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Tax-Exempt Bond Financing for Beginning and Low-Equity Farmers: The Case of 'Aggie Bonds'

James M. Williamson and Ani L. Katchova

The "Aggie Bond" program was established in the 1980s to provide beginning and low-equity farmers access to capital. The bonds, which pay tax-exempt interest, may be used by qualifying famers for purchases of farm real estate and equipment. Using Aggie Bond data collected from states and Census of Agriculture data spanning 25 years, we examine whether the program has had an impact on farm entrance, land ownership, and the size of operation. We do not find strong evidence that the program led to an increase in the proportion of beginning farmers; however, we find limited evidence the program helped beginning farmers become full land owners as well as increased the rate of growth in the proportion of beginning farmers who are full land owners.

Key Words: Aggie Bonds, beginning farmers, land ownership

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It comes as no surprise that starting a farm operation can be an expensive endeavor. Startup requires access to land and capital equipment as well as a commitment of the operator's time. The costs are particularly prohibitive for beginning or low-equity farmers. In 2011, the average farm operated 415 acres and held just under $1 million in assets, the vast majority of which was in land and structures.[1] On an annual basis, farms may make capital purchases as well. In 2011, 84% of farms made a capital purchase and the average was $36,430.[2] Together, these figures suggest access to capital and its cost present significant hurdles for new entrants.

Ownership of land and capital equipment is not imperative, and it is not uncommon for operators to farm a combination of owned and rented land. Furthermore, many of the common capital-intensive tasks of the farm operation can be contracted, for example custom application services for fertilizer, tillage and harvesting, and drying and storing. However, ownership of farmland in particular is attractive because it may be part of a larger wealth-building strategy for the operator. Nickerson et al. (2012) report that farm real estate, which includes structures, accounts for 84% of total value of farm assets. Ownership in farmland represents an investment not only in an asset used for current production,

[1] The term farm means any place from which $1000 or more of agricultural products were produced and sold, or normally would have been sold, during the year.

James M. Williamson is an economist with the Economic Research Service of the U.S. Department of Agriculture. Ani L. Katchova is an Associate Professor in the Department of Agricultural Economics at the University of Kentucky, Lexington, Kentucky, and AAAS Fellow and Visiting Scholar at the Economic Research Service, USDA, Washington, DC.

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[2] Authors' calculations from 2011 Agricultural Resource Management Survey data from the USDA.

but also as a store of wealth. Operators may wish to own land for other reasons as well. Research has shown that a portion of commodities payments may accrue to landowners, even when they rent their farmland (Kirwan, 2009; Michael, Kirwan, and Hopkins, 2003).

To finance land and capital equipment acquisitions, beginning farmers may reach out to traditional lending institutions such as commercial banks or farm credit services. However, it is up to them to negotiate terms with the lender, and because they are likely to face constraints as a result of a low equity or cash flow position (which is often the case with new operations), the terms of the loan will reflect such a position.

States and the federal government recognize the need to support agriculture and help new farm operators. The U.S. Department of Agriculture (USDA) through the Farm Service Agency (FSA) makes and guarantees loans to beginning farmers who are unable to obtain financing from commercial lenders by targeting a portion of its direct and guaranteed farm ownership and operating loan funds to beginning farmers. FSA targets a portion of its loan funds to small and beginning farmers and ranchers or farmers who have operated a farm or ranch for 10 or fewer years and do not own a farm or ranch greater than 30% of the median size farm in the county.[3]

A first-time or beginning farmer loan, also known as an "Aggie Bond," is another source of capital for farmers who wish to establish or expand an operation. The Aggie Bond program was established in the early 1980s to provide eligible farmers and ranchers with loans for purchases of farm real estate and equipment. Initially starting as a pilot program in three states in 1980, Aggie Bond programs currently operate in 16 states (CDFA, 2005). The program is authorized through a provision in the Internal Revenue Code (IRC) covering private activity bonds and relies on private lenders to make loans to eligible farmers; in return, the lender receives a tax exemption on the interest received from the loan. Although the program is not costless to federal and state governments—they still lose the revenue associated with the tax exemption on the interest lenders receive—they do not assume the risk of the loan. Instead, the program relies on private lenders to evaluate the creditworthiness of the farmer and to assume the liability of default. The benefit to beginning farmers is that the tax-exempt status of the loan is an incentive to lenders to provide access to credit they might not otherwise provide and at rates that may be below the market rate.

Despite having been around for over 30 years, questions of whether the program has achieved perceived objectives have remained largely unanswered. For example, has the program encouraged entrance into farming, and does the program affect land ownership or the size of the operation? In this article, we use state Aggie Bond data and Census of Agriculture data to examine these questions. We use a difference-in-differences approach to examine the effects of the program on outcome measures, which differ across groups such as U.S. states. Specifically, we evaluate the effects of the Aggie Bond program on beginning farmers in counties for the states where the program was introduced. Using Census of Agriculture data spanning 25 years combined with state Aggie Bond data, we do not find strong evidence the program led to an increase in the proportion of beginning farmers; however, we find limited evidence the program may be responsible for a greater proportion of beginning farmers who are full land owners as well as affecting the rate of growth in the proportion of beginning farmers who are full land owners. The next section provides a background on Aggie Bonds and the mechanics of the issuance followed by a presentation of our model and data and finally the results and discussion.

Background

The average age of U.S. farmers and ranchers has been increasing over time. The fastest growing segment of farmers is those 65 years and older. In 1978, 16.4% of principal farm operators were older than 65 years. By 2007, 30% of all farms were operated by producers older than 65 years of age. In comparison, only 8% of self-employed workers in nonagricultural

[3] Farm size is based on total operated acres as determined by the most current Census for Agriculture.

industries in 2007 are that old (Hoppe, MacDonald, and Korb, 2010). Furthermore, farmers aged 55 years and older account for over half of the total value of production, whereas farmers younger than 35 years contribute only 6% of total value of production. This demographic transition has implications for the future of the U.S. agricultural sector.

Ahearn (2011) identified two potential challenges for beginning farmers as having access to land and having access to government programs. As a result, many programs, including government programs and innovative Extension programs, have been introduced to help beginning farmers overcome those challenges (Meyer et al., 2011). Although the rest of the literature focuses mostly on management technologies used by beginning farmers (Adhikari, Mishra, and Chintawar, 2009; Mishra, Wilson, and Williams, 2007) or financial performance and financial stress of beginning farmers (Katchova, 2010; Kropp and Katchova, 2011), our study examines a unique tax-exempt bond financing program to help beginning farmers establish their businesses.

Recent evidence from a program similar to the Aggie Bond program offers some potential evidence of the effect of targeted financial assistance. Pederson, Chung, and Nel (2012) present findings from a study of Minnesota's Basic Farmer Loan and Seller Assisted Loan (BSAL) programs—two programs that are similar to Aggie Bonds with respect to the qualification restrictions they apply to loan applicants (beginning farmer status and net worth limitation, for example). Among their findings, they report Minnesota's BSAL program helped credit constrained farmers increase their farm's productivity, as measured by gross income, as well as increase their investment in depreciable capital equipment.

Mechanics of Aggie Bond Placement

The tax-exempt status of certain private activity bonds is predicated on the policy goal of addressing certain failures; a failure in the credit market is one possible explanation for the provisions, while suboptimal provision of a good is another. In certain cases, when private business activities are considered to serve the public good (or meet a public purpose test), the proceeds of the bonds may be used for the qualifying purpose and the interest on such bonds is tax-exempt (sections 103 and 141[e][1] of the IRC). Private activity bonds are authorized for many purposes, including the development of facilities associated with public services such as airports and sewage facilities, manufacturing facilities, certain student loans, redevelopment projects, and small issue farm property.

The Aggie Bond program has been around since a three-state pilot program was established in 1980. Over time, the program expanded to 24 states, although currently only 16 states operate a program. Authority to issue Beginning Farmer Loan Bonds is provided by Sections 141 (Private Activity Bonds) and 144 of the IRC. Under Section 141, certain bonds may be issued and the proceeds used to fund private business activities. The code applies a test to private business, namely more than 10% (5% in some cases) of the proceeds of the issue go to private business use and that the bond is secured by the property used for private activity or payment in respect of the property.

In most cases, Aggie Bond programs are administered by a state development or finance authority, because these agencies are responsible for facilitating other forms of development bond financing.[4] For example, Illinois provides bond funding through the Illinois Finance Authority, and Arkansas uses the Arkansas Development Finance Authority. Some states have development authorities specific to agriculture, for example, Iowa.

Unlike other forms of development bonds, the Aggie Bonds are financed by lending institutions and not from an issuance in a public or private bond market. Instead, beginning farmers who wish to acquire Aggie Bond funds start the process by contacting a private lender who participates in the Aggie Bond program, such as a commercial bank, as if they were pursuing traditional loan financing. Because the lender will hold the bond, the lender evaluates the operator's loan request for risk, collateral, and other conditions, and the lender and operator negotiate terms and conditions of the loan. Once the terms

[4] The Aggie Bond program in North Dakota is administered by the Bank of North Dakota, which is overseen by the North Dakota Industrial Commission.

are negotiated, the operator submits an Aggie Bond application with the required material—financial statement information of the operation, background letter, and other information to meet the requirements of the state authority—to the state's Aggie Bond program.

In the bond issuance process, a state authority acts as a conduit between the lender and the operator. If the bond application is approved by the authority, the lender purchases the bond from the authority who then lends the proceeds of the bond to the operator. In response, the authority assigns the payment of principal and interest to the lender secured by a promissory note from the operator.

Although the USDA's definition of a first-time or beginning farmer relies on a test of time spent farming, the IRC does not use a measure of time to define such farmers. Instead, it imposes a test on ownership—either direct or indirect—of farmland. The test limits farmers from owning substantial farmland, which the IRC defines as no more than 30% of the median size of a farm in the county in which such parcel is located (Section 147[c][2][e] of the IRC).

The Aggie Bond program has benefitted from adjustments overtime. First, the Tax Reform Act of 1986 (TRA86) expanded the term of "beginning farmer" to include farmers who would otherwise qualify except for having previously owned farmland that was disposed of while they were insolvent. TRA86 also allowed bond users to apply 25% ($62,500) of the maximum bond proceeds to purchase used agricultural equipment. Later, the substantial ownership rule was amended in 1996, replacing the 15% of the median rule with the current 30% rule, and bond rules were loosened to allow bond funds to be used to purchase land from related persons (P.L. 140-188, 1996). Before 2008, the IRC placed an additional test on the market value of the land a farmer could own: the market value of the land could not exceed $125,000. In 2008, the nominal maximum bond amount, that is, the largest loan a beginning farmer could access through the Aggie Bond program, was increased. This was arguably the most significant change made to the program since its inception. Starting in June 2008, the maximum bond amount was increased from $250,000 to $450,000 and is indexed for inflation thereafter. Before that, the maximum bond amount had been unchanged; thus, in real terms, the value of the loan has declined over time (Figure 1).

Some states impose additional tests for qualifying for a beginning farmer program. In addition to the substantial ownership test for first-time farmers in the IRC, states require applicants to meet a net worth limit test. For example, Iowa's Beginning Farmer Loan Program requires that farmers have a net worth of no more than $500,000, indexed for inflation by the *Prices Paid by Farmers* index.[5]

Econometric Approach

A basic challenge in empirically assessing the impacts of the Aggie Bonds is that we do not observe the counterfactual situation—the outcome of the parties affected by the policy (the treated counties for the states participating in the program) in the absence of the policy. When random assignment is not possible, like in the present case, some method of estimating the counterfactual outcomes such as difference-in-differences is necessary. Another challenge is that we cannot identify in our data which beginning farmers have participated in the Aggie Bond program and which have not. We can only identify the counties (nested in the states) that have implemented Aggie Bond programs. Therefore, our focus is on how the Aggie Bond program has affected the outcomes for all beginning farmers in counties and on states adopting this program rather than on calculating individual-specific effects based on program participation.

Difference-in-Differences Models

Difference-in-differences models typically evaluate the effects of a program on outcome measures, which differ across groups, such as U.S. states. Specifically, we evaluate the effects of the Aggie Bond Program on beginning farmers in states where the program was introduced.

[5] Internet site: "*Prices Paid Surveys and Indexes.*" http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Prices_Paid_and_Prices_Paid_Indexes/index.asp.

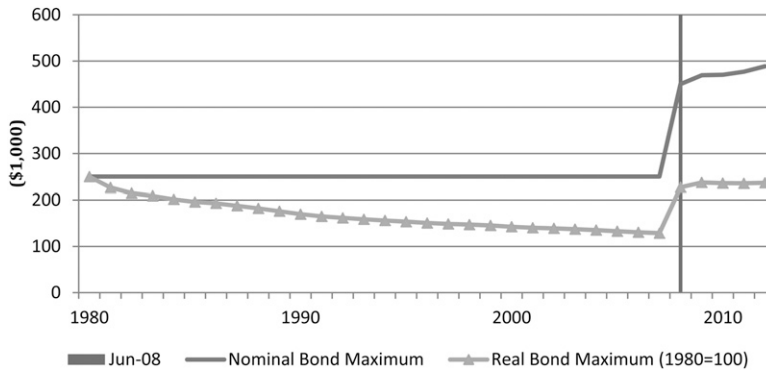

Figure 1. Aggie Bond Loan Limit: 1980–2012

Two differences are commonly considered. One difference is the selection or heterogeneity bias, which is treated by removing the state effects. The second difference is the common economic fluctuations from year to year, which are treated by removing the time effects. The difference-in-differences (DIDs) estimator estimates the effect of the program on the outcome measures after removing the state and time differences. Specifically, two differences are considered: one difference is between the outcomes of individuals located in states participating in the program and those that are not located in states participating in the program, and the second difference in outcomes is between the different periods in terms of the 6 years of census data. The remaining interaction effect (the DIDs) shows the impact of the program on beginning farmers in states that have adopted the program. We aggregate the data to county levels to calculate outcome measures affecting beginning farmers.

The DIDs model is defined as

$$(1) \quad y_{it} = \alpha + \sum_{j=1}^{6} \beta t_{it} + \gamma d_{it} + \sum_{t=1}^{6} \delta t_{it} a_{it} + \phi x_{it} + e_{it},$$

where y_{it} is the outcome measure for county i in one of the six census years t, t_{it} is a time dummy variable equal to one if the observation is in census year t and zero otherwise, d_{it} is a program state dummy variable equal to one if county i is located in a state participating in the program and zero if it is not, $t_{it}a_{it}$ is an interaction term between the time dummy variable t_{it} and active program dummy variable for an active program d_{it} (if the program is active in county i and time t), and x_{it} are other characteristics influencing the outcome variable. The time-active program interaction terms $t_{it}a_{it}$ are the DIDs measure for the effect of the program on outcome measures, controlling for common time differences between the two groups. We consider four outcome measures, y_{it}: 1) the proportion of beginning farmers in a county; 2) the proportion of beginning farmers who are full land owners in a county; 3) the proportion of beginning farmers who are full land tenants in a county; and 4) the average number of acres operated by beginning farmers in a county. Models are estimated in terms of the levels of these outcome variables as well as growth rates in these outcome variables from the current census period to the next census period. Because the analysis is at the county level, clustered standard errors are calculated with each state serving as a cluster variable with counties clustered within states.

Data

The Census of Agriculture data were used and covered census years 1982, 1987, 1992, 1997, 2002, and 2007. The census identifies farmers based on their years of experience and provides detailed information on their farm businesses. Beginning farmers are defined as those with 10 or less years of farming experience using a USDA definition. Several other commonly used operator and farm business characteristics are used in the analysis. Farmers reported their primary occupation as farming if they have spent the majority (50% or more) of their work time on farm or ranch work. Farmers who reported positive

number of hours for off-farm work are classified as those who worked off the farm. Farmers who lived on their operation are classified as having farm residence. Government payments are measured as the value of all government payments received. An indicator for a female primary operator is also used.

Farm size is measured as operated acres, which is calculated as the acres owned minus the acres rented to others plus the acres rented from others. Full land owners are farmers who own all of the land they operate. Part land owners own some land and rent the rest of the land that they operate. Full land tenants are those who rent all land they operate and do not own land.

Data from the Census of Agriculture is aggregated (averaged) at the county level and then aggregated (averaged) again to calculate state level statistics. Because of this intermediate aggregation at the county level before calculating state level statistics, the numbers reported in this study use a different calculation method and will differ from the official estimates published by the USDA.

Next, we take a look at the states that had an authorized Aggie Bond program at any time. Table 1 presents the states by year of program activity. In 1982, just four states in our data set had an authorized program: Colorado, Iowa, Illinois, and Nebraska. In 2007, the last available census year, 14 states had such a program. The Aggie Bond data were collected by the authors from the various state agencies that administer the program and were subsequently merged with the census data at the state level. In total, 14 states out of 16 with authorized programs have available data. Table 2 presents descriptive statistics of currently authorized programs. The oldest program in operation is Iowa's Aggie Bond program, and it is also has one of the highest issuance volumes among all program states with more than $4 million of bonds issued per year. On average, the 14 state programs issued just over $2.1 million in loans per year, whereas the average volume ceiling—maximum aggregate amount that could be issued in a year—was $12.9 million. In our data, Aggie Bond issuances were never limited by the volume ceiling. The average net worth limit in eight states was $346,592; the other seven states did not have such a limit.

Table 3 provides summary statistics by census year for program and nonprogram states. Program states are defined as those that have had the Aggie Bond program at least in one of the census years, whereas nonprogram states are defined as those that did not participate in the Aggie Bond program during 1982–2007. In general, in a given census year, program states had a greater proportion of beginning farmers than nonprogram states; however, overall both groups show declining proportions of beginning farmers over time. The proportion of beginning farmers who are full land owners is also higher in program states as is the average number of acres operated by beginning farmers.

Results

Two types of DIDs models are used based on both levels and growth in key variables such as proportion of beginning farmers in a county, proportion of full land owners, proportion of full land tenants, and average farm operated

Table 1. List of States with Active Aggie Bond Programs for Each Census Year

Census Years	States with Active Aggie Bond Programs
1982	Colorado, Iowa, Illinois, Nebraska
1987	Colorado, Iowa, Illinois, Nebraska, Montana
1992	Colorado, Iowa, Illinois, Nebraska, Montana, Arkansas, Kansas, Minnesota
1997	Colorado, Iowa, Illinois, Nebraska, Montana, Arkansas, Kansas, Minnesota, Oklahoma, South Dakota, North Dakota
2002	Colorado, Iowa, Illinois, Nebraska, Montana, Arkansas, Kansas, Minnesota, Oklahoma, South Dakota, North Dakota, Pennsylvania, Indiana
2007	Colorado, Iowa, Illinois, Nebraska, Montana, Arkansas, Kansas, Minnesota, Oklahoma, South Dakota, North Dakota, Maryland

Note: Washington adopted the program in 2008, so it is not included in our analysis.

Table 2. Characteristics of Authorized Aggie Bond Programs through 2012

State	Program Age in Years	Mean Annual Volume of Bonds Issued	Mean Ceiling Volume[a]	Mean Net Worth Limit[b]
Arkansas	23	$116,301	No Ceiling	No limit
Colorado	31	1,510,389	$13,698,516	No limit
Illinois	30	7,458,549	15,329,020	500,000
Iowa	31	4,128,273	49,566,535	341,908
Indiana	13	17,857	10,000,000	No limit
Kansas	22	2,859,052	No Ceiling	No limit
Maryland	5	0	No Ceiling	No limit
Minnesota	21	1,569,000[c]	5,000,000	325,929
Missouri	27	1,214,794	No Ceiling	No limit
Nebraska	30	3,566,386	No Ceiling	346,667
North Dakota	15	73,135	7,812,500	250,000
Oklahoma	18	959,652	3,521,804	254,090
Pennsylvania	14	2,288,842	5,473,857	435,714
South Dakota	16	2,230,397	10,000,000	311,765
Washington	4	1,576,634	NA	No limit
Total	20[d]	2,144,222	12,869,801	346,592

Notes: Altogether there are 16 states with authorized Aggie Bond programs, although some may not have had any bond issues in a particular year. Data for the state of Montana were not available.

[a] Some states do not have a specific volume limit for Aggie Bonds. In such a case, the Aggie Bond volume is limited by the State's Private Activity Bond limit.

[b] Not all states apply a net worth limit to Aggie Bond applicants.

[c] Based on 14 years of available data.

[d] Mean.

NA, not available.

acres. We first present the DIDs results for the level of variables (Table 4). The first column of Table 4 presents the results for the outcome measure Proportion of Beginning Farmers in a county. The state program dummy, the variable that indicates whether the county's state had an authorized Aggie Bond program, is negative and robust at the 5% level of significance. The coefficient tells us that the presence of the program is associated with a 3.4% lower proportion of beginning farmers than in the absence of an Aggie Bond program. The time trend control variables confirm that the proportion of beginning farmers is declining overtime. As well, we find the null of no program effect on the proportion of beginning farmers in a county of an Aggie Bond state—the DIDs estimators—cannot be rejected for any of the census years.

We find limited evidence that the program may have lead to a greater Proportion of Full Land Ownership and greater Acres Operated (columns B and D of Table 4). The DIDs estimator for census year 2007 indicates that the proportion of beginning farmers who are full land owners is 2.5% higher in counties of states with Aggie Bond programs than in those without, and on average, beginning farmers operated 143.3 more acres in the program counties in 2007 as compared with 1982. Both coefficient estimates are robust at the 5% level of statistical significance.

Government payments and the proportion of farmers who also worked off-farm were among other characteristics found to be associated with the outcome measures. All else equal, the larger the amount of average government payments in a county, the smaller the proportion of beginning farmers in a county, which is consistent with the evidence that beginning farmers operate fewer acres eligible for government program payments. Although statistically significant, the effect was small in economic terms—less than 0.002% increase in the proportion of beginning farmers for a $1000 increase in average government payments that farmers receive in a county. On the other hand, a 1% increase in the proportion of farmers who also worked off-farm was associated with a 0.119% increase in the proportion of beginning farmers in a county.

Table 3. Descriptive Statistics by Census Year for Program and Nonprogram States

Census Years	States	Number of Observations[a]	Proportion of Beginning Farmers[b]	Proportion of Full Land Owners[c]	Proportion of Full Land Tenants[c]	Average Farm Operated Acres[c]	Average Operator Age[c]
1982	Program states	1956	0.471	0.579	0.158	492	43.2
1987	Program states	1954	0.409	0.593	0.167	475	44.4
1992	Program states	1955	0.372	0.586	0.168	540	45.7
1997	Program states	1957	0.377	0.631	0.142	469	47.1
2002	Program states	1955	0.356	0.718	0.098	580	48.4
2007	Program states	1955	0.342	0.750	0.087	455	50.3
1982	Nonprogram states	1116	0.421	0.463	0.251	381	39.2
1987	Nonprogram states	1115	0.362	0.473	0.270	368	40.3
1992	Nonprogram states	1115	0.324	0.489	0.248	378	41.7
1997	Nonprogram states	1116	0.323	0.533	0.213	364	43.6
2002	Nonprogram states	1116	0.297	0.651	0.142	394	45.8
2007	Nonprogram states	1116	0.287	0.693	0.131	335	47.6

Note: Descriptive statistics (proportions and means) are calculated at the county level first and then averaged across all counties.
[a] The number of observations are counties.
[b] Calculated based on all farmers in a county.
[c] Calculated based on data for beginning farmers only in a county.

Although we do not find evidence the program influenced the proportion of beginning farmers in a county, we find limited evidence that the program affects growth rates for the proportion of beginning farmers. One possible explanation for this finding is that we only find a difference in growth rates for one period to the next and perhaps that is not sustained over the years or significant enough to make a difference regarding the proportions (levels). Table 5 presents the DIDs model for growth in variables. Because we calculate growth rates from one year to the next, only five growth rates are calculated from the six census years. The DIDs estimates represent the program effect on the change in growth rates between two periods. For example, the variable Active Program Dummy 2002 is the effect of the Aggie Bond program on the growth rate between 2002 and 2007 compared with the growth rate of the reference period 1982–1984. In column A, the DIDs estimator for 1997 tells us that the presence of the program decreased the growth of the proportion of beginning farmers by 1.37% between census years 1997 and 2002 compared with the growth rate in the reference period. However, consistent with the change in levels from Table 4, we find evidence of the program's positive effect on the growth rates of the proportion of beginning farmers who are full land owners. The DIDs estimator for the change between census years 1987 and 1992 is 1.98% and the change between census years 1997 and 2002 is 2.39%, and both are statistically significant at the 5% level.

Estimates for the growth of the proportion of beginning farmers who are full land tenants show the presence of the program resulted in slower growth over the same census years that found greater growth of full land ownership (Table 5, column C). The presence of the program is associated with a decreased growth rate of the proportion of full land tenants between census years 1987 and 1992 of 1.88%; the change between census years 1997 and 2002 is −2.16%. Both are statistically significant at the 5% level. We cannot reject the null of no program effect in the case of growth of operated acres.

Table 4. Difference-in-differences Models for the Levels in Variables

	A		B		C		D	
	Proportion of Beginning Farmers		Proportion of Full Land Owners		Proportion of Full Land Tenants		Farm Operated Acres	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Intercept	−1.122**	0.080	0.052	0.057	0.623**	0.039	−2951.562**	950.177
Program state dummy	−0.034**	0.010	−0.018	0.013	0.024**	0.008	−197.360*	105.567
Dummy for 2007	−0.088**	0.012	0.063**	0.010	−0.020**	0.006	−251.849**	72.130
Dummy for 2002	−0.056**	0.012	0.089**	0.009	−0.046**	0.004	−299.185**	121.373
Dummy for 1997	−0.069**	0.007	−0.008	0.006	0.012**	0.004	−68.360	51.344
Dummy for 1992	−0.071**	0.006	−0.018**	0.006	0.011**	0.003	−42.922	48.208
Dummy for 1987	−0.043**	0.005	0.008*	0.004	0.001	0.003	−62.840	40.719
Active program dummy 2007	−0.006	0.009	0.024**	0.012	−0.026**	0.010	143.250*	79.634
Active program dummy 2002	−0.005	0.011	0.016	0.011	−0.024**	0.009	−2.981	93.515
Active program dummy 1997	0.004	0.012	−0.004	0.012	−0.005	0.007	53.778	48.244
Active program dummy 1992	0.008	0.011	0.018	0.012	−0.003	0.006	−54.677	55.005
Active program dummy 1987	0.012	0.013	0.022*	0.012	0.010	0.011	−69.098	84.213
Average farmer's age	−0.011**	0.001	0.011**	0.001	−0.007**	0.000	62.030**	20.802
Average government payments ($000)	−0.001**	0.001	−0.005**	0.001	0.004**	0.000	7.500	15.349
Proportion of farmers with primary occupation farming	−0.116**	0.028	−0.347**	0.028	0.244**	0.023	2818.845**	756.480
Proportion of farmers with farm residence	−0.184**	0.025	0.260**	0.019	−0.317**	0.021	−871.894**	326.909
Proportion of farmers who also worked off-farm	0.119**	0.045	−0.027	0.029	−0.024	0.023	457.063	337.673
Proportion of farmers who are female	0.417**	0.053	0.171**	0.032	0.041*	0.022	−958.825	579.152
Number of observations	18,453		18,426		18,426		18,426	
R^2	0.463		0.630		0.610		0.060	

Note: Regressions are estimated with county-level data. Significance at the 10% and 5% level are denoted by one and two asterisks, respectively.

Table 5. Difference-in-Differences Models for the Growth in Variables

	A		B		C		D	
	Growth in the Proportion of Beginning Farmers		Growth in the Proportion of Full Land Owners		Growth in the Proportion of Full Land Tenants		Growth in Farm Operated Acres	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Intercept	−0.586**	0.046	0.146**	0.040	−0.179**	0.030	0.634	2.037
Program state dummy	0.005	0.003	−0.014**	0.005	0.009**	0.004	0.061	0.064
Dummy for 2002	0.008	0.006	0.038**	0.007	−0.042**	0.005	−0.282	0.207
Dummy for 1997	0.016**	0.005	0.093**	0.006	−0.069**	0.005	−0.104	0.123
Dummy for 1992	0.043**	0.004	0.038**	0.006	−0.043**	0.004	−0.164*	0.090
Dummy for 1987	0.013**	0.005	−0.014**	0.005	−0.015**	0.005	0.044	0.076
Active program dummy 2002	−0.001	0.006	0.007	0.008	0.006	0.006	−0.127	0.163
Active program dummy 1997	−0.013**	0.006	0.023**	0.009	−0.021**	0.007	0.008	0.100
Active program dummy 1992	−0.004	0.007	0.002	0.007	−0.008	0.006	0.031	0.059
Active program dummy 1987	−0.001	0.004	0.019**	0.007	−0.018**	0.008	0.072	0.071
Average farmer's age	0.009**	0.000	−0.003**	0.000	0.003**	0.000	0.020	0.013
Average government payments ($000)	−0.000	0.000	0.001**	0.000	−0.001**	0.000	−0.026	0.020
Proportion of farmers with primary occupation farming	0.061**	0.018	0.058**	0.018	−0.004	0.011	−0.250	0.840
Proportion of farmers with farm residence	0.061**	0.009	−0.072**	0.009	0.100**	0.009	−0.707	0.506
Proportion of farmers who also worked off-farm	−0.024	0.023	0.055*	0.028	−0.013	0.019	−1.327	2.023
Proportion of farmers who are female	−0.134**	0.024	0.021	0.039	−0.026	0.029	2.643*	1.380
Number of observations	15,375		15,335		15,339		15,339	
R^2	0.158		0.130		0.110		0.005	

Note: Regressions are estimated with county-level data. Significance at the 10% and 5% level are denoted by one and two asterisks, respectively.

Conclusion

For beginning farmers, starting a farm operation is an expensive endeavor with acquisition of equipment and land as one of the largest hurdles to overcome. The Aggie Bond program, currently authorized in 16 states, is one lending vehicle beginning farmers may access in coordination of private lenders. In return, the lender receives a tax exemption on the interest received from the loan, providing an incentive to lenders to offer loans to beginning farmers and at rates that may be below the market rate. Although the volume of bonds issued varies significantly across states, it is particularly popular in the Midwest, especially the Corn Belt.

We estimate four models, both for levels and differences in variables, meant to measure the program's impact on the beginning farmer population and aspects of their operation. The results generally show that there is no significant effect of the program on the proportion of beginning farmers in a county. We do not find evidence that the program increases the proportion of beginning farmers in a county, and in fact, the one significant DIDs estimate showed the proportion of beginning farmers declining in the presence of the program. We find, however, the program has an effect in some census years on the proportion of beginning farmers who are full land owners. In such years, we find the proportion of beginning farmers who are full land owners to be 2.5% greater in the presence of the program. Furthermore, we find the program's presence in a state resulted in the growth of the proportion of full land owners that was 1.98–2.39% greater than growth in a reference period without the program. Although limited, the evidence suggests the program is helping with the acquisition of real property, one of the intended goals of the program.

Those calling for an expansion of the program—primarily by exempting Aggie Bonds from the volume limit applied to private activity bonds[6]—may wish to consider whether, in light of the evidence we present, the policy objective of encouraging participation by beginning farmers could be achieved in another way. The evidence suggests the Aggie Bond program does not affect the proportion of beginning farmers in a county. On the other hand, the program has a positive effect on full land ownership and acres operated, which addresses the beginning farmer's challenges of acquiring land and program acres.

[6] It should be noted the authors have never found the volume limit to be binding.

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. "Potential Challenges for Beginning Farmers." *Choices (New York, N.Y.)* 26(2011):1–6.

CDFA. *Aggie Bonds*. Council of Development Finance Agencies, 2005. Internet site: www.cdfa.net/cdfa/cdfaweb.nsf/ordredirect.html?open&id=cdfafactsheetaggiebonds.html. Accessed February 2013.

Hoppe, R.A., J.M. MacDonald, and P. Korb. *Small Farms in the United States: Persistence Under Pressure*. EIB-63, U.S. Department of Agriculture, Economic Research Service, February 2010.

Katchova, A.L. "An Analysis of the Financial Performance of Beginning Farmers." Selected paper, Agricultural and Applied Economics Association Meeting, Denver, CO, July 25–27, 2010.

Kirwan, B. "The Incidence of U.S. Agricultural Subsidies on Farmland Rental Rates." *The Journal of Political Economy* 117(2009):138–64.

Kropp, J., and A.L. Katchova. "The Effect of Direct Payments on Liquidity and Repayment Capacity for Beginning Farmers." *Agricultural Finance Review* 71(2011):347–65.

Meyer, L., J. Hunter, A.L. Katchova, S. Lovett, D. Thilmany, M. Sullins, and A. Card. "Approaching Beginning Farmers as a New Stakeholder for Extension." *Choices (New York, N.Y.)* 26(2011): 1–7.

Michael, J.R., B. Kirwan, and J. Hopkins. "The Incidence of Government Payments on Agricultural Land Rents: The Challenges of Identification." *American Journal of Agricultural Economics* 85(2003):762–69.

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.

Nickerson, C., M. Morehart, T. Kuethe, J. Beckman, J. Ifft, and R. Williams. *Trends in U.S. Farmland Values and Ownership*. EIB-92. U.S. Dept. of Agriculture, Econ. Res. Serv. February 2012.

Pederson, G., W. Chung, and R. Nel. "Micro-Economic Impacts of a State-Funded Farmer Loan Program." *Agricultural Finance Review* 7(2012):1–25.

P.L. 140-188. *Small Business Job Protection Act of 1996*. Public Law (1996).