Loan Survival: Are Socially Disadvantaged Farmers More Likely to Default?

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Abstract

This paper analyzes the likelihoods of Farm Service Agency farm loan default and full repayment by Socially Disadvantaged Farmer and Rancher (SDFR) status. SDFR are members of a group who have been subjected to racial, ethnic, or gender prejudice because of their identity as members of a group without regard to their individual qualities. By controlling for financial, demographic, and other factors using a Fine and Gray competing risks model, we can identify differences in success that might be associated with different treatment based on SDFR status. We observed important differences in credit success among SDFR statuses. This is not a clear indicator of discrimination but refutes its absence. Our approach brings a new direction and novel knowledge to the question of SDFR discrimination in credit success.

Subject Codes: Agricultural Finance and Management, Agribusiness Economics and Management, Agricultural Policy

Keywords: competing risks model, historically underserved, socially disadvantaged, minority, farm loan, loan default, loan payment

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Introduction

In recent years there has been a growing interest among policy makers in advancing equal opportunity among disadvantaged groups. In January of 2021, President Biden issued an Executive Order directing Agencies to assess barriers underserved groups may face in accessing Federal benefits (Cowan and Feder, 2012). Socially Disadvantaged Farmers and Ranchers (SDFRs) represent an important part of the agricultural producers in the United States. Among all producers, 3.3% reported themselves as Hispanic, Latino or of Spanish origin, 1.7% identified as American Indian or Alaska Native, 0.6% as Asian, 1.3% as Black or African American, 0.1% as Native Hawaiian or other Pacific Islander and 0.8% of all producers reported more than one race. Together with women, that represented 13% of farm principal operators in 2017, SDFR have a long history of involvement in agriculture (US Department of Agriculture National Agricultural Statistics Services 2019e; 2019c; 2019a; 2019d; 2019b).

Within the US Department of Agriculture (USDA), some SDFR groups have faced historical discrimination or disparate treatment in programs and services.[i] Specific cases of historical discrimination against SDFR groups have included the denial of loans, credit services of limited access to legal defense against fraud, and outright acts of violence and intimidation (Jett, 2011). The consequences of which are the losses of resources, financial and otherwise, that would inhibit their ability to make investments necessary for financial progress. This is illustrated through the loss of land and disparities of income and wealth between Black and White farmers (King et al. 2018; Coppess 2021).

For disadvantaged groups, access to credit is essential in providing an opportunity to invest and acquire technologies to increase the efficiency of their farming operations. As a result of historical discrimination, SDFRs may have poorer land resources and less wealth. They may also suffer consequences of poorer financial training and technical expertise due to underfunded education system in disadvantaged communities. All of which can inhibit their ability to make financial progress, even with access to credit. In this analysis we examine the performance of farmers in the USDA Farm

Service Agency (FSA) direct operating loan program. FSA farm loan programs are an important source of loans for SDFR groups (Ahrendsen et al., 2022). If discrimination exists in the access of these programs, unequal opportunities may lead to unequal chances of success, which will highly impact U.S. agriculture. Discrimination could impact access to resources such as land, capital or markets and the progress of SDFRs in agriculture.

The question of discrimination in the U.S. agricultural sector has raised the interest in various studies (Horst and Marion, 2018; Orozco et al., 2018; Leslie and White, 2018). Recently, Dodson et al. (2022) found that delinquency rates tend to be higher for SDFR groups. Their approach relied on a survival analysis to explain the rate of default. However, this approach only allows for one loan outcome. This study builds on that previous work and estimates a competing risks model using FSA loan data to identify factors associated with two loan outcomes: delinquency and paid-in-full. The analysis provides useful information to policymakers and USDA program managers in designing programs, which improve SDFRs chances of success. The first part of the study gives background information on credit access for SDFRs in the United States. It is followed by a descriptive analysis of the sample used to perform our analysis. Then, the main findings of the analysis are presented and discussed.

Socially Disadvantaged Farmers and Ranchers

Depending on status, SDFRs are concentrated in different regions and operate different types of farms.

Women producers

Women represent 29% of all U.S. principal producers and operate mainly small-sized farms and several states with the largest shares of producers are Arizona (49%), Alaska (46%) and New Hampshire (47%). They tend to be younger than male producers on average, with 30% of them having 10 or fewer years of experience versus 25% for men (US Department of Agriculture National Agricultural Statistics Services, 2019c).

Hispanic, Latino or Spanish origin producers

Hispanic, Latino, or Spanish origin producers accounted for 3.3% of all U.S. producers in 2017. They concentrate in New Mexico, California and Texas where respectively 30%, 12% and 10% of each state's total producers are Hispanic. They are younger on average, generally have less experience (36% with 10 or fewer years of experience versus 27% for all producers) and tend to operate smaller farms than all U.S producers (US Department of Agriculture National Agricultural Statistics Services 2019d).

Black

Black farmers continue to concentrate in the American South. The main states are Mississippi (13%), Louisiana (7%), South Carolina (7%), Alabama (6%) and Georgia (4%). Most Black farmers tend to be older than U.S. producers overall. They are more likely to have served or to be serving in the U.S. military and a larger share of Black farmers are male (USDA National Agricultural Statistics Service (NASS), 2019).

American Indian or Alaska Native

American Indian or Alaska Native account for 2.3% of all U.S. producers. They tend to be younger, and more likely to be women than all U.S. operators. They mainly operate small-size cattle farms and more than half of all American Indian or Alaska Natives are located in Arizona, New Mexico and Oklahoma where they represent 59%, 22% and 13% of each state's total producers (US Department of Agriculture National Agricultural Statistics Services 2019e).

Asian

Asian producers accounted for 0.7% of all U.S. producers in 2017. They were mainly located in California and Hawaii, where Asian producers accounted for 6% and 35% of each state's producers. These producers tend to be younger and operate small farms producing specialty crops such as fruits, tree nuts and berries (US Department of Agriculture National Agricultural Statistics Services 2019a).

Farm loans

Farmers may access several types of loans to help finance their operations and to assist them in recovering from financial difficulties. Annual production loans can help farmers cover yearly operating expenses, such as seed, fertilizer, or other inputs. Expenses to finance nonreal estate property such as machinery, equipment, real estate improvements or breeding livestock purchases are less frequent and generally financed over multiple years through intermediate term loans. Typically, the terms of intermediate loans range between 14 months and 7 years. Finally, real estate loans help to finance land and buildings necessary for the business. Real estate loans are generally larger and have a longer term. While terms may range between 5 to 40 years, 30 years is considered the standard. It is very common that farms accumulate multiple loans (Congressional oversight panel, 2009).

Farmers may have different numbers of loans and may be served by various lenders. In 2017, the USDA's Agricultural Resource Management Survey (ARMS) revealed that 22% of farm operations borrowed from a single lender and 10% borrowed from at least two different lenders. Of all the loans, 31% were issued by the Farm Credit System (FCS) and 4% came from FSA (Key et al., 2019). FSA has been referred to as a temporary lender of last resort for the agriculture sector. It offers direct loans to farmers and guaranties loans made and serviced by commercial lenders, such as FCS or commercial banks. While the FSA lending programs are generally dedicated to serving family-size farms, specific sub-groups of family-size farms are targeted. Direct loan funds, in particular, are highly targeted toward young, beginning, and historically underserved such as farms operated by Black farmers. The operators are only eligible for FSA loans if they are unable to obtain credit at reasonable rates and terms elsewhere despite being creditworthy. The characteristics of loans made by the FSA farm loan program vary. Loans can be short-term or intermediate-term operating loans (OL) as well as long-term real estate farm ownership (FO) (USDA FSA, 2021). A recent review of participation rates in direct OL (DOL) and direct FO (DFO) programs by Black farmers in Georgia showed that more Black farmers

applied for DOL than DFO (Asare-Baah et al., 2018). Therefore, our study will focus on USDA FSA DOL loans that were originated during 2011-2020.

History of discrimination in access to credit

Horst and Marion (2018) highlighted the long-term impact structural discrimination has had for U.S. agriculture. They link this historical background with the current disparities that exist in farming by race, ethnicity, and gender. White, non-Hispanic male farmers currently own more land and generate more farm revenue than SDFRs. There have been studies showing how cultural biases result in structural racism that can cause white-minority disparities to continue. Minkoff-Zern and Sloat (2017) highlighted adverse impacts on the Latina community arising from USDA's incapacity to provide culturally relevant technical expertise. Kalo and Teigen de Master (2016) provided examples of how the complexity of paperwork procedure in application for USDA programs made the process even harder for non-English speakers.

As an example, in 1999, the Pigford lawsuit was filed alleging USDA had discriminated against Black farmers in the disbursement of farm loans on the basis of race and failed to investigate or properly respond to complaints from 1983 to 1997 (U.S. District Court for the District of Columbia 2013). By 2010, the Pigford vs. Glickman class action lawsuit reached a settlement to pay $1.25 billion to claimants (Cowan and Feder, 2012).[ii] Since then, significant changes have been made to reduce disparities in access to government support for minority farmers.

Prior to the filing of the Pigford case, disparities in access to government support for minority farmers had already been recognized and some actions had already been taken. Specifically, County Office Committees, which consist of local producers elected to terms of three years, were removed from having any input in farmers eligibility for farm loans (USDA Reorganization Act of 1994).[iii] The USDA also has guidelines and potential advisor and appointment procedures to ensure minority representative on the County Office Committees within its Farm Service Agency (Horst and Marion,

2018). Also, by 1992 FSA had begun to set-aside or target a portion of loan funds for use by minority farmers (Agricultural Credit Improvement Act of 1992). USDA's 2501 Program was created through the 1990 Farm Bill to help socially disadvantaged farmers, ranchers, and foresters, who have historically experienced limited access to USDA programs and services.[iv] In addressing concerns of SDFR groups, the Office of Advocacy and Outreach was established by the 2008 Farm Bill with SDFR as one of its key program areas. Although FSA has targeted loans to individual SDFR, the Office of Advocacy and Outreach awarded funds beginning in 2018 to various organizations to conduct outreach initiatives and training to assist SDFR and veteran farmers and ranchers in owning and operating farms and ranches and increase their participation in USDA programs and services. The 2008 Farm Bill established the Advisory Committee on Minority Farmers to help ensure socially disadvantaged farmers have equal access to USDA programs. FSA established a microloan program that serves new and small farmers and ranchers, many of whom may be SDFR.

However, studying the consequences of this past history, Horst and Marion (2018) conclude that changes have not been comprehensive. Black participation rates in Government programs permitting farmers to borrow money, obtain better commodity prices, and improve land are low (Gilbert et al., 2001). The recent review of participation rates in loan programs by Black farmers in part of Georgia by Asare-Baah et al. (2018) identified lack of knowledge, negative perception and complications with program requirements and financial issues as reasons for non-application and non-participation for all the programs. These pathways of discrimination are highly problematic for social, economic and environmental issues for all of the United States (Fagundes et al., 2020). Our approach aimed to bring a new direction and novel knowledge to the question of SDFR discrimination in credit success. Previous studies have found loan delinquency rates to be higher for SDFR groups (for example, Dodson et al., 2022). However, they did not analyze how both loan delinquency rates and paid-in-full rates vary by different SDFR statuses, such as women, Hispanic, Black, American Indian/Alaska Native, Asian, Pacific Islander and non-Hispanic, White men.

Criteria impacting the probability to default

As in the case of Black farmers, Black FSA direct borrowers, on average, are distinguishable from other farm borrowers regarding some characteristics. First, they tend to operate smaller farms and are more likely to specialize in the production of specialty crops or livestock (mainly dairy, beef and cash grain). They also are generally more financially stressed and have less capital than other groups of farmers. Geographically, they are mainly concentrated in economically impoverished regions (Dodson, 2013).

These factors may impact Black borrowers' probability of default. In fact, default probabilities differ significantly by loan, borrower, and location. In the home mortgage literature, higher default rates appear to be associated with higher loan to value ratios, lower incomes and home values and smaller loan amounts. Moreover, Berkovec et al. (1996) show that minority borrowers experience elevated default rates in home mortgage loans with Black borrowers experiencing the highest rate. Minority borrowers are generally more likely to have loans with high-risk characteristics that lead to default. The study explains these results as Black and Hispanic borrowers are significantly more likely to have a loan with a prepayment penalty, a balloon payment and a scheduled payment reset in the first 48 months of a loan's life. These borrowers also tend to have loans with more risk layering, which stands for multiple high-risk features included in the same loan, than other minorities and their unemployment rates are significantly higher than White borrowers. Finally, Black borrowers are more likely to have a low or no documentation loan (Berkovec et al., 1996). These characteristics impact the type of loan and the probability of default of loans to Black borrowers. Previous work used a Cox Proportional Hazard model to estimate the time to default for seven-year term DOL (Dodson et al., 2022). However, that approach does not differentiate between types of outcomes. The current study addresses this shortcoming by implementing a Fine and Gray competing risks model of survival analysis with competing risks being default and paid-in-full. This approach builds on previous FSA credit risk modeling using competing risks (Dixon et al., 2011).

Methodology

Survival models

Credit risk models are one way to look for the effects discrimination in loans and access to credit. They permit estimation of the chance a borrower defaults on a loan and establish the rate of default of borrowers or of a group of borrowers. In survival analysis models, *T* refers to the continuous random variable for the survival time of a loan, *h*(*t*) is the hazard function and considers the instantaneous potential per unit time of an outcome to occur given that the loan has not experienced an outcome at time t. It is expressed as $h(t) = \lim_{\triangle t \to 0} \left\{ \frac{P(t \leq T < t + \Delta t | T \geq t)}{\triangle t} \right\}$. $S(t) = P(T > t)$ is the survival function. It gives the probability that the time *T* of the event will occur after the time t. $F(t) = 1 - S(t) = P(T \leq t)$ is the cumulative incidence function (CIF). It gives the probability that an event occurs before time *t*. If no event has occurred before the time *t*, the observation is considered as censored. Conventional methods for survival data assume that the censoring distribution and the event time distribution are independent. This means that the observations that are censored can be represented by the ones that are not (Kleinbaum and Klein, 2012).

The Cox model is a common proportional hazard model assuming all individuals in the data set experience the same baseline hazard rate and that the regression variables and coefficients do not change with time (Cox, 1997). Previous work used a Cox Proportional Hazard model to estimate the time to default for seven-year term DOL (Dodson et al., 2022) but did not differentiate between types of outcome, i.e., default and paid-in-full. The current study addresses this shortcoming by implementing a Competing risks model of survival analysis. It also permits us to control for the other characteristics that may impact the likelihood to default by diminishing bias and variance in the estimate of the subdistribution hazard ratio as proven by Donoghoe and Gebski (2017).

Competing risks models

In the presence of competing risks, survival analysis imposes additional challenges because the hazard function has no one-to-one link to the cumulative incidence function, describing the risk (Wolbers et al. 2014). In competing risk, the occurrence of a competing event precludes the occurrence of the primary event of interest. In fact, another outcome for loans studies would be that these loans are paid in full. In competing risk models, the classic form of Kaplan Meier cumulative incidence function can be corrected by adding the type of event in the function. This gives a cause-specific hazard function defined by $h_i(t|X) = \lim_{\triangle t \to 0} \left\{ \frac{P(t \leq T < t+\Delta t, D=i | T \geq t)}{\triangle t} \right\}$, where *i* refers the type of event. The survival function is then given by $S(t) = \exp\left(-\sum_{k=1}^{K} \Delta_k(t)\right)$ (Prentice et al., 1978). This type of model, such as the Cox proportional hazard model, permits the identification of factors associated with the rate of occurrence of the outcome. It treats competing outcomes as censoring, which was done by Dixon et al. (2011). However, using classic Cox proportional hazard does not permit to identify direction of the effect of the variable on the incidence of the event of interest. To overcome this issue, Fine and Gray (1999) introduced a subdistribution hazard function giving the instantaneous ratio of the occurrence of an event of type *i*, given that the observation (loan) has not experienced the outcome (default) yet at time *t* or has experienced a competing event (paid in full) occur before *t*. The hazard function is then defined by $h_i(t|X) = \lim_{\triangle t \to 0} \left\{ \frac{P(t \leq T < t+\Delta t, D=i | T \geq t \text{ or } (T < t \text{ and } D \neq i), X)}{\triangle t} \right\}$. Subdistribution hazard model permits to recover the ability to interpret the direction of the effect of the covariate on the incidence of the outcome through subdistribution hazard ratios. This highlights the relation between subdistribution hazard ratios, and the cumulative incidence function expressed as $\left(1 - CIF(t)\right) = (1_{CIF_0(t)})^{\exp(\beta^T x)}$. $\exp(\beta)$ is the ratio of the hazard function of an event and the baseline hazard function and is fixed over time.

Our competing risks model will consider two competing events: Paid in Full and Default. If none of the outcomes has been observed before the end of the period, it is considered as censored. Our dependent variable is the loan duration, measured in days, until a loan outcome occurs. Our baseline hazard

function is defined by the average loans' characteristics. This refers to non-Hispanic White man, non-beginner, not married, with sufficient debt coverage ratio, a moderate solvency ratio, an adequate liquidity position, a medium gross revenue, and cattle farming farm type. Table 1 provides information for the variables implemented in the model.

Data

Data are issued from the USDA's Farm Service Agency (FSA) Farm Loan Programs. The dataset used to estimate the competing risks model is drawn from various sources within FSA. The data provide demographic information on the borrower such as race, ethnicity, gender, marital status, year started farming, if they have previously been USDA borrowers as well as loan performance. Also included is information on the farm including type of operation, location by state, and its financials, such as total liabilities and equity, total assets, current liabilities, working capital, value of farm production, gross revenue, debt to asset ratio, margin after debt service, discretionary income, term debt coverage ratio, asset turnover ratio, government program payments, loan to collateral, net farm income, and net income. The FSA data are at the loan level but also have borrower characteristics. To gather all the information on loans and borrowers, different sources of FSA data have been used. The observations are DOL with seven-year maturities (7-DOL) obligated during 2011-2020. The outcomes of the loan were tracked through April 2021. The overall data contain information on type of loans and the date they were obligated, the loan status and demographics and financials. To eliminate potential bias for borrowers with multiple 7-DOL, the total number of 7-DOL obligated during the time period are sampled. The sampling weight for each 7-DOL observation is based on the number of loans each borrower had for the sample period. A Poisson sampling procedure randomly selected observations based on the weight. The Poisson sampling process stands on an independent Bernoulli trial that determines if the element will be part of the sample or not. The final sample used for analysis is comprised of 46,161 loans.

Descriptive statistics

Of the total number of loans in the sample, 64.9% are to borrowers who have been identified as non-Hispanic White Men, as 13.8% Women, 3.6% as Hispanic, 3.8% as Black, 12.8% as American Indian, 0.8% as Asian, 0.3% as Native Hawaiian or other Pacific Islander (Table 1). The geographic distribution of the loans reveals a concentration in specific regions, such as Oklahoma, Kentucky, Texas, Nebraska and Arkansas that respectively accounted for 10.0%, 7.0%, 6.5%, 5.0% and 4.7% of the loans. This distribution is similar for Women but differ for other SDFR groups (Figure 1). Hispanic loans are principally located in states such as Texas (21.4%), New-Mexico (16.5%) and Puerto Rico (14.9%). Black loans are mainly concentrated in the South and Southeast led by Alabama, Mississippi, Texas, Louisiana and Arkansas, which respectively accounted for 18.8%, 15.3%, 12.2%, 8.0% and 7.8% of the Black loans (Figure 1). American Indian loans mainly located in Oklahoma (46.7%), Arkansas (5.8%) and South Dakota (5.2%). Asian loans borrowers were mainly found in Hawaii (40.3%) and California (9.6%). Finally, Pacific Islander loans were principally located in Hawaii (50.9%) and Western Pacific (10.3%). (Figure 1).

Regarding the type of operation associated with all loans, Beef Cattle represents the majority (56.0%) followed by Row-Crop (23.0%) and Dairy Cattle (8.0%) (Figure 2). Beef Cattle was the most common farm type for most SDFR statuses, except Asian and Pacific Islander. Asian and Pacific Islander loans were much more likely to be related with vegetable and crops production than the other groups, with 41.5% of loans to Asian borrowers were associated with vegetable production and 31.6% of loans to Pacific Islander borrowers were to Row-Crop farms. Loans to Asian borrowers also register relatively high proportion of broiler activity compared with the others. Dairy farming was an uncommon farm type for SDFR groups, while it was the third most common farm type for loans to non-Hispanic White man, accounting for 9.5% of their loans.

Comparisons of farmers' beginning or young status and marital status do not show there to be large differences among SDFR statuses. Beginning or young farmers and marital status have been found to impact the risk of delinquency (Dodson et al., 2022).

The second part of the descriptive analysis aims at bringing information on differences in the frequency of outcomes by SDFR status. Here, there are four outcomes: delinquency (90-180 days), long-term delinquency (more than 180 days), paid in full and censored. The observations clearly highlight differences by race, ethnicity and gender status (Figure 3). As an example, the shares of loans to Black farmers that are delinquent and long-term delinquent are greater than any other group and the share of loans that are paid in full are less than any of other group. In contrast, shares of loans to non-Hispanic White men that are delinquent and long-term delinquent are less than any SDFR group and the share of loans that are paid in full is greater than any SDFR group. These observations provide indications of the potential results of model. However, as mentioned earlier, other characteristics may impact the outcomes. It is therefore necessary to control for the possible impacts of these other factors by estimating a competing risks model.

Results

Cumulative incidence functions

The cumulative incidence function (CIF) for use with competing risks allows us to estimate incidence of competing risks. Visual inspection of the CIFs highlights clear differences by SDFR status (Figure 4). Seven years (the term of the loans) is 2555 days which is why several of the CIFs plateau around that time. Overall, we observe significant differences across the groups. We also observe that the probability of Black and Hispanic farmers' loans to be paid in full (blue lines) are less than overall loans at benchmark durations of 1000, 2000, and 3000 days (9%, 15% and 27% for Black farmers, 8% 18% for Hispanic farmers versus 15%, 30% and 44% for the Non-Hispanic White Men) (Table 2). These results are contrary to the results for Pacific Islander and Asian loans, where probabilities to be paid in

full were the highest at benchmark durations of 1000, 2000 and 3000 days (19%, 30% and 42% for Pacific Islander and 18%, 32% and 42% for Asian). The Long-Term Delinquency (purple lines) for these loans is also much higher for Black and Hispanic farmers than for the other groups especially after the first year where large jumps are observed (Figure 4). At 1000 days, the probability of Long-Term Delinquency is 20% for Blacks and 17% for Hispanics versus 7% for non-Hispanic White Men and 5% for Asians. For additional comparison, the probabilities of each event at the three different benchmark durations for Black farmers' loans and the other loans are shown in Figure 4 and displayed in Table 2. These differences across groups can be considered to be significant with regards to the *p*-values attributed to each outcome that were under 0.05 (Table 2). However, the Gray's test does not permit to differentiate significantly each group compared to another.

Competing risk analysis

The Hazard Rate (HR) corresponds to the exponentiated coefficient obtained with the model. An HR<1 implies that an increase in the covariate value is associated with a decreased rate of the event occurring. An HR>1 implies that an increase in the covariate value is associated with an increased rate of the event occurring. The further away HR is from 1, the larger the estimated effect size. However, a quantitative magnitude of the HR cannot be interpreted (Gardiner, 2016; Austin and Fine, 2017).

The results of the competing risks model are presented in Table 3. The results show that a loan to a Black borrower is associated with a significant increase in the incidence of delinquency and a significant decrease in the incidence of paying in full relative to a loan to a non-Hispanic White male borrower. These results are also observed for loans to Hispanic and American Indian borrowers, although the magnitude of the differences in the HRs from 1 are less than for loans to Black borrowers. Loans to Pacific Islanders and Asians show no significant association with the incidence of delinquency or paying in full relative to non-Hispanic White men. Loans to women are not significantly related to the incidence of paying in full, although they are significantly related to the incidence of delinquency. Loans

to a beginning or young borrower and loans to married borrowers are associated with an increase the incidence of paying in full, and they are associated with a decrease in the incidence of delinquency.

The study controls for many other relevant variables given the data to eliminate possible bias that may prevent us to observe differences in loan outcomes associated with SDFR status. The results are generally as expected based on previous research and financial expectations (Table 3). Loans to borrowers that have farms with low solvency (debt-asset ratio > 0.7) are associated with a significant increase in the incidence of delinquency while they also are associated with a decrease in the incidence of paying in full. However, high solvency (debt-asset ratio < 0.4) was not associated significantly with either outcome. The HR also shows that having low debt coverage or illiquidity are both associated with a small increase in the incidence of delinquency and with a small decrease in the incidence of paying in full. Discretionary income is not significantly associated with the incidence of defaulting or paying in full. Regarding use of non-traditional credit by borrowers, having an intermediate-term point-of-sale loan balance over $50,000 and having a current-term point-of-sale loan are significantly associated with an increase in the incidence of delinquency and a decrease in the incidence of paying in full.

Small farms (as measured by gross revenue) are actually associated with a decrease in incidence of delinquency compared to the baseline of mid-sized farms, but small farms are not associated with the incidence of paying in full compared to mid-size. The type of farm operation is significantly associated with the incidence of delinquency. Compared to the baseline of beef cattle operations, loans related with row crops, specialty crops, poultry and other livestock operations are associated with an increase of the incidence of delinquency, while loans to dairy cattle operations are associated with a decrease of this incidence. For the paid in full outcome, relative to beef cattle operations, loans to dairy cattle operations are associated with an increase in the incidence of paying in full while loans to specialty crop operations are associated with a decrease in the incidence of paying in full.

Discussion

The observed results permit identification of factors associated with whether an FSA borrower defaulted or paid in full. While the cumulative incidence function does not allow estimation of the magnitude of this impact, it does provide information on the relative importance of both potential outcomes. The differences noted for Black and Hispanic farmers indicated a higher incidence of default and a lower incidence of paid-in-full. It is important to note that in the loan cycle, default does not necessarily mean the borrower's journey is over. Once a loan has been unpaid for over 90 days, it goes into a servicing phase which has many regulations where FSA works with the borrower, often to restructure the loan. That phase is beyond the scope of this paper but is an important avenue for additional research.

While the results presented here may not be conclusive with respect to absence or presence of either historical or current discrimination, they do align with certain conditions. For one, the results are *not consistent* with the existence of Becker's taste-based discrimination, where groups experiencing discrimination would have a lower incidence of default and higher paid-in-full. Secondly, the poorer relative loan performance of Black and Hispanic borrowers to non-Hispanic White male borrowers could be related to a cumulative effect due to an historic past of discrimination. SDFR farmers tend to operate smaller, less efficient farms, hold fewer financial resources and specialize in lower return enterprises, however, these are all factors we attempted to control for in the analysis. The outcome presented here would be consistent with the presence of systemic racism over time which may explain any differences still observed in today's access to credit for Black farmers and for SDFR in general. A report of the U.S. Government Accountability Office (2019) showed that SDFR primary producers were still less likely to have outstanding farm ownership debt than all other farmers and ranchers even though the USDA FSA increased the number of guaranteed loans to SDFRs by 69.6% over the 2014-2018 period.

Also, these results raise the question of the effectiveness of credit programs alone in enabling SDFRs to make financial progress. The deficiency in technical and financial resources for some SDFRs presents a huge barrier to their financial success. To be successful, credit programs may need to be combined with broader programs of financial and technical assistance such as that provided through USDA's 2501 Program which provides some funding for outreach targeted to SDFRs. While outreach may reduce SDFR technical gaps, it will have minimal impact on wealth. Reducing SDFRs' financial gap will require policies which are more expensive, such as higher loan subsidies, targeted government payments, or financial grants.

Data limitations did not permit us to control for some other factors that may associate Black and Hispanic farmer with higher incidence of delinquency and lower incidence of paying in full such as internet access or association with other programs such as crop insurance. This could be an area of further study. Finally, these results may be of interest to researchers, lenders and policymakers to question the still remaining impact of the history of past discrimination and to adjust the effect of SDFR access to credit.

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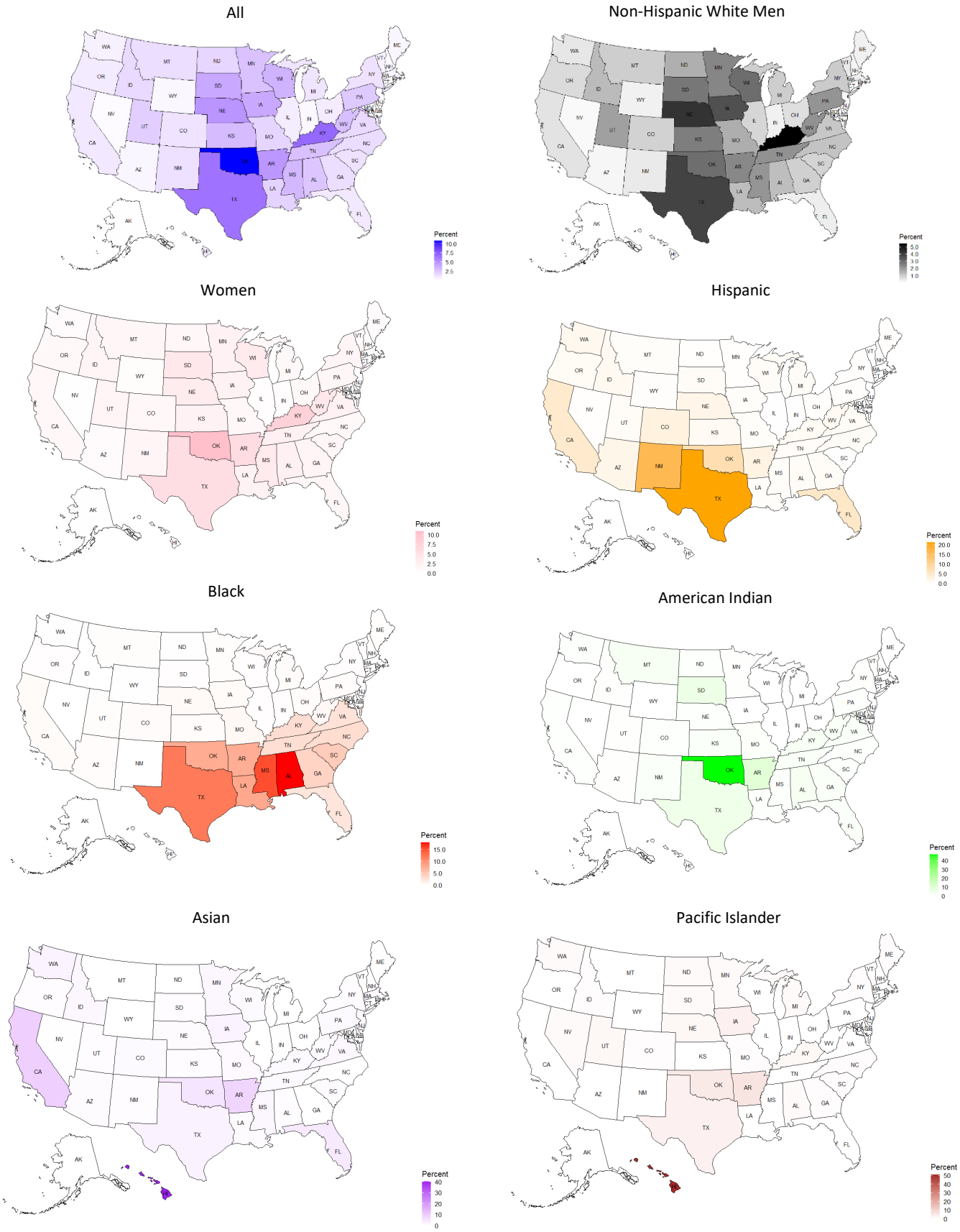
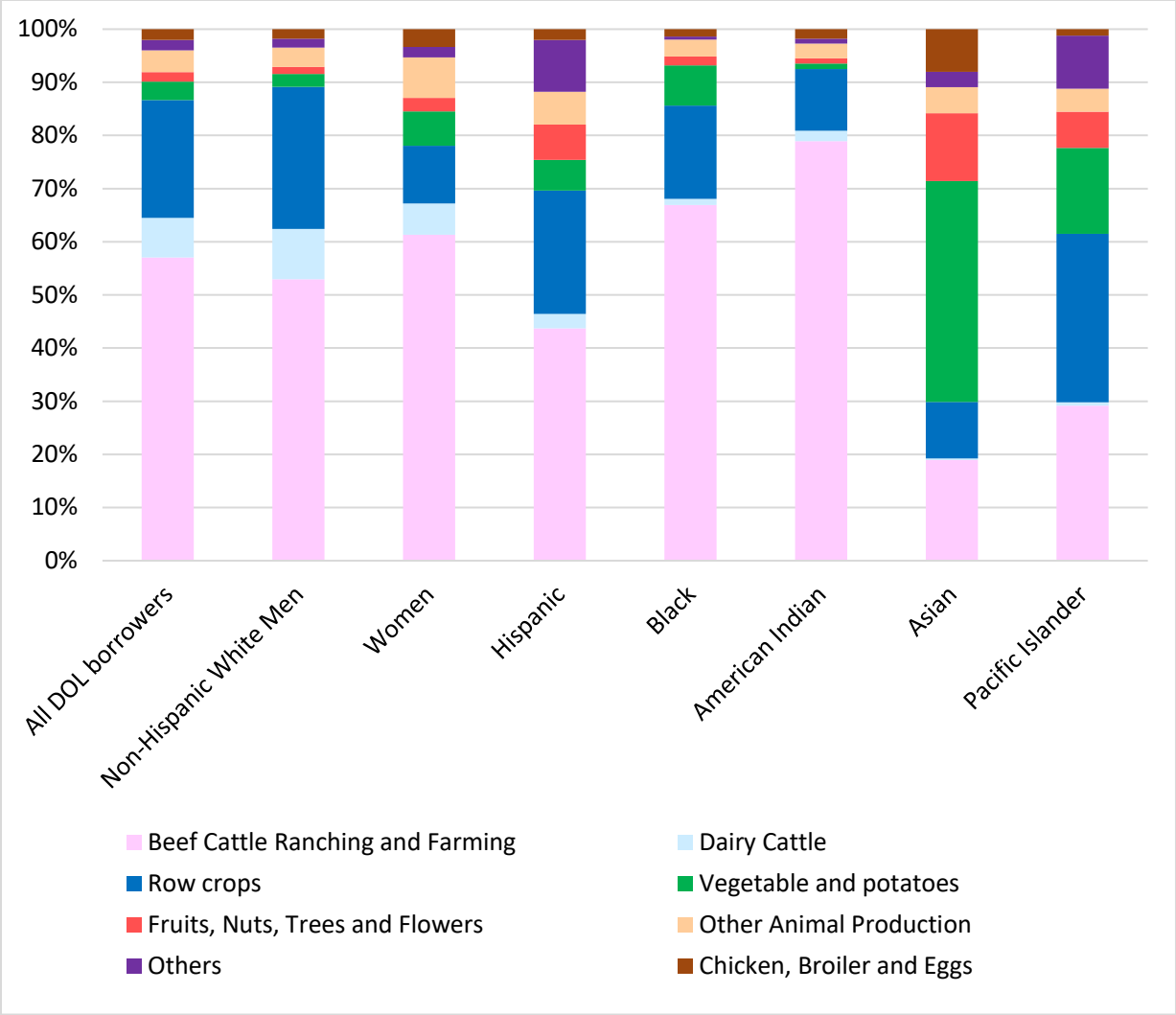
Figure 1. Distribution of seven-year direct operating loans in the sample by borrower SDFR status



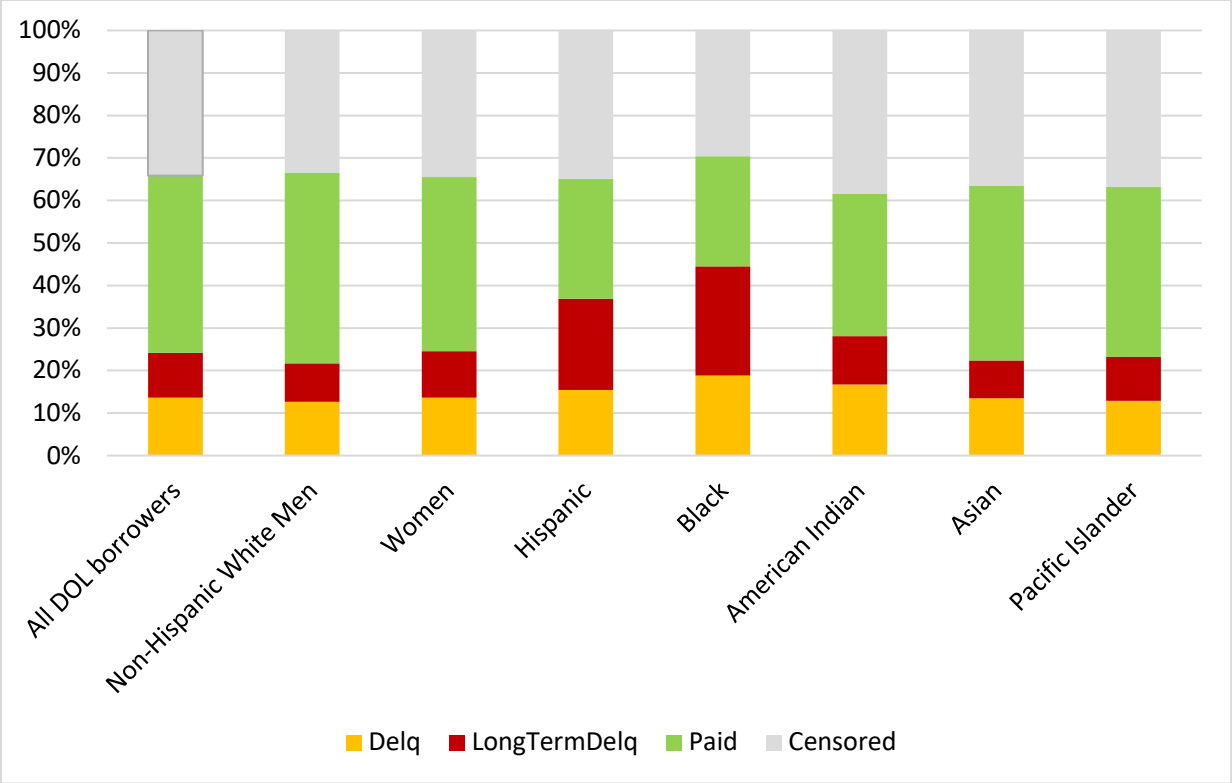
Source: Farm Service Agency Farm Loan Program and authors' calculations

Figure 2. Percent of seven-year direct operating loans by farm operation type, by SDFR status in the sample, 2011-2020



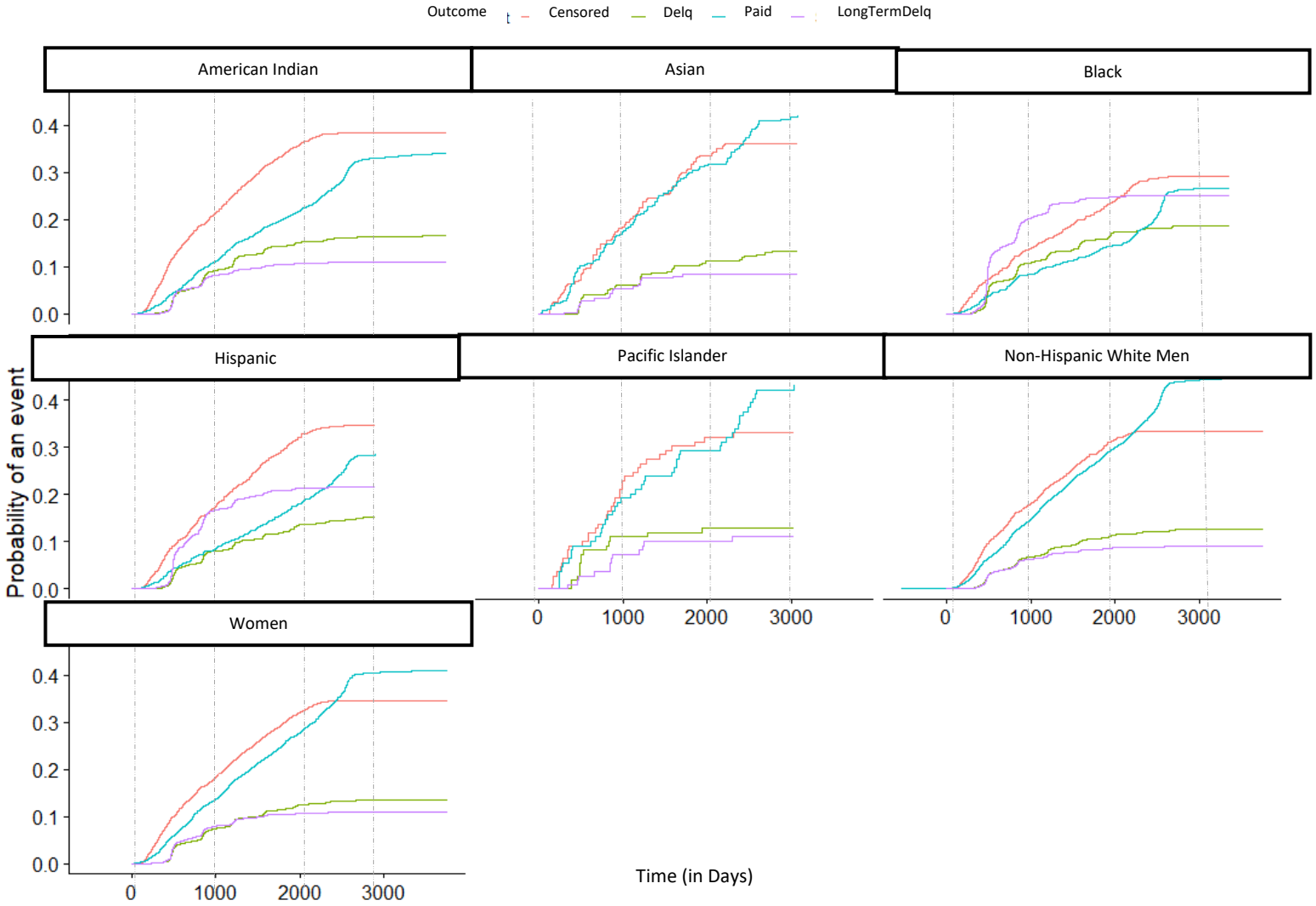
Source: Farm Service Agency Farm Loan Program and authors' calculations

Figure 3. Percent of seven-year direct operating loans in sample by outcome[1], by SDFR status, 2011-2020



[1] Delq: Delinquent, LongTermDelq: Long Term Delinquent, Paid: Paid In Full, and Censored
Source: Farm Service Agency Farm Loan Program and authors' calculations

Figure 4. Cumulative incidence functions for seven-year direct operating loans in sample by outcome[1], by SDFR status, 2011-2020



[1] Delq: Delinquent, LongTermDelq: Long Term Delinquent,Paid: Paid In Full, and Censored
Source: Farm Service Agency Farm Loan Program and authors' calculations

Table 1. Summary of variables implemented in the competing risks model

DEPENDENT		
Variable Description	**Definition**	**Frequency**
Duration	Days from obligation to outcome. Default occurs when the borrower becomes 90 days delinquent on the given or any other outstanding direct operating loan	1,205.2
Loan Outcome	Censored	0.340
	Paid in Full	0.422
	Delinquent + LongTermDelinquent	0.238
INDEPENDENT		
Variable Description	**Definition**	**Mean**
Non-Hispanic White men	1 if loan borrower is not in one of the other groups, else 0	0.688
Women	1 if loan borrower identifies as a Woman, else 0	0.138
Hispanic	1 if loan borrower identifies as Hispanic, else 0	0.036
Black	1 if loan borrower identifies as Black or African American, else 0	0.039
American Indian	1 if loan borrower identifies as American Indian or Alaskan Native, else 0	0.128
Asian	1 if loan borrower identifies as Asian, else 0	0.008
Pacific Islander	1 if loan borrower identifies as Native Hawaiian or other Pacific Islander, else 0	0.003
Beginning or young farmer	1 if beginning farmer (10 or fewer years of farming experience) or <35 years of age at time of application, else 0	0.773
Marital status	1 if borrower is married, 0 else	0.575
Low debt coverage	1 if term debt coverage ratio ≤1, else 0	0.287
Low solvency	1 if debt-asset ratio ≥0.70, else 0	0.407
Medium solvency	1 if debt-asset ratio ≥0.40 and <0.70, else 0	0.302
High solvency	1 if debt-asset ratio <0.40, else 0	0.292
Illiquidity	1 if liquidity ratio <1.0 or working capital <$0, else 0	0.609
Total discretionary income	Net income + nonfarm income – family living expense (in $10,000s)	3.383
Gross Revenue		
Small farm	1 if gross revenue <$100,000, else 0	0.696
Mid-size farm	1 if $100,000≤gross revenue<$350,000	0.287
Large farm	1 if gross revenue ≥$350,000, else 0	0.138
Farm Type		
Beef cattle farm	1 if beef cattle farm, else 0	0.564
Row crop farm	1 if specialized in corn, soybeans, cotton, wheat, rice or other row crop, else 0	0.226
Dairy farm	1 if specialized as a dairy farm, else 0	0.076
Specialty crop	1 if specialized in vegetables, potatoes, fruits or nursery, else 0	0.048
Other livestock	1 if specialized in poultry or livestock enterprises besides beef or dairy, else 0	0.084
Binary for current term point-of-sale loans	1 if borrower used current point-of sale financing, else 0	0.053
Categorical indicator for intermediate point-of-sale balance	POS_Balance $0	0.789
	POS_Balance $1-10K	0.051
	POS_Balance $10-50K	0.102
	POS_Balance $50K+	0.058

n = 46,161 ; Sample of loans originated 2011-2020; Loan outcomes occurred by April 30, 2021.
Source: Farm Service Agency Farm Loan Program and authors' calculations

Table 2. Results and significance of the cumulative incidence function for seven-year direct operating loans, 2011-2020

Outcomes	SDFR status	Days			X^2 (Gray's test for equality across groups)	*p*-value (* if significant: < 0.05)
		1,000	2,000	3,000		
Paid In Full	Non-Hispanic White Men	0.147	0.299	0.443	420.76	0.000*
	Women	0.137	0.278	0.407		
	Hispanic	0.086	0.180	NA		
	Black	0.085	0.146	0.266		
	American Indian	0.112	0.219	0.332		
	Asian	0.177	0.318	0.419		
	Pacific Islander	0.193	0.294	0.422		
Delinquent	Non-Hispanic White Men	0.067	0.114	0.126	98.55	0.000*
	Women	0.075	0.125	0.136		
	Hispanic	0.079	0.135	NA		
	Black	0.110	0.180	0.190		
	American Indian	0.092	0.152	0.165		
	Asian	0.061	0.112	0.133		
	Pacific Islander	0.110	0.128	0.128		
Long Term Delinquent	Non-Hispanic White Men	0.063	0.087	0.090	617.68	0.000*
	Women	0.079	0.107	0.109		
	Hispanic	0.166	0.213	NA		
	Black	0.204	0.250	0.252		
	American Indian	0.082	0.108	0.110		
	Asian	0.054	0.083	0.083		
	Pacific Islander	0.073	0.101	0.110		
Censored	Non-Hispanic White Men	0.180	0.316	0.335	69.54	0.000*
	Women	0.184	0.320	0.345		
	Hispanic	0.176	0.320	NA		
	Black	0.139	0.240	0.291		
	American Indian	0.216	0.360	0.384		
	Asian	0.184	0.336	0.361		
	Pacific Islander	0.229	0.321	0.330		

n = 46,161; Sample of loans originated 2011-2020; Loan outcomes occurred by April 30, 2021.
Source: Farm Service Agency Farm Loan Program and authors' calculation

Table 3. Results of the competing risk model for seven-year direct operating loans, 2011-2020

Outcome	Delinquent		Paid in Full	
Variable	**Exp(coef)**	***p*-value[1]***	**Exp(coef)**	***p*-value[1]**
Women	1.074	0.011*	0.981	0.350
Hispanic	1.847	0.000***	0.558	0.000***
Black	2.399	0.000***	0.462	0.000***
American Indian	1.396	0.000***	0.733	0.000***
Asian	0.852	0.150	1.021	0.800
Pacific Islander	0.957	0.800	1.099	0.460
Young or beginning	0.864	0.000***	1.107	0.000***
Married	0.823	0.000***	1.097	0.000***
Low solvency	1.257	0.000***	0.903	0.000***
High solvency	0.964	0.170	1.001	0.950
Low debt coverage	1.072	0.001**	0.957	0.005**
Illiquidity	1.251	0.000**	0.896	0.000***
Discretionary Income	1.002	0.180	1.000	0.830
Intermediate point-of-sale balance $1-10k	0.988	0.780	1.001	0.990
Intermediate point-of-sale balance $10-50k	0.971	0.380	0.996	0.870
Intermediate point-of-sale balance $50k+	1.114	0.015*	0.907	0.006**
Current point-of-sale binary	1.197	0.000***	0.865	0.000***
Small farm	0.816	0.000***	1.012	0.520
Large farm	0.979	0.550	0.985	0.570
Row crops	1.167	0.000***	0.970	0.099
Dairy cattle	0.709	0.000***	1.269	0.000***
Speciality crops	1.371	0.000***	0.900	0.003**
Poultry, other livestock	1.151	0.000***	0.955	0.093

n = 46,161; Sample of loans originated 2011-2020; Loan outcomes occurred by April 30, 2021.
[1]if significant *p*-value<0.05; ** if significant *p*-value<0.01; *** if significant *p*-value<0.001.
Source: Farm Service Agency Farm Loan Program and calculation

[i] The Sec, 355(e) of the Con Act defines SDFR to include Black or African American, American Indian or Alaska Native, Hispanic and Latino, Asian, and Native Hawaiian or other Pacific Islander. SDFR may also include women as in this study. However, only Blacks and American Indians have received any settlements.
[ii] In the Pigford case, USDA did not admit to discrimination but agreed to a class-action settlement of $1.25 billion to be paid out to those members of the class.
[iii] The county committees were non-Federal employees who were elected by farmers within the county or jurisdiction served by the local office. The committee had the authority to verify the eligibility of any loan applicant. They also had the authority to approve the loan applicant's business plan.
[iv] https://www.usda.gov/sites/default/files/documents/2501-factsheet-2022.pdf