STRUCTURAL CHANGES IN U.S. AGRICULTURE: FINANCIAL PERFORMANCE OF FARMS IN TRANSITION

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Abstract

This study examines the financial performance and stress experienced by beginning and retired farms in the U.S. Using USDA's ARMS data, probit models are estimated to study the personal and farm characteristics that affect whether or not the financial ratios fall into critical zones. The results show that older farmers and larger farms are less likely to experience financial stress while hobby farms and livestock farms are more likely to experience financial stress. The results for beginning and retired farmers indicate fewer significant effects.

Key words: beginning farmers, financial performance, financial stress, retired farmers, transitioning farmers.

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Structural change can be initiated by policy decisions or permanent changes in resources, society or the population. Over the next decade, the U.S. agricultural population will be experiencing a major structural change due to population dynamics. Half of all current farmers are expected to retire and be replaced by new and beginning farmers. Beginning farmers, by definition, have been operating a farm business for less than 10 years. Approximately 20 percent of family farms are currently classified as beginning farms. Beginning farmers need to develop managerial skills, secure financing to acquire capital, and operate a profitable business while reduce financial, production, price, legal, and human resources risk. Retired farmers need to scale down on farm operations while providing a steady stream of income. Understanding the financial condition and needs of beginning and retired farmers is important to ensure sustainability of the agricultural sector. Policymakers and various universities and organizations have responded to the needs of beginning and retired farmers by offering educational programs and financial capital that will help them transition into and out of agriculture.

Understanding the predictors of financial performance and financial stress can help structure and target these programs to better address the needs of beginning and retired farmers. Previous studies on transitioning farmers have considered various aspects of financial performance, including profitability (return on assets), marginal income and solvency criteria, and net farm income per dollar assets (Adhikari, Mishra, and Chintawar, 2009; Ahearn and Newton, 2009; D'Antoni, Mishra, and Chintawar, 2009; Mishra, Wilson, and Williams, 2007 and 2009; Newton and Ahearn, 2007). This study extends previous analyses to cover all five major financial ratios including profitability, liquidity, solvency, efficiency, and repayment

capacity. Analyzing all financial ratios will give lenders, policymakers, and educators a better indication of the overall financial health of beginning and retired farmers as well as the structural changes that will occur in the next decade and the farm strategies that can help such change.

The objective of this study is to examine the factors influencing the financial performance of transitioning farmers. While lenders and educators are interested in the general financial performance of transitioning farmers, they are even more concerned about financial stress when one of the financial ratios exceeds a critical value. Therefore, the analysis here concentrates on predicting financial performance in the context of financial stress.

The data are from the Agricultural and Resource Management Survey from the U.S. Department of Agriculture making the results representative of all farmers in transition the U.S. The survey includes detailed information on the financial condition of beginning and retired farmers making it possible to calculate financial ratios and classify them based on the level of acceptable and critical values of financial performance. Probit models are estimated to determine the factors affecting financial performance for transitioning farmers. Instead of using a continuous dependent variable, the five financial ratios are classified as being in the critical zone or not. This classification of financial ratios into critical/acceptable range is consistent with current lender practices of using credit scores to determine the credit worthiness of their applicants. Several factors are hypothesized to influence financial performance, including operator characteristics such as age, education, and household size as well as farm characteristics such as farm size, crop/livestock type, and the legal status of the farm. The results provide important insights into the factors affecting the likelihood that farmers will experience financial stress with several differences for beginning and retired farms.

Models and Data

The analysis is based on data from the Agricultural Resource Management Survey (ARMS) which is conducted annually by the U.S. Department of Agriculture. Data for 2005-2008 are used; with the last year representing an economic recession. The ARMS data include detailed information on the financial condition and performance of U.S. farmers. The survey includes questions about the financial indicators included in the farm balance sheets and income statements. These financial indicators are used to calculate the financial ratios used in this study. There are five measures of the financial performance of U.S. farms represented by the respective financial ratios: liquidity (current ratio), solvency (debt-to-asset ratio), profitability (return on assets ratio and operating profit margin ratio), efficiency (operating expense ratio), and repayment capacity (term debt coverage ratio). Table 1 shows the formulas used to calculate these financial ratios. Each financial ratio is classified as being in the critical zone (dummy variable equal to 1) if it exceeds or is below a critical threshold, indicating that farmers experience financial stress. For example, a current ratio of less than 1 is considered being in the critical zone, and similarly a debt-to-asset ratio that exceeds 55% is considered begin in the critical zone. While additional financial ratios are available to represent each of the five financial measures, only those financial ratios that have clear guidelines about being in the critical zone are included in this analysis.

Probit models are estimated to determine the factors affecting financial performance for transitioning farmers. Instead of using a continuous dependent variable, the five financial ratios are classified as being in the critical zone or not. This classification of financial ratios into critical/acceptable range is consistent with current lender practices of using credit scores to

determine the credit worthiness of their applicants. Several factors are hypothesized to influence financial performance, including operator characteristics such as age, education, and household size as well as farm characteristics such as farm size, crop/livestock type, and the legal status of the farm.

The analysis is conducted for all farmers in the U.S. and then for two groups of beginning and retired farms. Beginning farmers are classified as those with 10 years or less of experience. Specifically, the farm operators answered the following question: "In what year did the operator begin to operate any farm operation?" Their answer was used to calculate the years of experience. Retired farmers are classified as those who answered positively to the equation: "Regarding retirement from farming, do you consider yourself to be retired now?" In other words, retired farmers are classified as those that consider themselves retired from farming.

Descriptive statistics are shown in table 2. The results show that a larger proportion of beginning farmers are in the critical zones for their liquidity, solvency, profitability, repayment capacity, and about the same efficiency compared to the rest of the farm population. These results indicate that financial management strategies that aim to improve the liquidity and solvency for beginning farmers will tend to improve their overall financial condition.

Results

Probit models are estimated for whether or not each of the financial ratios falls in the critical zone. Table 3 reports the results for all farms and tables 4 and 5 show the results for beginning and retired farmers, respectively. Most farmer and farm characteristics are found to affect the likelihood of the financial ratios being in the critical zone. Age is found to negatively affect the likelihood of financial ratios being in the critical zones, and therefore older farmers generally are

in a better financial condition. Higher educational levels are associated with lower likelihood of being in the critical zones for the two profitability ratios (ROA and operating profit margin ratios) and with higher likelihood of being in the critical zone for the financial efficiency ratio. Hobby farms are generally more likely to be in the critical zone for all ratios except for their solvency represented by the debt-to-asset ratio. In other words, hobby farms (representing rural residence/lifestyle farms) are more likely to be in a vulnerable financial condition than their farm peers. Likewise, livestock farms are more likely to be in the critical zones for their profitability, efficiency, and repayment capacity ratios but less likely to be in the critical zones for their liquidity (current ratio).

Farm size also affects the financial performance of farms. Larger farms, reflected by their higher gross value of sales, are less likely to be in the crucial zones for their profitability, efficiency, and repayment capacity ratios but more likely to be in the critical zone for their solvency ratio. These results show that larger farms are more likely to take on larger amounts of debt to leverage up and run their operations and as a result to improve on the rest of their financial indicators. Similar results are found for government payments, which are shown to help the financial performance of farms making them less likely to be in the critical zones for all financial ratios except for their solvency. Therefore, government payments are helping farmers to be more leveraged and improve on the rest of their financial performance.

In comparison to 2008, previous years are associated with lower likelihood of farms being in the critical zones for their ROA, operating profit margin, operating expense, and term debt coverage ratios. These results indicate that the economic recession of 2008 has been associated with higher likelihood of farmers experiencing profitability, efficiency, and repayment

capacity issues. The evidence shows that the recession has negatively impacted farm performance making farms more likely to experience financial stress.

The probit models for the financial ratios being in the critical zones are also estimated separately for beginning farmers and retired farmers. Most of the results for the beginning and retired farmer groups are similar to the ones for all farmers, with a few exceptions as discussed below.

In contrasts to the results for all farmers, in the group of beginning farmers, most of the personal and farm characteristics do not affect the probability of farmers experiencing liquidity and efficiency problems. Also, being a hobby farm and receiving more total off-farm income generally do not have significant effects on the financial ratios being in the critical zones. These results may be due to the fact that most beginning farmers are more likely to be hobby farms and have higher off-farm incomes.

In the group of retired farmers, the results show that males are more likely to be in the critical zones for their profitability and efficiency ratios. Similarly to the results for beginning farmers, being a hobby farm and receiving more total off-farm income generally do not have significant effects on the financial ratios being in the critical zones.

Another difference in results is that for the beginning and retired farmers groups, the dummy variables indicating prior years no longer have significant effects on the likelihood of farmers experiencing financial stress. These findings show if farmers are grouped in homogenous groups such as beginning farmers (or retired farmers), their performance over the years seems to be more stable.

Overall, the results show that the personal characteristics such as operator's age and education, and farm characteristics such as the farm being a hobby farm, livestock farm, and

farm size/income measured by gross value of sales, government payments and off-farm income significantly affect the likelihood of farmers experiencing financial stress as measured by their financial ratios falling into the critical zones. Interestingly, the legal structure of the farm (sole proprietorship or not) and the household size do not affect the likelihood of experiencing financial stress. These results differ based when the analysis is performed for the groups of beginning and retired farms, with fewer characteristics affecting their financial performance and stress, possibly due to the fact that these groups are more homogenous.

Conclusions and Policy Implications

This study examines the financial performance and stress experienced by beginning and retired farms in the U.S. Using USDA's ARMS data, probit models are estimated to examine the personal and farm characteristics that affect whether or not the financial ratios fall into the critical zones. The results show that several characteristics influence the likelihood of experiencing financial stress, with important differences for beginning and retired farms.

The results indicate important differences between beginning farmers and their retired peers in terms of their financial performance. The descriptive statistics show that beginning farmers have lower liquidity, lower solvency, higher profitability, lower repayment capacity, and about the same efficiency compared to the rest of the farm population. These results indicate that financial management strategies that aim to improve the liquidity and solvency for beginning farmers will tend to improve their overall financial condition.

The results from the probit models on the predictors of financial stress for beginning farmers show that beginning farmers who are older are less likely to have liquidity and repayment capacity issues perhaps because they already have accumulated financial assets.

Larger farms are more likely to have liquidity and solvency issues but they are also more likely to be profitable, efficient, and able to repay their debt. Livestock farms are more likely to be efficient but also more likely to experience profitability issues. Overall, the findings indicate that compared to retired farmers, beginning farmers have different likelihood of experiencing financial stress depending on their operator characteristics, farm enterprise, size, and organization.

These differences among farms are helpful for agricultural lenders to assess the credit worthiness of farmers in transition. Understanding the predictors of financial performance for beginning and retired farmers can help in designing educational programs based on the particular needs of farmers to help them transition into and out of agriculture. With about half of the current farmers planning to retire in the next decade, it is of crucial importance to offer financial management training to the next generation of farmers with goals of achieving high profitability, financial efficiency, and adequate repayment capacity.

References

Adhikari, A., A.K. Mishra, and S. Chintawar. "Adoption of Technology and Its Impact on Profitability of Young and Beginning Farmers: A Quantile Regression Approach." Selected paper, Southern Agricultural Economics Association Annual Meeting, Atlanta, GA, 2009.

Ahearn, M., and D. Newton. "Beginning Farmers and Ranchers." Economic Information Bulletin Number 53, Economic Research Service, USDA, 2009.

D'Antoni, J., A.K. Mishra, and S. Chintawar. "Predicting Financial Stress in Young and Beginning Farmers in the United States." Selected paper, Southern Agricultural Economics Association Annual Meeting, Atlanta, GA, 2009.

Mishra, A.K., C.A. Wilson, and R.P. Williams. "Technology Adoption, Management Practices, and Financial Performance of New and Beginning Farmers: Evidence from a National Survey." Selected paper, American Agricultural Economics Association Annual Meeting, Portland, OR, 2007.

Mishra, A.K., C.A. Wilson, and R.P. Williams. "Factors Affecting Financial Performance of New and Beginning Farmers." *Agricultural Finance Review* 69(2009):160-179.

Newton, D.J., and M.C. Ahearn. "Management Strategies of Beginning Farmers and Ranchers." Selected poster, American Agricultural Economics Association Annual Meeting, Portland, OR, 2007.

Table 1. Financial Ratio Descriptions and Critical Zone Definitions

Financial Ratios	Financial Measures	Calculations	Critical Zones
Current ratio	Liquidity	Current farm assets/current farm liabilities	<1
Debt-to-asset ratio	Solvency	Total farm debt/total farm assets	>55%
Return on assets ratio	Profitability	(Net farm income from operations + interest expense - family living withdrawals)/average assets	<1%
Operating profit margin ratio	Profitability	(Net farm income from operations + interest expense - family living withdrawals)/gross revenue	<10%
Operating expense ratio	Efficiency	(Operating expenses - depreciation)/gross revenue	>80%
Term debt coverage ratio	Repayment capacity	(Repayment capacity + interest) / (principal and interest)	<1.1

Table 2. Definitions and Descriptive Statistics

Variables	Definitions	Means for All Farmers	Means for Beginning Farmers	Means for Retired Farmers
Current ratio	Proportion of farmers falling in the critical zone for this ratio	0.29	0.38	0.28
Debt-to-asset ratio	Proportion of farmers falling in the critical zone for this ratio	0.03	0.08	0.01
Return on assets ratio	Proportion of farmers falling in the critical zone for this ratio	0.75	0.79	0.74
Operating profit margin ratio	Proportion of farmers falling in the critical zone for this ratio	0.71	0.76	0.66
Operating expense ratio	Proportion of farmers falling in the critical zone for this ratio	0.57	0.58	0.53
Term debt coverage ratio	Proportion of farmers falling in the critical zone for this ratio	0.85	0.87	0.93
Age	Age of farmer	57.07	45.74	68.53
Education	Education level of farmer (categorical variable)	2.15	2.24	2.02
Male	1 if farmer is male	0.89	0.85	0.86
Household size	Household size	2.60	3.12	2.05
Sole proprietor	1 if the farm's legal status is sole proprietorship	0.82	0.85	0.85
Hobby farm	1 if farm is classified as limited resource or residential lifestyle	0.68	0.76	0.87
Livestock farm	1 if over 50% of farm revenues are from livestock operations	0.59	0.64	0.54
Gross sales	Total value of farm gross sales in thousand dollars	110.49	66.19	38.73
Government payments	Total government payments in thousand dollars	4.63	2.08	2.72
Total off-farm income	Income from off farm sources in thousand dollars	71.95	85.79	59.48

Table 3. Probit Models Predicting the Likelihood of Financial Ratios Falling into the Critical Zones (All Farmers)

	Current	Debt-to-Asset	ROA	Operating profit	Operating expense	Term debt coverage
Age	-	-		-		+
Education			-	-	+	
Male	-					-
Household size		+				-
Sole proprietor						
Hobby farm	+		+	+	+	+
Livestock farm	-		+	+	+	+
Gross sales		+	-	-	-	-
Government payments	-	+	-	-	-	-
Total off-farm income	+			-	+	
Year 2005	+		-	-	-	-
Year 2006			-	-	-	-
Year 2007			-	-	-	
Observations						
R square						

Note: Standard errors are in parentheses. Single and double asterisks denote significance level of 0.10 and 0.05, respectively.

Table 4. Probit Models Predicting the Likelihood of Financial Ratios Falling into Critical Zones (Beginning Farmers)

	Current	Debt-to-Asset	ROA	Operating profit	Operating expense	Term debt coverage
Age		-			+	+
Education			-	-		-
Male						-
Household size						-
Sole proprietor				+		
Hobby farm			+			+
Livestock farm	-		+	+		+
Gross sales		+	-	-	-	-
Government payments		+	-	-	-	-
Total off-farm income						
Year 2005				-		
Year 2006						
Year 2007						
Observations						
R square						

Note: Standard errors are in parentheses. Single and double asterisks denote significance level of 0.10 and 0.05, respectively.

Table 5. Probit Models Predicting the Likelihood of Financial Ratios Falling into Critical Zones (Retired Farmers)

	Current	Debt-to-Asset	ROA	Operating profit	Operating expense	Term debt coverage
Age		-		-		+
Education						
Male	-		+	+	+	-
Household size						
Sole proprietor	-					
Hobby farm	+					+
Livestock farm	-		+	+	+	
Gross sales		+		-		-
Government payments		+	-	-	-	-
Total off-farm income						
Year 2005						-
Year 2006						-
Year 2007						-
Observations						
R square						

Note: Standard errors are in parentheses. Single and double asterisks denote significance level of 0.10 and 0.05, respectively.