

Do Non-Traditional Loans Help Beginning and Female Farmers?

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Abstract

Beginning farmers and ranchers (BFRs) and women farmers (WFRs) are growing cohorts within the U.S. agriculture. Compared to traditional producers, they are more credit constrained because of limited collateral usually required by traditional agricultural lenders. In recent years, non-traditional lenders entered agricultural credit markets but their role remains unclear. At the same time, traditional lenders consolidated and even closed facilities. We combine data on the use of Non-Traditional Loans (NTLs) from the 2018 Agricultural Research Management Survey and data on geographic location of branches of traditional agricultural lenders (Farm Credit System Institutions, Commercial Banks, and Credit Unions) and of providers of Alternative Financial Services (AFS) to evaluate whether the use of NTLs and access to lending facilities relates to productivity of BFRs and WFRs. The main finding is that the use of NTLs and access to credit from AFS is not associated with productivity. However, credit constraints remain relevant because BFRs and WFRs with larger number of loans are less productive. We conclude that concerns of producers and policy makers that nontraditional lenders may replace traditional ones to the detriment of productivity of vulnerable groups such as BFRs and WFRs are not supported by the data.

Keywords: beginning farmers and ranchers, women farmers and ranchers, credit constrains, non-traditional lenders, local agricultural credit markets, credit use

JEL Classifications: Q14; Q19; Q12.

1. Introduction

Beginning farmers and ranchers (BFRs) and women farmers (WFRs) are important and growing cohorts of the US agriculture (Note 1). According to the latest Census of Agriculture, BFRs represent 27 percent of all operators, while over half of US farms had at least one woman with decision making role. Access to credit for BFRs and WFRs is often limited by insufficient collateral (Hartarska & Nadolnyak, 2012) whereas it is important to financing operations, acquisition of new assets (Nadolnyak et al., 2016; 2017), and improving productivity (Briggerman et al., 2009; Griffin et al., 2020, Hartarska et al., 2022). Limited collateral typically forces BFRs and WFRs to use multiple loans including from alternative financial services (AFS) because these groups are often rationed out by traditional lenders (Nadolnyak & Hartarska 2022). In this paper, we evaluate whether access to alternative financial services (AFS) and the use of Non-traditional loans (NTLs) is associated with the productivity of BFRs and WFRs and illustrate how these two cohorts are similar to or differ from more traditional farmers.

BFRs and WFRs are expected to play an important role in the future of US agriculture because a large transition of land and farms from older retiring farmers is expected in the next 10 years (Nadolnyak et al., 2019). However, little is known about what type of lenders are successful in alleviating their financial constraints. Agricultural producers need access to reliable credit to survive and expand their operations (Blancard et al., 2006; Pokharel et al., 2019; Rosenzweig & Wolpin, 1993; Kandilov & Kandilov, 2018). Some estimates indicate that credit constraints account for 3% loss in the total value of farm production in the US (Briggerman et al., 2009) and are associated with a significantly higher loss of production for beginning farmers and ranchers or BFRs (Griffin et al., 2020). Women are more credit constrained than men (Japelli, 1990), particularly in agriculture (Nadolnyak & Hartarska, 2022) and are often disqualified from borrowing (Escalante et al., 2009). Importantly, non-white women borrowers receive smaller Farm Service Agency (FSA) loan amounts than white women (Wu et al., 2012).

Farmers' main sources of credit include a variety of traditional lenders such as the Federal Credit System (FCS), commercial banks and credit unions (BCU), and non-traditional lenders (NTLs) whose share in the farmers' loan portfolio has been increasing in recent years. NTLs are credit providers for whom credit is not the primary purpose of contact with the customer. Instead, NTLs specialize in selling products such as farm inputs (Sherrick et al., 1994). A farmer's choice of lender may be associated with the availability of lenders as well as the specific credit constraints that the farmer faces. BFRs and WFRs are likely to have loan portfolio composition that differs from that of other producers because they are among the most credit constrained producer categories (Katchova & Dinterman, 2018; Schmidt et al., 2021; Griffin et al., 2020). Recent research suggests that access to traditional agricultural lenders increases the use of credit by BFRs, while access to alternative financial services (AFS) is associated with use of loans from NTLs by both BFRs and WFRs. It also points out substitutability between credit from commercial banks and from AFS for WFRs (Nadolnyak & Hartarska, 2022) (Note 2). However, there is no research on whether beginning and women farmers benefit from using loans from NTLs or whether they are better off using credit from traditional lenders.

This work also relates to the broader literature on local credit markets, geographic market diversification, and access to credit. In the narrower context of agricultural credit markets, it contributes to the limited understanding of the role of NTLs in the context of local agricultural credit markets and their impact on the success of BFRs and women farmers (Brunoehler, 1997; Ifft et al., 2017; Brewer et al., 2019).

The Farm Credit System institutions and commercial (agricultural) banks are the main agricultural lenders, together accounting for about 80% of credit to US agriculture and both types of institutions have experienced consolidation. The trade-offs between efficiency gains and the costs of serving local clients differ by the lender type and geographic location suggesting that some lenders may offer limited financial services, which may affect agricultural producers' use of credit and potentially agricultural productivity.

Access to credit, unlike the use of credit, refers to the ability to apply for loans at physical and, more recently, virtual lending facilities. The branch and office infrastructure of the FCS has remained relatively stable despite the consolidation of the system's institutions. However, the infrastructure of commercial banks has shrunk significantly, particularly in the past 10 years. In 2017, the Wall Street Journal reported that "*Of America's 1,980 rural counties, 625 don't have a locally owned community bank—double the number in 1994, and that at least 35 counties have no bank, while about 115 were served by just one branch*" (Simon & Jones, 2017) (Note 3). "Banking deserts" have been a major challenge in rural areas, with 86 new bank deserts created in rural counties in the post-financial crisis period of 2008 to 2016 (Morgan et al., 2016; Taylor, 2017) (Note 4).

Farmers' productivity can be negatively affected if their access to credit is limited due to the closings of commercial bank branches driven by trends unrelated to agriculture such as decrease in demand for banking services because of depopulation of some areas (Hinton et al., 2017) or deteriorated economic conditions following crises (Freshwater, 1997; Morgan et al., 2016). Additionally, the implementation of the Dodd-Frank legislation decreased the incentives of commercial banks to specialize in agricultural lending (Regmi et al., 2020), which further limits access to lending facilities and lender options in sparsely populated rural areas.

These changes could have created opportunities for the NTLs to reach remotely located clients. Previous work indicates that agricultural and rural financial markets are local and geographically constrained (Kilkenny & Jolly, 2005). Evidence also shows that branch location remains a major factor in improving farmers' access to loans and the distance to branch and field office location is negatively associated with agricultural loan volumes (Kän äet al., 2020; Witte, et al., 2015). Thus, in some rural areas, low branch density of the FCS institutions and commercial banks may provide more opportunities for NTLs to fill in the niche (Turvey, 2017; Ifft et al., 2017). Given that credit constraints and credit use have been shown to affect agricultural productivity and the growth of rural economies (Briggeman et al., 2009; Hartarska et al., 2015; Nadolnyak et al., 2017), renewed attention to the role of access to credit in local credit markets is warranted.

The latest dynamics of agricultural credit markets is more likely to affect beginning and women operators who have larger credit needs and are more credit constrained relative to larger and more established operations (Griffin et al., 2020; Schmidt et al., 2021; Schmidt et al., 2024). We contribute to the literature by investigating whether the use of credit from NTLs and access to AFS is associated with the productivity of BFRs and WFRs. The main finding is that the use of loans from NTLs, as well as access to credit from AFS, are not associated with better or worse productivity. However, credit constraints remain relevant because BFRs and women principal operators with larger number of loans are less productive.

The rest of the paper is organized as follows. The next section details the conceptual framework and empirical model, Section III describes the data, and Section IV presents the results followed by conclusion.

2. Conceptual Framework and Empirical Specifications

Production theory suggests that leverage increases profitability and growth (Petersen & Rajan, 1994; Bolton & Scharfstein, 1996). However, asymmetric information between lenders and borrowers, coupled with the finite pool of loanable funds, leads to credit rationing by lenders, particularly towards businesses with limited collateral or a sparse credit history (Stiglitz & Weiss, 1981).

Our study builds upon the conceptual framework established by Detragiache, Garella, and Guiso (2000). Their theoretical model posits that a credit-seeking firm tries to maximize its profits through leveraging its operations by borrowing. The total profit from borrowing includes the cumulative gains from all loans, with the firm's choice parameters being the number of lenders and the respective loan sizes, subject to the loan terms (interest rates and fees). Within this model, there is a balance between the advantages of securing a loan and the transaction costs for searching and negotiating with lenders. For borrowers facing more severe financial constraints, it becomes rational to bear the additional costs associated with identifying and establishing new lending relationships. Detragiache et al. (2000) argue that a firm's choice of types of lenders and the number of loans is influenced by its economic characteristics and the lending environment, including lender availability and loan conditions. For agricultural producers, factors such as farm attributes and demographic characteristics of the principal and other farm operators also play a significant role, in addition to the availability of branch infrastructure of the main lenders.

Existing research suggests a divergence in lending practices between traditional agricultural lenders (commercial banks, FCS, and FSA) and NTLs. Traditional lenders rely more on established relationships and collateral for loan approval. BFRs and WFRs, who face greater credit constraints, may resort to NTLs who may offer similar credit terms but employ different methods for screening and contract enforcement (Ball, 2019; Griffin et al., 2020; Hartarska & Nadolnyak, 2012). NTLs may be also able to fill the potential gap left by the consolidation and closure of branches among traditional agricultural lenders, even if credit from NTLs is primarily for machinery and equipment, real estate loans, and variable input loans, and may not fully substitute for all types of credit offered by traditional lenders. Moreover, borrowing from NTLs may still incur higher costs due to creditworthiness of specific operator categories. The overall effect of NTLs on the performance of BFRs and WFRs remains uncertain, highlighting the need to ascertain potential benefits from using them.

To find whether is the use of loans from non-traditional lenders and access to AFS are related to productivity, we consider separately three groups of farmers: BFRs, WFRs, and also traditional or non-BFR producers in order to gain insights from a comparison in estimated coefficients. We follow Key (2022) and regress farmer productivity measured as the sales-to-assets ratio on variables that measure access to credit from each group of lenders, measures for the use of NTLs, and a number of economic and demographic operator and farm characteristics. We estimate equation (1) for each of the three groups

$$Productivity_i = \beta_0 + \beta_1 NTLs_i + \beta_2 Access\ FCS_i + \beta_3 Access\ BCU_i + \beta_4 Access\ AFS_i + \beta_5 Access\ AFS_i * NTLs_i + \sum_{j=4}^k \beta_j Controls + \varepsilon_i$$

where the *Access* variables proxy access to different lender types measured by the presence of traditional and other lenders in the local (county level) credit market. Specifically, we use the branch and office infrastructure per square mile of agricultural land rather than per population because most farmers live in sparsely populated rural areas and because the impact of geographical distance has been documented (Witte et al., 2015). To capture the availability of commercial lending facilities, we use county level data on the density of bank and credit union (BCU) branches per square mile of agricultural land. Similarly, to capture the presence of the FCS institutions and potential alternative sources of credit, we use county level data on the density of bank and credit union (BCU) branches and the density of alternative financial services (AFS). The AFS variable measures the number of establishments providing alternative financial services from the Bureau of Labor and Statistics including revenue anticipation loan firms, rent-to-own firms, auto title loan companies, non-traditional mortgage providers, and payday lenders. These creditors target less wealthy and more credit constrained borrowers typically in areas with missing commercial bank branches suggesting that at least some categories of BFRs and women operators may use these facilities. AFS providers usually locate in areas with a deficit of banking services where non-traditional agricultural lenders are also likely to be more active. Finally, using the AFS services may be correlated with loans from “other lenders” in the ARMS survey. Unfortunately, we cannot account for possible online lending by both NTLs and AFS providers because we do not have data for online lending to agricultural producers.

A key coefficient of interest is β_5 that captures the interaction of the use of NTLs and access to AFS to measure the choice of using NTLs given certain level of AFS presence and controlling for access to all other types of

lender facilities. It allows us to evaluate if productivity of presumably more credit constrained BFRs and WFRs is negatively affected by their use of NTLs when such facilities are more easily available. The same specification for non-BFR producers serves as a comparison with this potentially less credit constrained group.

The economic variables follow previous work (Katchova & Dinterman, 2018; Brewer et al., 2014; 2019) and include ratios that measure the repayment capacity and liquidity (current ratio and debt-coverage margin) and debt structure (debt-to-assets ratio). We also control for size by including acres operated, the value of assets, and several expense categories consistent with previous work. The demographic variables include principal operator age, gender, race, education, a dummy for principal operator working more than 50 percent of the time on the farm, family size, and a dummy for marital status. The next section describes the data in more detail.

3. Data

The data for this analysis comes from the 2018 Agricultural Resource Management Survey (ARMS) Phase III Costs and Returns that contains farm and operator level financial and demographic variables. ARMS is a nationally representative farm survey implemented every year by USDA and includes data from over 20,000 farms. Only operations with more than \$10,000 in sales are included in our analysis, leaving out hobby farmers that are of less interest for this analysis. The appropriate survey sampling weights are applied in all regressions. Data on branch networks for the same year come from the Farm Credit System, Federal Deposit Insurance Corporation, National Credit Union Administration, BLS, and Agricultural Census Quick Stats. Table 1 contains variable definitions and descriptive statistics for BFR, female, and all principal operators.

Table 1. Variable definitions and summary statistics

Name	Description	BFRs		Women Operators		All Operators	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Dependent Variable							
Sales-to-Assets	Sales-to-Assets Ratio	0.45	7.61	0.20	3.96	0.16	3.25
Explanatory Variables							
PO_BFR	Principal Operator BFR=1	1.00	0.00	0.21	0.40	0.17	0.38
PO_WFR	Principal Operator Female=1	0.16	0.37	1.00	0.00	0.13	0.34
Loan #	Number of loans, 1-5	0.57	1.00	0.31	0.72	0.58	1.05
NTL loan	Has NTL loan(s)=1	0.06	0.24	0.04	0.19	0.08	0.27
Debt-to-Assets	Debt-to-Assets Ratio	0.17	0.73	0.08	0.40	0.09	0.39
Debt Coverage Margin	Debt Coverage Margin	2.46	22.38	1.39	12.45	3.85	31.49
Current Ratio	Current Ratio	11.58	126.88	14.86	78.19	7.16	74.28
Labor Exp	Hired Labor Expense in \$ '000s	7.71	91.90	4.87	38.41	12.51	158.03
Machinery Exp	Machinery Inventory in \$ '00,000s	0.68	1.55	0.50	1.31	1.17	3.02
Acres	Total Acres Operated, '000s	0.19	0.70	0.17	1.20	0.39	2.04
Livestock	Livestock Total value (Cur Inv+for Breeding)	0.24	2.28	0.25	2.12	0.48	5.20
Assets	log of Value of total Farm Assets	12.65	1.34	12.89	1.29	13.16	1.35
Access to FCS (psm)	# of FCS branches per sq. mile	6.57	6.47	6.65	8.32	5.97	6.22
Access to BCU (psm)	# of Bank & Credit Union branches per sq. mile	4.71	7.03	5.69	10.14	5.28	8.71
Access to AFS (psm)	# of Alternative Financial Service offices per sq. mile	1.35	2.82	1.61	3.55	1.56	3.13
OP_TOT	Total # of Operators	1.57	0.73	1.58	0.78	1.61	0.70
PO_AGE	Principal Operator Age	49.19	14.89	59.68	13.13	61.38	13.95
PO_NWhite	Principal Operator Hispanic or Non-White = 1	0.08	0.27	0.07	0.25	0.05	0.23
Some College	Education Dummy for Some College	0.32	0.47	0.27	0.44	0.31	0.46
College & +	Education Dummy for College & Beyond	0.34	0.47	0.28	0.45	0.34	0.48
Farm>50% time	PO BFR works on farm >50% of the time = 1	0.33	0.47	0.50	0.50	0.52	0.50
HH size	PO Household Size	2.87	1.61	2.45	1.40	1.82	1.40
PO Married	PO Married = 1	0.78	0.41	0.78	0.42	0.58	0.49
Observations*			1,212		904		12,304

Note. Mean values are computed with the corresponding sampling weights.

* the number of observations varies slightly by variable for each category.

We use data on the number of loans and their balances within 10 years prior to 2018 as about 95% of the total loans were within this category. Commercial banks have the largest, and NTL have the smallest share in the total loan portfolio and in terms of average loan size. Banks and credit unions also charged the highest average interest rate (5.09%), followed by the FCS and related (4.86%), and by NTLs (4.18%), which is consistent with Sherrick et al. (1994) (Note 5). However, we do not have data on the fees and other contract provisions that affect loan demand.

The ARMS weighted numbers show that 17% of all the principal operators in 2018 were BFRs while women principal operators accounted for 13%. Women principal operators also had the smallest number of loans. Interestingly, BFRs had the highest sales-to-assets and debt-to-assets ratios but fewer loans from NTLs compared to the whole sample, which may suggest their higher productivity. The current ratios of BFRs and female principal operators are considerably higher than that of the whole sample, and both groups had lower labor expense, machinery, livestock, acres, and total assets. BFRs were younger, more racially diverse, more educated, and worked off-farm less than non-BFRs. The branch density variables among farmer categories are not easily comparable because the FCS branch infrastructure data are only available at state level (Note 6). The density of NTLs is significantly smaller than that of banks and credit unions (BCU) (Note 7).

4. Results

The main objective of this analysis is to evaluate whether the productivity is associated with the use of NTLs by BFRs, WFRs, and established non-BFRs and how it relates to access to AFS. For that purpose, we follow Key (2022) and regress the Sales-to-Assets ratio as a productivity measure on the number of loans, which captures the role of multiple lending relationships, and on measures of credit access, a dummy variable for the use of NTLs, and an interactive dummy for the use of NTLs and access to AFS. We also include as full set of relevant controls. The results are presented in Table 2.

Table 2. Productivity (sales-to-assets ratio) regression results, weighted OLS

	BFRs	WFRs	Non-BFR
<i>PO_BFR</i>	-	0.178 (0.423)	-
<i>NTL loan</i>	-0.318 (0.902)	0.604 (1.086)	0.031 (0.03)
<i># of Loans</i>	-1.651*** (0.134)	-1.545*** (0.302)	-0.0164 (0.0143)
<i>Access FCS (psm)</i>	0.005 (0.02)	0.017 (0.011)	-0.012* (0.006)
<i>Access BCU (psm)</i>	0.026 (0.028)	-0.029 (0.025)	-0.006 (0.004)
<i>Access AFS (psm)</i>	-0.07 (0.082)	0.079 (0.087)	0.014 (0.009)
<i>Access AFS (psm) *NTLloan</i>	0.129 (0.139)	-0.499 (0.633)	-0.005 (0.008)
<i>Debt-to-Assets</i>	10.71*** (0.564)	11.21*** (1.473)	0.349*** (0.13)
<i>Debt Coverage Margin</i>	0.000*** (0)	0.000** (0)	0.000*** (0)
<i>Current Ratio</i>	0 (0)	0.001 (0)	0 (0)
<i>Labor Exp</i>	-0.001 (0.001)	-0.003 (0.002)	0.001*** (0)
<i>Assets</i>	-0.126 (0.193)	-0.181 (0.146)	-0.190* (0.109)
<i>PO_AGE</i>	0.079 (0.058)	-0.032 (0.046)	0.015 (0.012)
<i>PO_AGE^2</i>	-0.001 (0.001)	0 (0)	0 (0)
<i>PO_WFRs</i>	0.444 (0.548)	-	-0.071* (0.037)

<i>PO_Non White</i>	0.33 (0.489)	-2.189 (1.575)	0.009 (0.057)
<i>Some College</i>	-0.489 (0.383)	0.047 (0.36)	0.002 (0.034)
<i>College & +</i>	0.074 (0.324)	0.404 (0.346)	0.02 (0.023)
<i>Farm>50% time</i>	-0.617* (0.319)	-0.145 (0.297)	0.210** (0.089)
<i>HH size</i>	0.004 (0.09)	-0.268* (0.137)	0 (0.007)
<i>PO Married</i>	-0.039 (0.408)	-0.024 (0.259)	0.031 (0.036)
<i>Constant</i>	-0.771 (2.689)	3.303 (2.248)	2.303* (1.18)
<i>Obs</i>	776	512	8,089
<i>Prob > F</i>	0	0	0.041
<i>R2</i>	0.931	0.88	0.41

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

The models have good F-statistic and reasonable R^2 ranging from 0.6 to 0.92, with a few significant key individual variables. The main observation is that the use of loans from NTLs is not related to productivity of the BFR, WFRs, and non-BFR farmers (Note 8). At the same time, BFRs and WFRs, but not the established principal operators, that rely on multiple lending relationships (*# of Loans*) are less productive. These results are consistent with the previous work documenting that credit constraints that are more severe for BFRs and WFRs likely resulting in loan size rationing and forcing these producers to seek more loans, which may negatively affect their productivity (Schmidt et al., 2020; Griffin et al., 2020). For established operators, the number of loans is not an impediment to their productivity either because they have sufficiently large or better matched loans or credit lines and/or because they are less credit constrained. The insight here is that the need to get additional loans to meet financing needs (presumably due to loan size rationing) and not the source of funding (NTLs or traditional lenders) is what may be affecting the productivity of BFRs and WFRs. This has important consequences for agricultural production and suggests that policies to alleviate credit constraints for BFRs and WFRs remain relevant.

The regression results also indicate that access to various types of credit in the local credit markets is not associated with better productivity of BFRs and WFRs. For the reference group of established farmers (non-BFRs), better access to FCS branches is associated with slightly lower productivity (coefficient of 0.01). The results may indicate that farmers with long-term history of borrowing from FCS institutions have entrenched relationships with their FCS lenders. Lending practices by traditional lenders are likely to collateral-based or grounded in rules that prevent these lenders from funding more productive and entrepreneurial operations, although that effect is small in magnitude (Hartarska & Nadolnyak, 2012).

The main coefficient of interest - the interaction of the dummy for the use of non-traditional loans and access to alternative financial services - is not statistically significant for any of the three groups. This result indicates that there are no productivity enhancing opportunities for operators with access to AFS that used NTLs. This does not seem to justify the concerns of policy makers and farmers that nontraditional lenders may replace the traditional agricultural ones to the detriment of the productivity of some more vulnerable groups such as BFRs and WFRs (Note 9). The results may also reflect the fact that BFRs and WFRs are more comfortable with using online banking and are getting loans from online sources the data on which are unavailable, making their lack of access to branch infrastructure less important to them.

Results also show that operators of all three types with higher leverage (*Debt-to-Assets*), and presumably because of that more creditworthy to the lenders, also have higher productivity. Most notably, the estimated coefficient on leverage is 10.71 for BFRs and 11.2 for WFRs, which is almost two orders of magnitude higher relative to 0.35 for non-BFRs. These results indicate that access to and use of credit is much more important for the success of BFRs and WFRs than it is for the success of established farmers. Interestingly, we find that larger established (non-BFR) operations are less productive than smaller ones, with one percent increase in asset size is associated with 0.19 percent lower productivity. The estimates show that full-time farming (working on-farm more than 50 percent of the time) is negatively associated with productivity of the BFRs but positively

associated with productivity of non-BFRs, suggesting that BFRs running productive farms are doing this in combination with substantial off-farm work. This may be simply a self-selection effect: new entrants take up farming as part-time job. Moreover, BFRs may be entering farming businesses that generate more sales per assets and are more productive to start with. The results also show that, among non-BFRs, women BFRs have lower productivity. Finally, household size is negatively associated with productivity of WFRs, indicating that family obligations remain very much relevant to the success of women operators.

5. Conclusions

There is ample empirical evidence that farmer productivity is affected by credit constraints and that beginning farmers and ranchers (BFRs) and women farmers and ranchers (WFRs) are more credit constrained than other agricultural producers. Agricultural finance literature has argued that agricultural credit markets remain local and access to and use of agricultural credit are affected by geographical proximity to credit providers (Kilkenny & Jolly, 2005; Witte et al., 2015). At the same time, there is an increasing realization that lending innovations such as online banking and the growth of financial services by the non-traditional lenders (NTLs) may decrease the role of distance and geography and expand access to credit previously confined to local credit markets. In addition, regulatory changes and demand factors lead to consolidation of traditional agricultural lenders and have resulted in multiple closures of bank branches in rural America. These changes may provide opportunities for non-traditional lenders to supply more credit to agricultural producers and potentially influence the sector's productivity. Lending by NTLs may be productivity enhancing if it offers loans that other lenders are unwilling to make. On the other hand, there are concerns that lending by NTLs may be too expensive, especially to vulnerable producer groups and thus may decrease their productivity. We contribute to the literature by offering insights as to whether access to local branch infrastructure of the Farm Credit System, commercial banks and credit unions, and alternative financial services providers (AFS) and their combined use with NTLs is related to productivity of BFRs and WFRs.

The results show no association between the access to lending facilities and the use of non-traditional loans and the productivity of BFRs and WFRs. Moreover, producers with better access to AFS who chose to use NTLs do not have better productivity either. Overall, the results indicate that using NTLs neither benefit nor hurt beginning and women producers. Yet, while we do not study the role of credit constraints directly, we do find evidence that credit constraints may negatively affect productivity because BFRs and WFRs with more loans are less productive although the effect is very small in size. This may have important consequences for agricultural production and suggests that policies to encourage providers of any kind to lend to BFRs and WFRs remain relevant.

The lack of proper panel data limits the analysis to cross sectional methods because the ARMS surveys different samples of producers every year. Improving access to individual farm-level panel data from the Census of Agriculture, as well as identifying a dataset of Fintech companies serving agricultural producers would allow for more precise estimates of the relationship between productivity of beginning and women farmers and ranchers and loans from the alternative and non-traditional agricultural lenders.

Authors Contributions

Drs. Hartarska and Nadolnyak were responsible for study design and revising. Dr. Hartarska was responsible for data analysis and drafting the manuscript, while Dr. Nadolnyak revised it. All authors read and approved the final manuscript.

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Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Notes

Note 1. Beginning farmers and ranchers (BFRs) are principal operators with less than 10 years of prior experience. Women farmers and ranchers (WFRs) are women principal operators/principal producers.

Note 2. AFS are financial services provided outside of the traditional banking institutions and proxy here for the insufficient banking services. We measure the presence of alternative financial services by the number of such establishments' offices within a county. Typically, AFS include rent-to-own agreements, pawnshops, refund anticipation loans, some subprime mortgage loans, car title loans, payday loans, and private moneylenders. The NTLs, on the other hand, include trade credit from input suppliers and implement dealers, loans from "co-ops and other merchants", contractors, individuals, and "any other lenders" and "other debts" as listed in the ARMS questionnaire.

Note 3. Agricultural banks, while a separate category of commercial banks, also fall into the larger community banks category (itself defined by branch location and asset size).

Note 4. Bank deserts are service gaps where there are no banks within 10 miles of populated areas.

Note 5. It is important to note that ARMS data debt tables may be imputed and there may be a degree of error. Yet, we believe that since we are aggregating the loan sources into three broad categories – FCS, banks and credit unions, and NTLs, the size of the possible error is small. In addition, since NTLs is a dependent variable, the perceived error should not bias the results.

Note 6. It is also important to observe that the data on FCS branches are on state level and but are somewhat artificially scaled by the county level agricultural land. Results with better alternative measures are available but are not qualitatively different.

Note 7. Unfortunately, we cannot account for branchless/online NTLs' availability and use due to lack of data sources. However, Fiechter and Ifft's (2020) describe branchless NTLs as ones that target large and intensive farm operations that are less likely to be BFRs and/or minority operations.

Note 8. Replacing the use of NTLs with the share of loans from NTLs also shows that the share of NTLs is not associated with productivity.

Note 9. It is important to note that we do not have data for other socially disadvantaged, veterans, and other marginalized farmer groups who may have entirely different experience with NTLs and access to lending facilities as well as resulting productivity consequences.

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