Financing Constraints and Access to Credit in Post Crisis Environment: Evidence from New Farmers in Alabama

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Financial market crises translate in limited access to credit with negative consequences for all producers including those in agriculture. We study how the 2008 crisis affected agricultural producers' access to credit. Agricultural banks were less affected because they are small compared to non-agricultural banks and since previous financial crises have affected agricultural lenders significantly, this time they were in a better position to manage risks (Briggeman, Gunderson and Gloy, 2009; Ellinger, 2009). However, while agricultural sector profitability picked in 2008, it has decreased since. Consequently, while the share of problem loans in agricultural lenders remain less than 50% of that in non-agricultural banks, delinquencies have been increasing (Briggemann, 2011; Ellinger 2011). Increased delinquency rates typically lead to elevated collateral requirements with a potential to worsen access to credit for agricultural producers, especially among more vulnerable groups (Briggeman and Zakrzewicz, 2009).

This paper sets out to determine the impact of the financial crisis on access to credit for new farming operations and to determine which farmers got credit in the post crisis environment. The existence and magnitude of credit constraints for agricultural producers are non-negligible. Nationwide, Briggeman, Towe, and Morehart (2009) estimate that the value of production is 3% lower in credit-constrained farm sole proprietorships compared to those that are not credit-constrained. Credit constraints have also been found in agricultural cooperatives and shown to affect land values (Chaddad, Cook and Heckelei, 2005; Mishra et al., 2008)

If the financial crisis has affected farmers' ability to borrow, then new operations should be most affected, since they typically lack capital, experience, or both. Previous studies have found that new operations are financially constrained, and that in younger (and high debt) farms, the financial constraints are affected by the business cycle (Barry, Bierlen, and Sotomayor, 2000; Bierlen and Featherstone, 1998). This group is most vulnerable because banks elevate collateral

requirement when delinquencies are on the rise and new farmers typically have less assets to offer as collateral. Moreover, even when lenders make lending decisions based on not on collateral but on projected performance, younger farmers are still at a disadvantage because they have lower return on assets compared to more established operations (Mishra et al., 2009).

Even prior to the financial crisis, farmers in Alabama, especially small sole proprietors, were financially constrained and used off farm spousal income to invest on the farm (Hartarska and Mai, 2008). In this paper, we use survey data collected in the fall of 2010 from new operations in Alabama to study the degree to which new operations were financially constrained during the post crisis period and to identify the factors affecting lending in the 2009-2010 period.

The remainder of the paper is organized as follows. Section 2 presents the conceptual framework and empirical specifications. Section 3 briefly describes the data. Section 4 summarizes the results. Conclusions are offered in Section 5.

2. Analytical framework and empirical specifications

The analysis consists of first establishing if new operators have financing (or liquidity) constraints and whether these constraints have become more severe in the post crisis period. Next, we identify the factors affecting farmers' ability to obtain credit, in order to gain insights into possible ways to alleviate existing financing constraints.

The first part of the analysis is based on the literature on asymmetric information in credit markets. According to this literature, in the presence of high transaction costs and asymmetric information, loans are either rationed or available at a premium (Jensen and Meckling, 1976; Stiglitz and Weiss, 1981). In such circumstances, external and internal finance are no longer substitutes and investment in firms facing high information costs, such as most new farming

operators, is constrained by the availability of internal funds (Myers and Majluf, 1984). Since financial constraints do not affect all farmers uniformly, the extent of effective financing constraints that different operators face provides information on the ability of the financial system to cater to their financial needs in that time period.

Financial constraints are important in farming because farming is capital intensive and while farmers do not like debt, many especially newer operations, have limited ability to undertake profitable investment with only own funds. The lack of equity markets and seasonality of cash flows makes access to loans crucial and the ability of credit markets to alleviate financing constraints very important. Moreover, limited diversification opportunity and supply shocks lead to large variations in farmers' net worth and profitability further restricting their investment.

The financing constraints approach, pioneered by Fazzari et al. (1988), tests for differences in sensitivity of investment to internal funds in firms with different levels of informational opacity by comparing sub-samples, defined according to priors that characterize constrained and unconstrained firms (*e.g.,* new and established farms). For each sub-sample, a reduced-form investment equation is estimated where investment is modeled as a function of internal funds and investment opportunities determined from a variety of theoretical perspectives (Hubbard, 1998).[i] A statistically significant difference in investment sensitivity to internal funds between sub-samples indicates that one group is more credit constrained. Recently, Carreira and Silva (2010) provided an extensive review of the vast empirical literature on the subject. In particular, they argue that numerous studies find that younger firms are more financially constrained than established firms.

We first estimate a reduced-form investment equation for the 2008-2010 period for two groups of Alabama operators: *new* (started any part of their operation between 2000 and 2004)

and *newest* (since 2005) and test for the difference in sensitivity of investment to cash flows. In this framework, we also test for differences in financing constraints before and after the crisis of 2008 for each group. Following Hartarska and Nadolnyak (2008), investment is modeled as a function of operators' investment opportunity and internally generated funds (typically defined as revenues minus expenses) to which we add change in liquidity since 2008 and controls.[ii] The estimated model is of the form:

$$\Delta \text{I}nvestment_i = \beta_0 + \beta_1 Inv\ Opportunity_{\ i} + \beta_2\ Cash\ Flow_i + \beta_3 Change\ in\ Liquidity\ since\ 2008_i + \\ + \Sigma\beta_K Controls_{\ i} + e_i \qquad (1)$$

where Δ *Investment* is the percentage change in the value of Fixed Assets, *Inv Opportunity* is a measure of investment opportunity proxied by the change in ROA, *Cash Flow* is the cash flow measure that proxies for available internal cash (liquidity), *Change in Liquidity since 2008* is a dummy that measures the impact of the 2008 crisis on liquidity and takes the value of one if, after 2008, operators kept larger proportion of liquid assets, compared to before 2008.[iii]

In this class of models, proper measurement of the investment opportunities and cash flow is important. Farm operators who do not have investment opportunities would not invest even if they had cash. These two effects must be clearly separated to ensure that the *Cash Flow* variable (liquidity, net worth) is capturing internally generated funds and not investment opportunity to avoid attributing investment's sensitivity to cash flow.[iv]

The control variables capture various entrepreneurial and operation characteristics and may affect farmers' investment since empirical evidence shows that farmers' off-farm investment is affected by such factors and since money is fungible within the household (Mishra and Morehart, 2001). We include controls for entrepreneurial experience and experience in farming prior to starting this operation; whether the operator or the spouse work off farm to

capture possible access to external funds; the age of the operation to capture experience, and gender of the entrepreneur to capture differences in preferences for investment. We also include the proportion of income coming from farming to control for hobby farming as well as the proportion of sales coming from various types of farming e.g. livestock (largest group and serving as the base), poultry, specialty crops, government payments, and others.

Investment in farms differs from that in firms because, for farmers who own their land, it is the largest part of fixed investments. Some operators may not be landowners, and landowners may not be working on their farms. The dependent variable measuring change in fixed assets may contain possible measurement error since the survey did not collect data on land ownership and increase (or decrease) in land value may drive changes in fixed assets. Furthermore, when farmers cannot obtain a loan to invest in fixed assets, they can lease it, and there will be no change in investment but we argue that even if this is true it will be systematic (y measurement error), and remaining investment cash flow sensitivity remains informative. We also note that the majority of farm operators in Alabama are in livestock production (cow and calf) or poultry (66 % of all farm sales), and land is less important capital asset compared to land in raw-crop producing regions. To attenuate this problem, we add the value of farm assets at the beginning of the operation, the type of farm operation, and the average county per acre price of land. During the study period, there were no recorded drops in the price of agricultural land values, so possible bias is likely one-sided. Since the possible measurement error is in the left hand side variable, it will be swept away in the error term.

Since we find that the newest operations face financing constrains, we next want to know which farmers were able to overcome these constraints and secure loans. To answer this question, we estimate a probit model of who got credit and who was rejected. Some operators,

however, may have self-selected out of the market because they believed they would not be approved even if they applied for credit. Thus, we estimate a Heckman type probit model to control for farmers' self-selection following Van de Ven and Van Pragg (1981). Specifically, the unobserved relationship is

$$y^*_j = x_j\beta + u_{1j}$$

where y_j^* is the credit received by operators and x includes variables affecting banks' decisions to lend. However, instead of y^*_j, we only observe a binary outcome (received or did not receive loans) which is captured by a probit equation

$$y_j^{probit} = (y^*_j > 0)$$

However, the dependent variable for operator *j* is observed only if we observe a loan application from that operator. Thus, the selection equation (applying not applying for a loan) is

$$y_j^{\ select} = z_j\gamma + u_{2j} > 0$$

$$where$$

$$u_1 \sim N(0;\ 1)$$

$$u_2 \sim N(0;\ 1)$$

$$corr(u_1;\ u_2) = \rho$$

and the Log likelihood for this model is

$$LnL = \sum_{\substack{j\in S \\ y_j\neq 0}} w_j ln\{\Phi_2(x_j\beta, z_j\gamma, \rho)\} + \sum_{\substack{j\in S \\ y_j\neq 0}} w_j ln\{\Phi_2(-x_j\beta, z_j\gamma, -\rho)\} + \sum_{j\neq S} w_j ln\{1 - \Phi(z_j\gamma, -\rho)\}$$

where S is the set of observations for which y_j is observed, $\Phi_2(.)$ is the cumulative bivariate normal distribution function (with mean [0 0]`0), $\Phi(.)$ is the standard cumulative normal, and w_j is an optional weight for observation j. [v]

To achieve identification, we need at least one instrument in z_j that does not also belong to x, otherwise identification can be achieved only by functional form. The instrument needs to affect the choice to apply or not to apply for credit but not lenders' decisions to lend. We use two instruments: z_1, the perceived lack of access to credit from banks and financial institutions, and z_2, the perceived lack of access to credit from the Farm Credit System.

The explanatory variables in the second stage include factors affecting the decision to extend a loan by a lender. This decision is based on evaluation of project profitability, collateral, and borrower credit worthiness. Since agricultural lending remains collateral driven, the existence and value of collateral will be the main determinant on who gets a credit or not.

Lenders do not have perfect knowledge of the project's quality and the borrower's credibility. To decrease information asymmetry, lenders collect additional information about borrowers and their projects and require collateral to guard against default. Boucher, Carter and Guirkinger, (2008) show that asymmetric information can result not only in typical quantity rationing but also in "risk rationing" whereby farmers are able to borrow but only under high-collateral contracts which bring then lower expected well-being. Therefore, farmers' perception of the collateral requirement will affect their application decision. We asked operators if they considered availability of collateral as an *obstacle* to obtaining loans and use this variable in the credit equation.

To control for possible land price effects, we include county level land values. We also include farm age to control for availability and quality of financial statements and a growth dummy to proxy for farm profitability, since agricultural lenders are increasingly using cash flow rather than collateral based lending (Klinefelter and Penson, 2005). We also control for operators' income diversification and creditworthiness by including the percentage of income

coming from farming and whether the operator works off the farm since banks also use such information in lending decisions (Berger and Udell, 1998).

To properly identify the effect of credit constraints on investment, variables that affect credit but not investment should be included in the credit offer equation. This variable takes the value of one if the enterprise grew (experienced employment growth) and zero otherwise. The assumption is that change in ROA used in the investment equation captures (expected in previous period) investment opportunities, while the dummy variable used in the credit offer equation provides information only on whether growing firms were funded or not.

3. The data

The data come from a survey of new farmers in Alabama, conducted by Alabama National Agricultural Statistical Service (NASS) in October 2010. The survey was designed to collect unique financial, business and demographic information from new operators in the state. [vi]

New operators were defined as farmers in Alabama who begun any part of their operation since 2005 based on their answer to the 2007 Agricultural Census. Questionnaires we sent to all farmers of the population and one reminder letter and a questionnaire copy were sent two weeks after the first questionnaire. [vii] There were 393 returned questionnaires – a response rate of 24 percent.

While only operators who began to operate any part of their operation in 2005 or later were part of the population that received the questionnaires, when the completed questionnaires were returned, about 30 percent of the respondents indicated that they started their operation before 2005. About 90 percent of these operators indicated that they started their operation in a year after 2000. Thus, these operators fit the definition for new farmers by The Farm Credit

Administration. We use this data feature to our advantage to study if there are financing constraints for the two groups of new farmers. The "newest" operators group includes those who started their operation in 2005 or later, and the "new" operator group includes those operators who, in the survey, indicated that they started any part of their operation between 2000 and 2004. The resulting sample with all variables needed for the analysis consists of 305 observations.

Investment, measured by the change in the value of fixed assets, has both positive (investment) and negative (disinvestment) values. The question we use to construct this variable first defines fixed assets as land, buildings, machinery vehicles, equipment and breeding livestock, and then asks by what percent has the net value of all fixed capital assets changed from 2008 to 2010 to measure the value of investment as percentage of fixed assets.

Since land is part of fixed investment, there is a concern that measured increases in investment may be due to change in land prices even if there was no real investment change. To alleviate measurement errors as discussed in the methods section, we include the county level price of land from the 2007 Census of Agriculture to reflect possible differences in the value of the assets. Second, we add the value of assets at the beginning of operation to control for size of beginning assets values. This variable also corrects for the overall scale effects. Since the largest group of farmers in Alabama consists of livestock (calf and cow) and poultry producers, ownership of land would cause some measurement error but, for Alabama, the measurement error is likely smaller compared to what it may be for a major crop producing region. Further, since potential measurement errors are in the dependent variable, we expect valid coefficient estimates with likely high standard errors.[viii] Although the average disinvestment of the *newest* operations is 1 percent while that of *new* ones is 2%, this difference is not statistically significant as Table 1, which contains the summary statistics results, shows.

The cash flow variable is measured by the percentage of profits (revenue minus costs) kept in liquid assets. Table 1 shows only few statistically significant differences between the two groups. We asked whether the liquidity farmers kept has increased after the crisis and use this dummy to explore if there is a possible effect on investment. We do not find statistically significant difference across the two groups with only 22 percent in each group reporting they kept high levels of liquidity after the crisis.

Opportunity cost of capital is measured by two dummy variables - one that takes the value of one if operations' ROA has increased in the 2008-2010 period and zero otherwise, and one dummy that takes the value of one if ROA has decreased during the period and zero otherwise. The base dummy variable is the one with no change in ROA.[ix] Table 1 shows that increase in ROA was twice higher (10 %) among the *newest* operators than among the new operations (5 %) and this difference is statistically significant, although at the 10 % level.

Among the control variables, we find few statistically significant differences across the groups. The newest farmers have fewer years of previous experience in farming (8.5 versus13.5) and higher proportion of their income coming from farming (17% versus 9%). Compared to the group of new operators, larger proportion of operators from the newest group have a Masters Degree or higher (16% versus 9%), fewer have sales from livestock production (51% versus 62%) and fewer are black (7% versus 13%). Fewer of the newest operators inherited it (14 % versus 24%) and more purchased it (19% versus 12%). Most interestingly, while only 5% of the sample of operators in the new group had beginning assets of $250,000 or more, 29 % of the newest operations fall within this group. It is possible that many of the newest entrants in farming bought land to diversify their assets in unstable financial markets. However, since much

higher percentage of this group's income comes from farming, it is possible that the high returns to farming in the past few years had attracted new entrants.

Summary statistics for the variables in the credit offer equation are also presented in Table 1. There is a statistically significant difference between credit applications by the new and by the newest farmers (25% vs. 38%, respectively).[x] To evaluate how collateral requirements affected access to loans, we asked farmers if collateral requirements were an obstacle to obtaining loans. The answer choices were "no obstacle" which we use as a base, while the obstacles were classified as *minor, moderate,* and *major*. We find statistically significant difference between the two groups only in the *moderate* category: 27% vs. 17% for the *newest* and the *new* farmers, respectively.

4. Results and Discussion

Liquidity constrains

Table 2 presents the results from the regression of investment sensitivity to cash flow and investment opportunity. It contains 3 models with three different samples, the first with operators who started any part of their operations after 2005 (the *newest* group), the second with those who started between 2000 and 2005(*new*), and the last regression uses all observations. The overall fit of these models is acceptable explaining from a quarter to a third of the variation in the data.

The results indicate that, as expected, investment opportunity affects investment by new farming operations in all specifications. Compared to farmers with a flat ROA, investment in operations with increasing ROA is higher by 12 percent and that in operations with decreasing ROA is lower by 6 percent. These results are the same for both groups of farmers.

We find that investment in the group of newest operators depends on internal cash flows (liquidity) with 10 percent higher cash flows associated with about one percent higher investment. This relationship does not hold for the subsample of farmers who started their operation before 2005 which is consistent with Bierlen & Featherstone (1998) who found liquidity constraints in only youngest operators as well as with the literature on liquidity constraints in general (Carriera and Silva 2010). However, the dummy capturing the change in liquidity (*Extra Liquidity*) kept by operators since 2008 is not statistically significant in any of the specifications. We interpret the results to indicate that while the new farmers experience liquidity constraints, these constraints were not affected by the 2008 crisis.

Few other variables are statistically significant in the OLS model. In the group of newest operations, female operators had 7 % less investment than male operators. This result, combined with the relatively high age of operators and anecdotal evidence suggests that the sample contains widows receiving an inheritance and disinvesting from farming. In the same sub-sample, operators in poultry have higher investment compared to operators in livestock with one percent higher income from poultry associated with 8 % higher investment. Off farm work by the operator or the spouse and the percentage of income from farming are not associated with higher level of investment. We also do not find that experience in farming or in other business, operator age, education level, or race are associated with differences in on-farm investment, contrary to findings for off-farm investment by farmers (Mishra et al., 2001).

Since land and its acquisition is important in farming, and we do not have data on operators' land ownership, to ameliorate possible measurement issues in the change in the investment variable, we include the level of farm assets at the begging of the operation and county level land prices for 2007. We find that 100 dollars higher land values are associated with

about 3.8 percent disinvestment in farming and this variable is statistically significant only in the first specification for the newest operations. These results may suggest that relatively expensive land promotes leasing, or that it forces disinvestment in other capital assets.

In terms of the size of the beginning assets, we find differences in association with investment only for the first model specifications and it indicates that farmers with larger beginning assets were much more likely to disinvest from farming compared to those in the smallest $5,000 or less beginning assets class[1].

4.2 Access to credit

Since financing constraints in new operators exist as our results suggest, we turn to the credit offer equation to determine what factors affected operators' access to credit. The results with the marginal impact coefficients are shown in Table 3. Two specifications are estimated – one with the subsample of operators who started since 2005 and one for all operators who started since 2000. We first test for self-selection out of the credit market by testing if a heckman probit model is appropriate. The Wald test for independence of the two equations is rejected at the 1 percent level in both specifications confirming the presence of self-selection.

The results suggest that, for the overall sample of new farmers, those who thought they would not be awarded credit were 20 % less likely to apply than farmers who though that they could get credit from banks and other financial institutions. The *newest* operators were even less likely to apply as shown by the higher marginal impact coefficient of 27. Results further suggest that lending to farmers remains collateral driven. Farmers who thought collateral was a minor obstacle were 18 % less likely to apply (14 for the *newest* group) and those who thought collateral is a major obstacle were 27% (or 18 % for the *newest* group) less likely to apply for

[1] To fit the table on one page, these results are not explicitly presented.

loans. The group of the *newest* farmers seems less likely to apply if they feel they do not have access to loans from FCS or commercial banks but, compared to all farmers, are less averse to applying if collateral is a problem. Together, these results support the idea that new farmers and their lenders are less interested in the return to assets where collateral plays major role consistent and perhaps more interested in the return to management, consistent with the literature.

We further find that average land prices do not affect the probability of loan application. Farmers running new operations were more likely to apply for loan. One additional year in business is associated with 0.6% and 6% lower probability of applying for credit for the *new* and *newest* operations, respectively.

The results from the impact of income diversification show that one percent increase in income from farming is associated with 0.5 % increase in probability of applying for a loan. Farmers with off farm jobs were 13.7 % more likely to apply for loans than farmers who did not work off the farm suggesting that income diversification might have affected farmers' confidence to seek loans. We further find that a 10 point increase in income from livestock production is associated with one percent higher probability to apply for loans and one percent higher probability of being denied a loan. The latter is a small magnitude but it is consistent with the resent problems in the market for protein production (Elinger, 2011).

After controlling for the self-selection out of the credit market, we find that operators who considered collateral a moderate obstacle to getting credit were 6% more likely to have been denied loans while this coefficient is almost doubled to 11% for the group of newest operations. Compared to operators who did not consider collateral a problem, those who considered it a major problem were 16.3 % more likely to be denied credit, and this coefficient is 20.5% in the group of the newest operations.

The dummy for growth is statistically significant and loan applicants whose operations grew were 10 to 15% more likely to have been approved for loans compared to those who did not experience growth, suggesting that agricultural lenders consider factors other than collateral. This finding may give support to the idea that lenders are increasingly focusing on cash flow rather than collateral based lending (Klinefelter and Penson, 2005).

5. Conclusions

In this paper, we set out to establish how the financial crisis on 2008 has affected farmers' credit constraints and who were the farmers able to secure loans for their operation. We focus on the most vulnerable farmers – those with new operation or any part of their operating started in the past 10 years. Survey data from over 300 farmers from Alabama are used to estimate investment equation linking investment to investment opportunity and cash flow. Significant cash flow variable is interpreted as an indicator that internal and external funds are not perfect substitutes and evidence of credit (liquidity) constraints since investment depends on internally generated funds.

In this context, we test for a link between investment and farmers keeping larger liquidity post 2008 as evidence of worsened credit constraints but we do not find evidence that the crisis has worsened the credit constraints of new operations in Alabama. We further find financing constraints only for the group of operators who started any part of their operating since 2005 with 10% increase in cash flow associated with about 1% increase in investment. We did not find financing constraints for the group of operations that started/expanded between 2000 and 2004, consistent with previous findings about agricultural producers in Kansas (Bierlen and Featherstone 1998).

Exploring what factors affected agricultural lenders decisions to fund or not agricultural producers, we found that collateral remains the main obstacle to obtaining loans. We also found that farmers' cash flow and profitability were also considered and were more important to the newest operations. Since our survey results also show that most new farmers use multiple sources to start and expand their operations, programs to encourage entrepreneurship remain relevant.

Table 2. Investment Determinants, OLS

	Newest	New	All
Constant	17.10*	-16.56	11.44
	(10.15)	(18.17)	(7.783)
Cash Flow	0.111**	0.0112	0.0634*
	(0.048)	(0.0615)	(0.035)
Extra liquidity	2.812	1.656	1.563
	(2.665)	(5.333)	(2.097)
ROA Increase	11.46***	12.08*	9.391***
	(3.460)	(6.500)	(2.889)
ROA Decrease	-5.782**	-6.080*	-5.825***
	(2.448)	(3.474)	(1.901)
Female	-7.232**	-5.117	-7.622***
	(3.541)	(5.966)	(2.834)
Exp in Farming	-0.0868	0.185	0.0117
	(0.0797)	(0.147)	(0.0671)
Exp in Business	-0.0545	0.0931	0.00575
	(0.0807)	(0.119)	(0.0621)
Income from Farming	-0.0544	0.0587	-0.0313
	(0.0602)	(0.0879)	(0.0473)
Off farm work	-1.211	4.076	-0.341
	(2.845)	(4.505)	(2.215)
Off farm work by spouse	0.916	-0.273	1.436
	(2.409)	(3.661)	(1.786)
Operator age	-0.088	0.105	-0.0361
	(0.115)	(0.173)	(0.0854)
Farm age	1.654	-0.0807	0.00686
	(1.287)	(0.165)	(0.118)
Row crops	0.089	-0.058	0.0512
	(0.061)	(0.045)	(0.0435)
Land value	-0.004**	0.004	-0.00136
	(0.002)	(0.003)	(0.00133)
Inherited	-7.208**	-5.388	-5.053**
	(3.057)	(3.635)	(2.087)
Purchased	-2.023	-3.418	-2.796
	(2.752)	(6.787)	(2.579)
Dummies			
Operations type (%sales from operation)	Yes	Yes	Yes
Education	Yes	Yes	Yes
Beginning Assets Size	Yes	Yes	Yes
Observations	201	104	305
R-squared	0.357	0.335	0.251

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3 Probit Heckman for receiving loan. Marginal effects for new and newest samples

	(2)	(4)	(1)	(3)
VARIABLES	(Newest)	New	(Newest)	New
No access to loans from Farm Credit Services	0.059	0.076		
	(0.079)	(0.066)		
No access to loans from banks & financial institutions	-0.266*	-0.201*		
	(0.141)	(0.117)		
Collateral is a minor obstacle to credit [a]	0.139*	0.175**	-0.020	-0.024
	(0.083)	(0.069)	(0.054)	(0.044)
Collateral is a moderate obstacle to obtaining credit [a]	0.106	0.098	-0.112*	-0.061*
	(0.079)	(0.066)	(0.062)	(0.035)
Collateral is a major obstacle to receiving credit [a]	0.181*	0.267**	-0.205***	-0.163***
	(0.115)	(0.091)	(0.060)	(0.073)
Land Values (2007 in $'000)	-0.059	-0.016	-0.0.36	-0.038
	(0.048)	(0.040)	(0.046)	(0.031)
Dummy growth	-0.005	-0.035	0.1490**	0.101**
	(0.007)	(0.054)	(0.058)	(0.042)
Farm Age	-0.064**	-0.006*	0.034	0.0049
	(0.028)	(0.003)	(0.022)	(0.0036)
Income from farming	0.005***	0.005***	-0.00066	-0.001
	(0.001)	(0.001)	(0.0001)	(0.001)
Livestock production (% of farm income)	0.002*	0.001**	-0.0014**	-0.001**
	(0.001)	(0.001)	(0.0004)	(0.001)
Exp in Farming	0.002	-0.00001	0.0008	0.001
	(0.002)	(0.0019)	(0.0015)	(0.001)
Off farm work	0.137*	0.136**	0.011	0.029
	(0.071)	(0.061)	(0.045)	(0.029)
Observations	208	301	82	106
Wald Chi2 (10)		40.14		
Pseudo log likelihood (Prob>chi2)	-156 (0.000)	-225 (0.000)		
Wald test of eq. independence (Pr>chi2)	154 (0.000)	10.34 (0.001)		

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

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[i] This approach has been modified to account for the impact of working capital and other issues. Advantages and disadvantages of the approach are also discussed in Hubbard, 1998.

[ii] Advantages and disadvantages of this approach are discussed in Hubbard, 1998 and empirical findings and specification issues are discussed in Carrier and Silva, 2010, recent theoretical work is in Clearly et al 2007.

[iii] Change in cap ital assets rather than the more typical investment level scaled by capital stock is the dependent variable because it was not possible to ask farmers what was the value of their investment and their capital (or we would not have had sufficient number of returned surveys to conduct this analysis). For Alabama for example, there are 149 observations from farms in the 2009 ARMS data and only 7 have started any part of their operation since 2005.

[iv] There are several specifications for the investment opportunity such as the expected value of future profits and discounted value of income from 1 extra $ investment. In large firms, this is typically the average *q* which, under certain conditions (*Hayashi 1982*) serves as a proxy for marginal *q,* or by the fundamental q which is measured in various ways (see Bierlen and Featherstone (1998) for application to agricultural producers). In small firms/farms, a measure of investment opportunity can be employment growth, sales growth, or profitability (e.g., Carreira and Silva 2010).

[v] This model is estimated with heckprobit in Stata

[vi] Such data are not available though alternative sources – e.g in the 2009 ARMS data there are only 6 observations from Alabama that correspond to the group of our newest farmers.

[vii] The Census question was "In what year did the operator begin to operate any part of this operation?" The population was identified as all farmers who entered 2005 or latter; imputed records were excluded and only the first operator from the operation cell (k0930) was used (operators 2 or 3 were ignored); inactive records were removed. Only operators with total value of products sold, who met the minimum threshold of $1,500 were part of the net population , which consisted of 1,639.

[viii] It is possible that some Alabama farmers leased rather than bought land, but we were unable to measure use of leasing by operators.

[ix] *Thijssen* (1996) shows that when investment and financing decisions are independent, capital investment decisions are consistent with static expectations, suggesting that a simple measure for investment opportunity is appropriate.

[x] These results are consistent with the latest evidence on new small businesses presented at Atlanta Fed Reserve Conference on Small Businesses and Entrepreneurship, November 9-10 2011.