm numbers by estimating a first-order difference equation which shows how the change in farm numbers occurs at a declining rate based on the number of farms in the past year and a deviation. The deviation is hypothesized to be influenced by economic conditions (<math>X_{jt}</math>). The equation below expresses a change in the number of farms in terms of the number of farms in the previous year and the economic factors:</p> $F_t - F_{t-1} = -\alpha F_n + \alpha F_{t-1} + \sum_{j=1}^k b_j X_{jt} + e_t \quad (1)$ <p>where <math>X_{jt}</math> is expressed in terms of mean deviations, <math>F_t</math> is the number of farms in the U.S. in year <math>t</math>, <math>\alpha</math> and <math>F_n</math> are parameters following the restrictions: <math>-1 &lt; \alpha &lt; 0</math>, <math>F_n &gt; 0</math>. a deviation. Here, <math>F_n</math> is a fixed constant representing the number of farms that the declining number of farms converges to. Therefore, the change in farm numbers is a function of an intercept <math>-\alpha F_n</math>, lagged number of farms, and economic factors (e.g. non-farm earnings, interest rates, prices, and land value). Because land value is considered endogenous and, possibly, correlated with interest rates, it is instrumented using exports of farm products, real interest rates, and actual inflation. Equation (3) is estimated using the Yule-Walker procedure for correcting for first order autocorrelation, also named Prais-Winstan estimates (Daniela 2010). Prais-Winstan is preferred over other procedures to correct for autocorrelation (e.g., Cochrane-Orcutt method) particularly for small samples because the first observation in the data is not lost (SAS Institute Inc. 1999).</p>	
<b>Results</b>	<b>100 – 250 words</b>
<p>The inclusion of other economic factors shifted the factors that impact the annual change in farm numbers from the ratio of prices received to prices paid to measures of urbanization pressure represented by population and financial stress represented by the debt-to-asset ratio.</p> <p>When analyzing the effects of economic conditions on the growth rate of farm numbers, the long-run trend stopped being statistically significant when more economic factors were added. Thus economic factors play a significant role in explaining the changes in farm numbers.</p> <p>The increase in nonfarm earnings to real farm income is associated with an increase in the number of small farms but a decrease in the number of large farms, implying that a strength in the nonfarm economy leads to small farm entry and large farm exits. When adding more variables, these effects are replaced by the effect of unemployment rate, which positively affects the number of small farms but negatively affects the number of large farms.</p> <p>The ratio of prices received to prices paid by small and midsize farms in Brazil has a negative effect on the growth rate for these farms, similar to the U.S. case. In addition, this trend is also present for Brazilian large farms. Interestingly, the unemployment rate has a positive effect on the growth rate in the number of large farms in Brazil, where the opposite effect was present</p>	

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for U.S. large farms. An increase in highway mileage has a positive effect on the growth rate of small and midsize farms.

**Discussion and Conclusion**

**100 – 250 words**

Gale (1990) was one of the early studies that examined the economic factors affecting farm numbers in the U.S. and a convergence of farm numbers to a long-term trend. Our results lead us to conclude that a convergence toward a long-term trend in farm numbers is of smaller magnitude and not significant. Economic factors like population pressure, financial stress, and infrastructure play an important role in explaining the growth rate in the number of farms by farm size.

Policy makers have targeted their policies for small farms while diverting their focus away from midsize and large farms. Our results show that generally economic conditions impacted small and midsize farms similarly in terms of direction but with a different magnitude. This may explain the disappearing midsize farms. By focusing policies on small farms, these policies may only have indirect effects on midsize farms. By recognizing farmland distribution, policy makers can tackle their goals of reducing poverty by promoting sustainable agriculture with increased productivity and income. Ignoring trends in farm sizes and the role of economic conditions will not allow for an objective view of the state of equality within agricultural production. Policy makers in different countries and regions can learn from experience of the role of economic conditions on farm growth rates but should take into consideration characteristics that are intrinsic to their country.

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