An Impact Analysis of the Transition Incentive Program on Beginning Farmers' and Ranchers in Rural United States

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ABSTRACT

We evaluate the impact of the 2008 Transition Incentive Program (TIP) that was introduced to help alleviate land acquisitions problems encountered by beginning farmers and ranchers (BFRs) in the United States. We nest a growth model into a difference–in–difference fixed effect model to determine whether the TIP has attracted additional BFRs in rural counties in the United States. We determine the impact of the program by analyzing the effect on two groups of BFRs: BFRs in counties with high and low volume of Conservation Reserve Program acres. We find that TIP has a positive effect on attracting BFRs into agriculture and increased the principal BFR numbers. In particular, we reveal that the TIP increased the number of producers just entering agriculture. BFRs with less than 5 and less than 3years' of farming experience by approximately 59% and 39% respectively. However, the TIP effect differs for BFR with 5–9 years' farming experience as their numbers BFRs decreased by 10%. The results are useful for policy purposes and developing strategies to improve the land acquisition problems encountered by BFRs.

INTRODUCTION

Beginning farmers and ranchers (BFRs) are a group of farmers with less than 10 years of agricultural experience. These farmers constitute about 27% of the farming population in the United States and specialize in various agricultural activities like livestock rearing, controlled-environment farming, organic farming, vineyards, and specialty crops (Nadolnyak et al., 2019; Freedgood & Dempsey, 2014). Although BFRs are essential in the agricultural sector, their ability to farm is constrained by access to agricultural lands (key & Roberts, 2006; Ackoff et al., 2017). To make land more available to BFRs, the Transition Incentive Program (TIP) was established in 2008. The purpose of this program is to transfer conservation lands that are near their contract expiration from a landowner to a BFR in order to improve the competitiveness and productivity levels in the agricultural value chain (USDA–Farm Service Agency, 2019b). That is why we evaluate if the introduction of TIP increased the number of BFR using a Difference-in-Difference (DID) approach.

The Conservation Reserve Program (CRP) that supports the TIP has undergone changes over the years. For instance, the CRP enrollment cap is expected to increase from 24 to 27 million acres by 2023 while CRP rental payments to landowners are expected to decline by 85% and 90% for general and continuous sign-ups respectively (USDA, 2020). The expected decline in CRP rental payments raises concern on whether farmers will be willingness to enroll lands into the conservation program. In turn, land availability through this program may affect the entry of BFRs into agriculture because it would decrease land acquisition options. Thus, evaluating if, in the wake of decreasing rental payment, TIP still supports BFRs activities is timely and important.

Previous work has evaluated various aspects of the challenges that BFRs face. For instance, it is well documented that BFRs face financial constraints and have limited access to credit (Kropp & Katchova, 2011; Kaufmann, 2013; Katchova & Dinterman, 2018; Griffin et al., 2020; Hartarska & Nadolynak, 2021). Work has also documented how socioeconomic factors and climate variability effect on BFRs actions (Katchova & Dinterman, 2017). Previous work has evaluated the entry and exit dynamics of BFR (Hoppe & Korb, 2006; Mishra et al., 2010; Kuehne 2012; Ahearn, 2013; Williamson 2017; Katchova & Ahearn 2017; Griffin et al., 2019). A group of studies also evaluate how government policies affect BFRs (Weiss, 1999; Goetz & David, 2001; Key & Roberts, 2006; Kropp & Katchova, 2011). However, there are no studies that have tried to determine the impact of the specific government program – TIP, passed in 2008 on the on the net

entry of BFRs. Given the importance of land in agriculture and the need to facilitate land acquisition for farming activities we contribute to the literature in the following ways. First, we determine if the TIP has achieved its purpose by assessing its impact on the number of BFRs using a comparison of on high–and–low CRP counties for periods before and after the policy. We achieve the study's objective by employing a difference–in–difference (DID) fixed effect estimation method that establishes the relationship that exist between the TIP and BFRs.

We find that TIP has a positive effect on attracting BFRs into agriculture and increased the principal BFR. In particular, we realize that the implementation of TIP increased the number of BFRs with less than 5 and less than 3 years of experience by approximately 59% and 39% respectively. However, the outcome differs for BFR with 5–9 years' farming experience because the size of that group decreases by 10%. The results from this study are important and is expected to be of interest to policy and decision-making organizations that try to develop strategies towards improving the land acquisition problems encountered by BFRs.

MODEL SPECIFICATION

The objective of the transition policy is to improve land accessibility for BFRs. Better land accessibility is attractive to this group and may translate into larger number of BFRs. Even though the size of BFRs can increase in the absence of the transition program, we assume that the TIP serves as a catalyst that increases the growth over time. First, we assume that improved land accessibility motivates BFR's interest in farming and is reflects in their numbers over time, farm performance, and competitiveness on the agricultural market[1]. Second, we assume that BFRs differ in numbers by the uneven distribution of CRP lands across the CRP regions. As the effect of TIP would be determined by land in CRP, we expect the TIP to have diverse effect of the different types of BFRs.

We follow the approach by Brown et al. (2019) and develop a local measure and determine the impact of the program by analyzing the TIP effect on two groups of BFRs: BFRs in counties with high level of CRP acres against BFRs in counties with low levels of CRP acres. We hypothesize that BFRs in counties with less CRP lands are likely to experience more growth

[1] Although we assume that increasing the number of BFRs in the agricultural sector leads to an improvement in their level of competitiveness, we are unable to empirically prove this assertion due to lack of data on BFR farm productivity. However, we assume that this is implicitly determined in the number of BFRs if the transition policy is effective in increasing the number of BFRs over time.

relative to BFRs in counties with huge CRP acreages when TIP is implemented. This is because BFRs located in areas of high CRP participation may face difficulty entering, finding land, and becoming established farmers (Sullivan et al., 2004). We employ CRP–cropland ratio and CRP rental payment–farm earnings ratio as the two local measures to assign the treatment and control groups for our study.

The first local measure of "treatment/effect distinction" is the CRP–cropland ratio. This acreage-based measure is important to evaluate the CRP effect on BFRs–a group that are quite sensitive to CRP–induced changes in land-use patterns. We claim that the higher the CRP–cropland ratio, the smaller the potential effect of the TIP on that county. This explains that counties that have large CRP acreages are less likely to benefit from the transition program relative to a county that have lesser amount of that CRP acreage. Again, the second local measure is the CRP rental payment–farm earnings ratio. This measurement is equally important as it combines information on the value of the land being retired and the importance of the associated farming activity to the local economy. We estimate the model as follow:

$$Ln(BFR_{it}) = \alpha + \beta D_{Nit} + \gamma X_{it} + a_c + \mu_t + \varepsilon_{it} \quad (1)$$

where $lnBFR_{it}$ is the logarithm of BFRs in county i at time t; D_{Nit} is the dummy for the treated groups in county i at time t; X_{it} is a set of covariates that affect BFRs in county i at time t; a_i controls for the time-constant attributes through the county fixed effects; μ_t controls for the macroeconomic shocks exhibited through commodity prices and other unobservable factors; ε_{it} is the error term.

In finding a homogeneous groups for our study, we eliminate all metropolitan counties and rural counties that share boundaries with urban areas. We focus our analysis on nonmetropolitan and strictly rural counties to eliminate urbanization effects as studies show that urban development affect resource allocation to BFRs (Ahearn & Newton, 2006). We evaluate the effect of the TIP using the DID fixed effect and traditional DID strategies. However, we rely on the DID fixed effect estimates to interpret our results as studies show that the DID fixed effect generates realistic and unbiased estimates (Imbens & Wooldridge, 2009). Also, using county fixed effect controls for plausible non-randomness of the transition policy that are unobservable. County fixed effects are important as they control for time-invariant factors that are a major determinants of BFRs decisions to enter into agriculture. Subsequently, fixed effects control for the average levels of

environmentally sensitive land and soil productivity. Subsequently, we use year fixed effects to control for common factors affecting all counties over time.

We estimate another model where we control for factors such as land prices, crop prices, and farm-level demographics that are likely to affect BFRs. Given that the CRP acreage and the CRP rental payment vary widely by county and depends on cropland acreage and farm earnings by county, we control for CRP-cropland proportion and CRP payment–farm earnings proportions to account for omitted variable bias. Afterwards, we conduct a robustness test to check if the TIP was influential in increasing the number of BFRs by estimating our model for the periods before the policy was enacted. This is important as it establishes the parallel trend assumption underlying DID studies and equally confirms the causal relationship that exist between the transition policy and the number of BFRs.

DATA SOURCE

The estimation are based on data from rural counties in the United States from 2002–2017 with 5-year intervals. We use several dependent variables: the number of BFRs with less than 3 years' experience, the number of BFRS with less than 5 years' experience, the number of BFRs with 5–9 years' experience, and principal BFRs that comprise farmers' with less than 10 years' experience. The data on BFRs were obtained from the Census of Agriculture for the years 2002–2017. Since this study is based on the fact that the effect of the transition program is expected to differ across counties based on the CRP acreage, we compute the CRP-cropland ratio as well as the CRP rental payment-income ratio. Data on CRP acreage and CRP rental payment data were obtained from the USDA–Farm Service Agency (FSA) for the years under study. The CRP acreage denotes the total acres of land enrolled in the CRP in each county whereas the CRP rental rate is the per acre payment allocated for land enrollment. Subsequently, the cropland data represents the total cropland acreage in each county at a specific time. The net cash income per operation is employed to represent the agricultural farm income in each county at a specific time. The net cash income per operation data is obtained from USDA Farm Income and Wealth Statistics. The CRP-cropland ratio is expressed as $CRP\ acreage - cpland = \left(\frac{CRP\ acreage_{it}}{cpland_{it}}\right)$; where $CRP\ acreage_{it}$ is the CRP acreage in county i at time t, and $cpland_{it}$ is the cropland acreage in county i at time t. Likewise, we compute the $CRP\ rental\ rate\ to\ farm\ earnings = \left(\frac{CRP\ rental\ rate_{it}}{farm\ earnings_{it}}\right)$; where

$rental\ rate_{it}$ is the CRP rental rate in county i at time t, and $farm\ earnings_{it}$ is the net cash income per farm operation in county i at time t.

Economic and demographic factors are critical factors that influence BFRs, so we control for the farmers' operating age from 35 to 65 years to represent active farmers as well as famers that are more than 65 years old to depict aged farmers (Ahearn & Newton, 2006). We define the operating age adopted as total number of people within that age bracket in county i at time t. Data on farmer's operating age are obtained from the United States Department of Agriculture (USDA). We evaluate the effect of agricultural commodity prices on the number of BFRs by constructing an agricultural price index to reflect the economic environment in the farm sector. We compute the agricultural price index as the ratio of the total output to total input price indexes using data from the Economic Research Service (ERS) agricultural productivity. We present the summary statistics and the pre-and-post summary for the variable employed for the analysis.

RESULTS AND DISCUSSION

Results on the impact of the TIP on the BFRs are reported in Tables 1 and 2. The Table 1 reports the findings when the outcomes do not account for other factors that affect BFRs and otherwise. Our results show that TIP had a positive effect on attracting principal as well as new entrant BFRs in the agricultural sector except for BFRs with 5–9 years farming experience. Similarly, the results indicate that the TIP had a positive and significant effect on the number of BFRs having less than 3 years farming experience as their numbers increased by 39 percent. Moreover, there is positive a statistically significant effect of the TIP on BFRs with less than 5 years of agricultural experience and their numbers increased by 59 percent. However, the results differ for BFRs having farming experience between 5–9 years where there is no statistically significant effect of the TIP.

These results demonstrate that the 2008 Farm Act that mandates the TIP transition policy has encouraged entry of BFRs into the agricultural sector by increasing the number of BFRs having less than 3-to-5 years of agricultural experience. Federal funds allocated to the CRP–TIP has increased to over US$210 million over the years due to the increasing demand for the program (Valliant & Freedgood, 2020). States like Ohio, Minnesota, Oregon, Colorado, Pennsylvania, and Kentucky have increased their federal shares of CRP–TIP payments to encourage the transfer of lands to new generational farmers that are also classified as BFRs (National Sustainable Agriculture Coalition, 2014). Interestingly, the CRP–TIP payment have more than doubled in Iowa

and increased six–folds in Nebraska after inception in 2008 (Beck, Carter, & Circo, 2018). These number together with our results indicate that the transition program has encouraged entry into agriculture, especially for the newest farmers with less than 5 years of farming experience.

The 2008 Farm Act supports the assertion of reforming the agricultural labor force by altering the unequal access to land and participation in agriculture by fostering opportunity for a diversity of farmers (Valliant et al., 2019). We find that our results satisfy the mandate of the policy that we study because overall TIP increase in the number of principal beginner farmers and ranchers in rural areas in the United States.

Table 1: Transition Incentive Program and BFR estimates

Variables	BFRs (<3years)		BFRs (<5years)		BFRs (5–9 years)		Principal BFRs (<10 years)	
	Diff-in-diff	Diff-in-diff (Fixed effect)	Diff-in-diff	Diff-in-diff (Fixed effect)	Diff-in-diff	Diff-in-diff (Fixed effect)	Diff-in-diff	Diff-in-diff (Fixed effect)
Transition Policy	0.1809***	0.2872***	0.5041***	1.0326***	1.2422***	0.3065	0.9081***	1.3465***
	(0.0697)	(0.1551)	(0.1228)	(0.2762)	(0.1317)	(0.2544)	(0.2211)	(0.4772)
Time	0.5827***	0.5812**	0.6015***	0.604***	-1.1385***	-1.1103***	-0.5515***	-0.5381***
	(0.0483)	(0.0329)	(0.0791)	(0.0536)	(0.0784)	(0.0593)	(0.1224)	(0.0895)
Transition Policy*Time	0.3976***	0.3937***	0.6535***	0.5955***	-0.0808	-0.1029	0.8279***	0.7365***
	(0.097)	(0.1174)	(0.1596)	(0.1631)	(0.159)	(0.1992)	(0.249)	(0.2995)
Constant	2.3953***	2.3701***	6.4548***	6.3295***	10.8035***	11.0254***	17.134***	17.03***
	(0.0339)	(0.0378)	(0.0601)	(0.0671)	(0.0653)	(0.0618)	(0.1117)	(0.1147)
Observations	7,760	7,760	7,760	7,760	7,760	7,760	7,760	7,760
R-squared	0.048	0.045	0.029	0.03	0.046	0.046	0.014	0.012
Number of counties	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940

Note: Heteroskedasticity robust standard errors appear in the parentheses. Heteroskedasticity robust standard errors are clustered at the county level. Asterisks denote the following: ****p<0.01, **p<0.05, and p<0.1*

We control for other variables that may bias our results as BFRs decision are influenced by other factors that are not captured by year or time fixed effects. Specifically, we estimate specifications with controls for demographic characteristics of the county, crop prices, and land prices. We also include the proportion of the CRP–cropland and the proportion of CRP rental–farm income. We report the coefficient estimates in Table 4. Comparing the DID with fixed effect outcomes in Table 3 and 4, the results show that the impact of the TIP on BFRs are similar in signs and significant levels but differ in the magnitude of the coefficients.

We reveal that there is a negative but significant effect of land prices on the different types of BFRs. Specifically, our results indicate that increase in access to land is important for BFRs because increase in land prices is associated with fewer number of BFRs with less than 3 years, 5 years, and 10 years. However, the outcome differs for BFRs having 5 to 9 years of farming experience. These results are expected and align with *a priori* expectations as BFRs experience financial constraint and usually start their farm operations by either renting or purchasing farmlands (Kauffman, 2013). Therefore, increasing land prices dissuade BFRs from entering into agriculture. Subsequently, we try to determine how crop prices affect BFRs. Our results show mixed consequences as the estimates suggest that crop prices increases have a significant and positive effect on BFRs with less than 3-and 5-years of farming experience, but not effect on principal BFRs and BFRs with 5 to 9 years' of farming experience.

These results are plausible because increasing crop prices may serve as a good indicator to enter into agriculture for new entrants (BFRs with less than 3- and 5-years' farming experience). However, most BFRs operate smaller farm sizes and depend on nonfarm income to support their agricultural activities (Ahearn & Newton, 2009). As a result, their farming activities may not be influenced by crop price dynamics as they gain experience. Our results show that there is positive and significant relationship between farm operators between 35–65 years. In particular, the higher proportion (percentage) of farm operators between 35–65 years is associated with larger number of BFRs (Table 4). This is a realistic outcome as Katchova and Ahearn (2015) suggests that the age distribution of BFRs lie between 33–68 years. However, the results indicate that the proportion(percentage) of farm operators older than 65 years is associated with fewer BFRs suggesting that the replacement of retired farmers may be done through transferring resources to

established farmers. This is important because the average age of established farmers are about 59 years, and about one-third are above 65 years old or more (USDA, NASS 2014).

Table 2: Transition Incentive Program and BFR estimates with controls

Variables	BFRs (<3years)		BFRs (<5years)		BFRs (5–9 years)		Principal BFRs (<10 years)	
	Diff-in-diff	Diff-in-diff (Fixed effect)	Diff-in-diff	Diff-in-diff (Fixed effect)	Diff-in-diff	Diff-in-diff (Fixed effect)	Diff-in-diff	Diff-in-diff (Fixed effect)
Transition Policy	0.0632	-0.0268	0.6323***	0.3279	0.5917***	-0.1984	1.1584***	0.2861
	(0.1118)	(0.2655)	(0.199)	(0.3846)	(0.2088)	(0.3841)	(0.3356)	(0.6166)
Time	1.2059***	1.4881***	2.554	3.0836***	0.7262***	1.0372***	3.3561***	4.1294***
	(0.0638)	(0.0959)	(0.1037)	(0.1424)	(0.1105)	(0.1567)	(0.1632)	(0.2061)
Transition Policy*Time	0.8064***	0.6146***	1.4079***	1.0531***	0.0318	0.2101	1.3328***	1.2641***
	(0.1269)	(0.2188)	(0.2078)	(0.3329)	(0.2213)	(0.3280)	(0.3278)	(0.5052)
Land price	-0.0488	-1.0317***	-0.053	-1.7902***	0.446***	0.8869***	0.1893	-1.0363***
	(0.0408)	(0.1423)	(0.0771)	(0.2139)	(0.0801)	(0.2286)	(0.1377)	(0.3469)
Crop price	0.3738	2.6087***	-1.0213***	3.2473***	-5.5616***	-4.1052***	-5.4646***	-0.3837
	(0.1691)	(0.2896)	(0.28)	(0.4669)	(0.2973)	(0.4923)	(0.4498)	(0.7861)
Operators age between 35-65 years	-0.3631***	1.4141***	-0.3691***	3.6078***	-0.9159***	2.3363***	-0.0956	6.3696***
	(0.0897)	(0.2609)	(0.1614)	(0.4412)	(0.1692)	(0.4746)	(0.2742)	(0.7674)
Operators age above 65 years	0.30713***	-0.5598***	0.3614***	-1.2874***	0.4091***	-1.1412***	0.2239	-2.551***
	(0.0882)	(0.1978)	(0.1574)	(0.3052)	(0.1652)	(0.338)	(0.2654)	(0.4978)
CRP acreage–cropland ratio	-0.1274***	0.0497	0.0568	0.21***	0.0113	0.1029	0.1222**	0.42116***
	(0.0242)	(0.0606)	(0.035)	(0.0977)	(0.0365)	(0.0964)	(0.0609)	(0.1584)
CRP payment–farm earnings ratio	-0.0071	0.1405	-0.4197***	0.1863	-0.5228***	0.0585	-0.8413***	0.2191
	(0.0191)	(0.1144)	(0.0463)	(0.2095)	(0.048)	(0.1877)	(0.0839)	(0.3632)
Constant	2.9412***	6.2322***	4.9626***	7.0867***	6.5985***	-5.1112	9.5202***	0.8913
	(0.385)	(1.9278)	(0.729)	(3.1323)	(0.7565)	(3.2187)	(1.3074)	(5.1528)
Observations	4,938	4,938	4,938	4,938	4,938	4,938	4,938	4,938
R-squared	0.21	0.079	0.23	0.05	0.106	0.101	0.192	0.07
Number of counties	1,729	1,729	1,729	1,729	1,729	1,729	1,729	1,729

Note: Heteroskedasticity robust standard errors appear in the parentheses. Heteroskedasticity robust standard errors are clustered at the county level. Asterisks denote the following: ****p<0.01, **p<0.05, and p<0.1*.

CONCLUSION

Several studies have tried to evaluate what factors influence the entry into farming by BFRs. In this study, we evaluate the impact of the TIP on BFR numbers with data from the Census of Agriculture from 2002 to 2017 with 5-year gaps. We specify a BFRs growth model and estimating it with a with a difference–in–difference fixed effects. The results show that the TIP had a positive and significant effect on most BFRs except BFRs with 5–9 years of farming experience. Results support the idea that the policy encouraged new entry into the agricultural sector but is not helpful to BFRs with more experience. The results also confirm previous findings that BFRs are sensitive to changes in land prices and that increase in land price is associated with decrease of entry into farming. Similarly, increasing crop prices is associated with net entry into agriculture for BFRs with less than 5 years of experience. Like the TIP program, crop price have less effect on BFRs who have gained more experience.

These results suggest several future issues of relevance to BFRs in rural United States there that needs further evaluation. First, our results are based on a county-level panel data while further studies could potentially use individual level data to evaluate the impact of the transition program on BFRs land acreage. Second, given the changes in the Census of Agriculture questionnaire, change in land held by BFR could be a better dependent variable with data from 2022 and 2017.

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