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Article

High Risk, Constrained Return: Impact of Student Loans on Agricultural Real Estate

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Abstract: A farming household's decision to continue producing agricultural commodities within the United States is influenced by a multitude of factors. Thus, this study seeks to examine whether the outstanding student loan balance of any member within a farming household may explain why the total number of acres devoted to the production of agriculture in the United States continues to decline. Panel data from the 2007–2009 Survey of Consumer Finances are analyzed via a fixed effect model to estimate the effect of outstanding student loan balances on farmland acreage owned, controlling for other factors like farm income, debt, and land prices. The results suggest that for each additional dollar of outstanding student loan debt, there is an associated decrease of 0.0064 acres in total farmland ownership. This suggests that student loan debt may also be a factor in the decline in real estate devoted to agriculture production. The estimated effect is both economically and statistically significant. This study contributes to the literature on the risks and constraints associated with farming households that own or seek to procure additional acres of agricultural producing real estate.

Keywords: student loans; agricultural real estate; agricultural economics; farmland; debt



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1. Introduction

Agricultural real estate is a critical factor in the production of agricultural commodities in farming and ranching operations worldwide, not just in the United States. However, the total acres devoted to the production of agriculture in the United States declined from 922 million acres in 2007 (Kueth 2014) to 879 million acres in 2023 (USDA 2024). Farming families owned and operated most of that farmland (Hoppe 2010). The reasons why these families continue to farm vary across the United States. Rosenzweig and Schultz (1985) suggest that a farming household produces commodities according to its members' preferences. However, it is more likely that market forces dictate the commodities produced by this modern small-family farm for sale and exchange, as these operations consist of household members who have forgone the opportunity to participate in other industries and have chosen to continue in the production of agriculture (Singh et al. 1986). The opportunity costs associated with agriculture production may explain why the educational gap between rural and urban populations continues to widen and why those with student loan balances are less likely to reside in rural areas (Tabit et al. 2019).

According to the Census of Agriculture, conducted every five years by the United States Department of Agriculture, ninety-eight percent of farming operations are classified as family farms (Hoppe 2010). In 2012, eighty-eight percent of these farming operations were classified as small-family farms, which, on average, owned 236 acres (USDA 2011). Smaller farms are at a disadvantage compared to large ones since these operations are

relatively more profitable when prices are supported, and the market remains competitive (Kumbhakar et al. 1991). This could be another reason why there has been a decline in the land used by farms to produce crops and/or rear livestock. The harsh reality is that most farmers, whether established or just beginning, are more likely to acquire an additional acre of agricultural real estate by purchasing it on the open market from a nonrelative than by any other procurement means (Ahearn 2011). Thus, it is essential to evaluate how a farming household can be affected by the choice to finance the education of one of its members with the use of a student loan, as that decision to enter that type of debt contract may influence and/or impact the farming household's ability to allocate resources and/or make investment in other projects.

A significant number of American households rely on the assistance of federally funded student loan programs to finance a college education. In the academic year of 2007, when the households in this study attained student loans, forty-six percent of undergraduate students received federal loan proceeds from the Stafford Loan Program (Woo and Horn 2016). This article examines whether taking out a student loan to fund a college education impacts the quantity of farmland owned and operated by a farming family, regardless of which household member is liable for the student loan debt. Per the criteria outlined in the USDA's National Agricultural Statistics Service (NASS), the farming households within this sample are intended to represent small-family farming operations. The effect of student loans on the quantity of farmland will be estimated with a fixed effect ordinary least squares regression on a panel sample from the Survey of Consumer Finance 2007–2009 dataset.

2. Literature Review

2.1. *The Role of Education in Agriculture*

Prior research exploring whether education attainment affects farming efficiency has yielded mixed results. Various researchers (Griliches 1964; Welch 1970; Hayami and Ruttan 1970; Lockheed et al. 1980; Huffman 1974, 1977; Pitt and Sumodiningrat 1991; Bravo-Ureta and Pinheiro 1993; Phillips 1994; Rosenzweig 1995; Weir 1999) suggest that education has a positive effect on a farmer's production efficiency; however, other researchers (Kalirajan and Shand 1985; Tarabla and Dodd 1990; Adesina and Djato 1996) report no significant effect between educational attainment and farm efficiency. Prior studies have also found empirical evidence that suggests individuals from farming households with higher levels of education typically report higher household income and/or higher degrees of household economic well-being than those individuals from farming households with lower levels of education (Rosenzweig 1977; Yang 1997; Mishra et al. 2002; El-Osta et al. 2007). The level of education has also been observed to influence if and when farm managers choose to re-enter the agricultural industry when market conditions change and the agriculture sector enters a boom phase (Tolley 1970).

2.2. *The Costs and Benefits of an Investment in Human Capital*

The long-term benefits of obtaining a college education can outweigh the costs, especially if the individual acquires human capital specialized in producing a particular commodity (Becker and Murphy 2007). Studies show that the return on investment in education remains relatively high (Lochner and Monge-Naranjo 2016), even though some researchers suggest that college graduates are worse off than their peers. These studies suggest that college graduates are more likely to delay making significant investments and/or purchases such as a car and/or home (Stone et al. 2012), postpone marriage (Gicheva 2011), and earn lower wages during the first year after graduation (Minicozzi 2005) due to forgoing income and incurring education expenses. However, individuals who acquire an education are more likely to improve many abilities. These abilities include but are not limited to processing information, preparing and implementing a plan for future events, and the management of multiple tasks (Becker and Murphy 2007). Human capital investments, such as education and/or apprenticeship, can significantly influence an individual's

lifetime earnings (Becker 1975). The experience and/or education acquired not only influence how income is earned but also how it is allocated. Mishra et al. (2002) suggest that a farmer's educational attainment, age, occupation, and farm characteristics, such as regional location, size, tenure, and type, influence how income is earned and spent by the farming household. Prior research suggests that when a member of a farming household pursues a college education, human capital investment enables those educated individuals to shift their labor efforts away from agriculture and into more profitable industries (Gisser 1965; Mook 1976; Huffman 1980; Yang 1997; Fafchamps and Quisumbing 1999; Taylor and Yunez-Naude 2000).

2.3. *The Cost and Financing of an Education*

Various factors influence the costs associated with an investment in education. In 2007, the average cost of a full-time, full-year, post-secondary education at a public four-year institution in the United States was approximately \$19,300 USD (Aud et al. 2011). This cost is relevant to our analysis as the sample analyzed incurred this educational expense during this period. How the family and/or student pay for post-secondary education has significantly changed over the last two decades. Mezza et al. (2014) suggests that using student loans to finance a post-secondary education negatively impacts a borrower's credit scores, which could potentially exclude indebted student loan borrowers from the mortgage markets. Thus, the availability of (or lack thereof) credit, coupled with everchanging underwriting standards on how loans are evaluated, along with prior investment decisions (education-related or not), can influence and/or shape a farming household's decision to continue in the production of agricultural commodities (Carolan 2018). However, there are advantages to using leverage, as credit enables households to build wealth and/or smooth consumption (Keister 2000; Oliver and Shapiro 2013). Thus, access to federal student loan markets has led to unexpected financial behaviors. Undergraduate students enrolled in the 2011–2012 academic school year were more likely to request student loans and borrow significantly more than students enrolled in 1989–1990, even after adjusting for inflation (Woo and Horn 2016). The average outstanding student loan debt per borrower in 2005 was \$20,000 USD, which had increased to 27,000 USD by 2010 (Mezza et al. 2014). Prior debt financing, not just outstanding student loans, may also prevent households from accessing credit in the future (Elliott 2013).

2.4. *Farming Household's Income and Wealth*

In 2007, nearly half of American farming households reported higher incomes and held greater wealth than the average household in the United States (Mishra et al. 2002). Farming households and non-farming households are significantly different due to how these households earn an income and/or the overall composition of their wealth. Income and wealth are vastly different. Wealth reflects ownership, power, and control over resources; income represents the resources earned over a defined time frame, such as a week, month, season, or year (Elliott 2013). Wealth, especially homeownership, significantly influences whether a young adult enrolls in post-secondary education and whether he or she graduates with a degree (Urahn et al. 2012). Thus, the farming household's wealth can profoundly affect whether an individual pursues a college degree. Other studies suggest that a multitude of variables, along with the farmer's education, influence the income earned and/or wealth accumulated by the farming household. El-Osta et al. (2007) suggest that a farmer's ethnicity, along with his or her education, is more likely to influence whether the farming household is identified as "higher income, higher wealth" rather than "lower income, lower wealth".

2.5. *Children's Roles in Farming Households*

Prior studies have also explored the role of children in a farming household, as they can be viewed as both household members and employees in agricultural production (Singh et al. 1986). Clay and Johnson (1992) analyzed data from a third-world setting

and found empirical evidence that an increase in the size of a farming operation also increases the farming household's demand for children, but the reciprocal effect was rejected. [Rosenzweig \(1977\)](#) found a positive correlation between the enrollment of school-age children who actively participated in agriculture production and the family farm's marginal rate of productivity. Therefore, an investment in the education of a household member can ultimately affect the farming household's production of agricultural commodities.

2.6. Barriers to Entry and Succession Challenges

Historically, the high costs of procurement associated with both land and capital have discouraged and/or prevented entrepreneurs from entering the agricultural sector ([Winter 1984](#)). Therefore, the continuation of the family farm may be the only way an individual can gain access to and/or remain in the agriculture industry. To ensure the survival of the family farm, one of the family members must continue with agriculture production. However, the family dynamic and/or relationship is likely to change as children mature and become more involved in managing the farm ([Hutson 1987](#)). As the risks associated with the production of agriculture increase along with greater financial stringencies, it is not clear how these factors will affect the future of full-time family farming operations ([Gasson et al. 1988](#)). This is why succession and transferring property at inheritance significantly influence whether the family farm survives. Seventy-six percent of family-operated agricultural businesses require a successor ([Harrison 1975](#)). [Carolan \(2018\)](#) suggests that multigenerational farmers, on average, are strongly motivated by social factors, such as the desire to maintain agrarian cultures, rural communities, and family farms, in the decision to continue agriculture production.

3. Data

The data analyzed in the study were published and made publicly available by the United States Federal Reserve Board. They are a sample of farming households from the Survey of Consumer Finance (SCF), which is intended to represent the demographical characteristics of American households along with their balance sheet, pension, and income. The sample analyzed in this study can be located within the 2007–2009 Panel Survey of Consumer Finances.

Since 1992, the National Opinion Research Center (NORC) at the University of Chicago has conducted a cross-sectional SCF survey every three years. However, there are exceptions to this procedure. For example, the respondents from the 2007 survey were re-interviewed in 2009. The follow-up SCF interview focused on a smaller set of variables to better understand how various families weathered the Great Recession of 2008, and their response rate across most demographic and economic groups was nearly 90% ([Bricker et al. 2012](#)).

This revisitation of survey participants yielded a rare opportunity to evaluate a panel data sample rather than the traditional cross-sectional sample, as it enabled the observation of the original survey respondents across time. Given the detailed nature of the SCF, it was possible to identify which of the survey respondents met the USDA's definition of a small family farm. Thus, the sample in this analysis consists of households that owned farmland, were actively involved in the day-to-day production of an agricultural commodity, and whose gross farm income was less than 350,000 USD ([NASS 2017](#)). Approximately 0.44 percent (or 499,056) of the 113,178,790 million American households meet the USDA definition of a small-family farming household.

4. Model Section

This analysis examines the relationship between obtaining an educational loan and the demand for land by small family farms. A fixed effect model will be used to explore this association between farmland and outstanding student loan balance, as each individual farm operator in the sample has unique, time-invariant characteristics that may influence the amount of farmland they own and use in their agricultural operation. The fixed effect

model removes the effects of those time-invariant characteristics. Therefore, the net effect of the independent variables on the quantity of farmland owned by each individual farm operator was isolated over the two survey waves. The effect will be analyzed with a fixed effect model, and that will be estimated via ordinary least squares:

$$FL_{it} = \beta_0 + \beta_1 PPA_{it} + \beta_2 SL_{it} + \beta_3 THD_{it} + \beta_4 GCFIPA_{it} + \beta_5 GCFI_{it} + \beta_6 FO_{it} + \beta_7 FH_{it} + \lambda_{it} + \varepsilon_{it} \quad (1)$$

where FL_{it} represents the total acres owned by a household that is actively involved in the production of an agricultural commodity.

The variable PPA_{it} identifies the owner's perceived price per acre value. Per the economic law of demand, the quantity of goods demanded will decrease, all else constant, as the price of that good increases, therefore implying that the estimated coefficient of β_1 between price and quantity should have a negative sign. The variable SL_{it} represents the present value or payoff amount of a student loan. The expected value of β_2 is ambiguous and depends on whether the education acquired with a student loan is a complement or a substitute for the quantity demanded of farmland. THD_{it} represents the total amount of debt burden owed by the household, and the expected value of β_3 is ambiguous.

$GCFIPA_{it}$ is a proxy for the price of the underlying agriculture commodity and reflects the income per acre generated by the production of an unknown agriculture commodity. The value of β_4 is expected to be negative because a profit-maximizing farmer seeks to obtain the highest yield on the smallest land area. Minimizing the area for any given output would allow the farmer to reduce costs and increase profits. The $GCFI_{it}$ variable measures the family's net annual income (or loss) from the farm in the previous year. [Arnott and Riley \(1977\)](#) suggest that land is a normal good, regardless of location, especially when the individual does not significantly prefer either an urban or a rural area. Therefore, the value of β_5 is expected to be positive; as annual income generated from the production of agricultural commodities increases, so does the demand for farmland.

FO_{it} represents whether the household identified itself as a farming or ranching operation, while FH_{it} represents whether the survey respondents identified themselves as farmers. It is expected that the values of β_6 and β_7 will be positive. These variables help identify which individuals are more likely to prefer land given the nature of their or their spouses' primary occupations.

Lambda (λ) estimates the commonalities and/or differences for all farming households between total land ownership in the year 2009 relative to 2007. The error term (ε_{it}) is assumed to be normally distributed.

5. Results

To reduce missing data from its publicly available dataset, the Federal Reserve publishes an imputed version of its Survey of Consumer Finance, a nationally representative survey. The SCF consists of five imputed datasets, and it is impossible to identify which dataset was not subjected to imputation. However, the Stata package "micombine" allows researchers to make a statistical inference from a dataset with multiple imputations. This software package produces a point of the estimated dependent variable by merely calculating the arithmetic mean of multiple imputed dependent variables in the dataset ([Carlin et al. 2008](#)).

5.1. Summary Statistics

The demand for farmland by a farming household is influenced by various factors, including the land's per acre price, the price of other goods, and the household's income. The total number of acres a farming household owns will be the dependent variable in this analysis. It is estimated that the average family farm owned an average of 144.19 acres of farmland in 2007, which increased to 177.59 acres of farmland in 2009.

This analysis's explanatory variable of interest is the outstanding balance of student loans owed by anyone from within the farming household. Per the criteria outlined in consumer demand theory, the following explanatory variables are also included: a farmer-

estimated price per acre and the gross income generated by farming activities. This analysis also controls for household-specific variables such as whether the respondent was actively involved in producing an agricultural commodity, whether the operation was classified as a farm or a ranch, the total debt burden owed by the household, and a proxy for the profitability of the per acre operation.

Table 1 contains descriptive information for each variable along with the mean, standard deviation, minimum, maximum, and number of observations for each variable analyzed. The differences in the estimated averages suggest that the average balance of outstanding student debt declined by almost one thousand one hundred dollars during observation. However, the descriptive statistics do not explore the association between the total acres of farmland owned and the outstanding student loan balance.

Table 1. Variable description, average, standard deviation, min, and max.

| Variable | Average | Std. Dev. | Min | Max |
|--|-----------|------------|-------------|------------|
| Total farm and/or ranch acres owned. | | | | |
| 2007 | 144.19 | 324.61 | 2 | 1000 |
| 2009 | 177.59 | 366.37 | 2 | 1000 |
| Total | 158.06 | 343.47 | 2 | 1000 |
| An estimate of the owner’s perceived price per acre. | | | | |
| 2007 | 30,881.56 | 34,848.54 | 388.89 | 153,000 |
| 2009 | 24,613.55 | 35,281.98 | 203.00 | 140,000 |
| Total | 28,276.94 | 37,135.71 | 203.00 | 153,000 |
| The outstanding balance of the student loan. | | | | |
| 2007 | 1831.27 | 5244.76 | 0 | 18,640.76 |
| 2009 | 731.99 | 1919.39 | 0 | 6000.00 |
| Total | 1366.48 | 4247.82 | 0 | 18,640.76 |
| Is it considered a farming operation? | | | | |
| 2007 | 0.9510 | 0.2462 | 0 | 1 |
| 2009 | 0.8379 | 0.4444 | 0 | 1 |
| Total | 0.9040 | 0.3520 | 0 | 1 |
| Farming was reported as the primary occupation. | | | | |
| 2007 | 0.2638 | 0.5403 | 0 | 1 |
| 2009 | 0.1784 | 0.4573 | 0 | 1 |
| Total | 0.2283 | 0.5099 | 0 | 1 |
| Total household debt. | | | | |
| 2007 | 78,278.84 | 184,333.70 | 0 | 2,081,551 |
| 2009 | 63,298.09 | 186,966.70 | 0 | 5,310,000 |
| Total | 10,796.31 | 185,691.00 | 0 | 5,310,000 |
| Gross farm income is divided by the number of acres in production. | | | | |
| 2007 | 4993.78 | 15,271.86 | −968.16 | 63,898.58 |
| 2009 | 18,960.84 | 55,106.04 | −4682.16 | 199,241.00 |
| Total | 10,796.31 | 38,264.14 | −4682.16 | 199,241.00 |
| Annual net income generated from the production of agriculture. | | | | |
| 2007 | 9165.78 | 18,115.73 | −12,779.72 | 244,944.50 |
| 2009 | 1659.27 | 43,244.99 | −167,362.40 | 229,127.00 |
| Total | 6037.26 | 31,933.67 | −167,362.40 | 244,944.50 |

5.2. Estimated Coefficients from Fixed Effect Model

The results from the fixed effect model are reported in Table 2. A one-unit increase in the price per acre is expected to result in a decline of 0.0014 acres in the number of farmland acres demanded by the small family farms. The estimated effect of this independent variable indicates that as the perceived price per acre increases, the farming household is less likely to increase the farm’s total acreage. This estimated inverse relationship between price and quantity demanded aligns with the expectations outlined in consumer demand theory.

Table 2. The results from a fixed effect model on the effect of student loans on the quantity of farmland owned by small family farms.

| Variable | Estimated Coefficient |
|--|--------------------------|
| Intercept (baseline) | 12.3334 (49.5885) |
| Owner-estimated price per acre | −0.0014 *** (0.0005) |
| The outstanding balance of student loans | −0.0064 * (0.0038) |
| Total household debt | 0.0001 (0.0001) |
| Farming operation (ref: ranching operation) | 76.0775 * (45.0522) |
| Farming is the primary occupation | 380.376 ** (161.2797) |
| Productivity ratio | −0.0006 *** (0.0002) |
| Income generated by farming | 0.0001 *** (0.0001) |
| 2009 (ref: 2007) | 69.7368 (49.0922) |
| R-squared | 0.4644 |

Source: The Survey of Consumer Finances 2007–2009 Panel. Standard errors in parentheses. Statistical significance: * < 0.10, ** < 0.05, and *** < 0.01.

For each additional dollar of student loan debt outstanding that a farming household became liable for, the quantity of farmland was reduced by 0.0064 acres, all else equal. This estimated coefficient suggests that a farming household that chooses to finance a post-secondary education using student loans is more likely to reduce the total number of farmland acres dedicated to agriculture production. A one-unit increase in the household's overall debt burden did not have a statistical and/or economic effect on the quantity of farmland demanded by the household. It was not possible to distinguish how or what the other debts were used to finance. The results from our study suggest that access to education financing with borrowed capital is a substitute for the demand for farmland. This implies that the returns on education remain relatively high and educated individuals are more likely to seek employment in industries other than agricultural production within farm-family households.

Those respondents and/or their spouses who identified themselves as farmers demanded 380.37 more farm acres than those survey participants who did not identify themselves as farmers. In the sample analyzed, it was possible to enter and/or leave the agricultural industry. Farming operations demanded 76.76 more acres than ranching operations. The estimated effect of the productivity ratio suggests that small-family farms that are more productive tend to demand less farmland.

The estimated effect of a one-unit increase in the net annual income generated by farming activity coincides with the findings of [Arnott and Riley \(1977\)](#), which suggest that land is a normal good. A unit increase in farming income is expected to increase the demand for farmland by 0.0001 acres. This result is statistically significant, but the implications of this estimated effect are more economically significant. The time variable or fixed effect element included in this analysis suggests that the year did not have a statistical and/or economic effect on the quantity of farmland demanded by American farming households.

6. Conclusions

American households with at least one college graduate, regardless of how post-secondary education was financed, fared significantly better after the Great Recession than those without college graduates (Elliott 2013). However, previous studies suggest conflicting policy recommendations regarding the association of student loans and real estate ownership. Mountain et al. (2020) concluded that student loans have negatively affected Millennial homeownership; although they still expressed interest in owning a home, they would need to delay the purchase, unlike their counterparts without student loan debt balances. Mezza et al. (2014) suggest there may be an additional value in promoting student forgiveness policies. In contrast, Houle (2014) suggest that student loan policies such as loan forgiveness, debt refinancing, or debt-free colleges may not effectively increase the rate of real estate ownership among young adults.

In the summer of 2010, the total outstanding student loan debt of 800 billion USD surpassed the total outstanding credit card debt for the first time in history (Avery and Turner 2012). These two types of debt contracts are generally unsecured debts, and the surpassing of the student loan balance has the potential to influence and/or affect all economic sectors, not just the agricultural industry. Although one in three US farmers receive either commodity and/or conservation payments, the Farm Bill influences what, where, and how food is produced (Reganold et al. 2011). Traditionally, the US Congress renews the Farm Bill every four to five years (Reganold et al. 2011); however, as of 2023, it has yet to enact a Farm Bill that addresses and/or includes any provisions regarding the effects of student loans on family farming operations.

In 2018, Senator Christopher Murphy [D-CT] and Senator Tom Udall [D-NM] introduced the “Student Loan Forgiveness for Farmers and Ranchers Act” to address the unintended effects of student loan debts on the decisions made by American family farms. More recently, the USDA (2023) recommended that the Farm Bill consider creating a student loan forgiveness program for Black farmers and professionals, prioritizing HBCU alumni, with a 20% reduction in student loan balances for each year spent working in agriculture or at CBOs serving Black farmers.

As college education costs in the United States continue to rise, prior research suggests that educated individuals are more likely to reside in urban areas. Policymakers should explore economic policies that incentivize college-educated individuals to pursue careers in agriculture and/or relocate to rural areas. Potential policies include student loan forgiveness for those producing agricultural commodities and/or tax credits for those who relocate to rural areas. Such an initiative could support the necessary investment needed to facilitate the transitioning of post-secondary educated labor into the agricultural sector.

Due to a lack of access to longitudinal panel datasets, it was impossible to identify for whom in the household and/or which types of college degrees were financed with student loans. The ability to determine the specific fields of study would enable future researchers to analyze which areas of college education are more likely to steer graduates into careers in agriculture versus other fields that are more likely to appeal to individuals residing and seeking employment in more urban regions. The challenges of participating in a farming operation, coupled with the traditionally remote location of many agriculturally producing areas, may also directly influence those who have a higher preference for residing in those rural areas. Future researchers who are able to overcome those data limitations and evaluate the educational backgrounds will be able to understand the factors that incentivize and attract college-educated individuals to enter the agricultural industry. This would help identify how the decision to finance a college education potentially creates a situation where the farming household risks losing a member to other labor market sectors, thereby constraining the farm’s return on its investments.

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