Crop insurance's impact on agricultural lenders

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Selected Paper prepared for presentation at the 2019 Agricultural & Applied Economics Association Annual Meeting, Atlanta, GA, July 21 – July 23

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May 15, 2019

*This research is supported through a cooperative agreement with the USDA Office of the Chief Economist.

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Abstract

1 Introduction

Crop insurance is the largest component of the current U.S. farm safety net, providing protection for unexpected declines in yield or price (Shields, 2009). Through its expansion since its creation in 1938, it has gone from a minor yield support program to the foundation of the current risk management system (Schultz, 1945). A primary goal of the program is to provide for greater financial stability for farmers, by reducing the risk of low prices or yield instead of having to rely on systems of direct payments. This greater financial stability has implications not just for farmers, but for the institutions that serve them.

The purpose of this study is to gain an understanding of how changes in crop insurance availability, characteristics, and uptake affects lenders' willingness to make loans to agricultural producers. We aim to causally estimate the relationship between crop insurance and credit decisions made by lenders. Greater concentration in a single industry makes credit risk management more difficult for banks, so for banks faced with potential risks from a large portfolio of agricultural loans, crop insurance could decrease weather and market-related repayment risk. Specifically, crop insurance increases the collateral value of planted crops under low yield or price outcomes. As availability and uptake spread since the inception of the 'modern crop insurance program' in 1980 (Shields, 2009), banks with high levels of exposure to the farm sector may have been able to expand credit. For larger bank's that use more 'hard information' crop insurance may also be a valuable indicator or even proof of a farm's repayment ability (Bülbül et al., 2019).

A few studies have considered the effects of crop insurance on credit use at the farm level. Research on crop insurance programs in western India found that the national crop insurance program helped smaller farmers to overcome collateral constraints that prevented further borrowing (Mishra, 1994). The propensity to repay did not improve by a discernible amount, suggesting that the collateral effect is what was driving the expansion of credit.

An analysis using data from the 2011 Agricultural Resource Management Survey found a correlation between crop insurance participation with short term debt but not long term debt (Ifft et al., 2015). An expanded analysis using more than 10 years of ARMS data and a stronger identification strategy confirmed that this relationship is causal and likely driven by the collateral mechanism (Ifft et al., 2017).

Previous research has suggested crop insurance influences lenders' willingness to extend credit. Based on 147 responses to a mail survey of lenders in Illinois, lenders respond positively to farm use of crop insurance (Pfleuger and Barry, 1986). Nearly sixty percent of lenders surveyed indicated that they would either offer more credit or a lower interest rate to farms with crop insurance compared to comparable farms without crop insurance. This effect extended to both operating and capital loans. However, responses to crop insurance availability may not be consistent across different types of banks. Using a survey completed by 86 agricultural banks in Minnesota during July, 1988, Pederson (1986) found a correlation between banks with a greater concentration in agricultural loans (and less diversification overall) and higher levels of multi-peril crop insurance uptake. Berger et al. (2005) found that larger banks incentivize the collection of hard data, such as audited financial statements, instead of soft data, due to the individual loan officers having less control over the bank's capital distribution. For banks making decisions between lending to agriculture or other industries, crop insurance might provide sufficient information on repayment ability to encourage the bank's stakeholders to put a portion of their portfolio into agriculture.

These results are consistent with research on how banks change their risk management strategies in response to increasing levels of sector concentration. Bülbül et al. (2019) found that for German savings banks, sector concentration has a large impact on what strategies banks use to manage credit risk. Increases in sector concentration make it harder to manage risk through risk transfer techniques, such as loan pooling. To reduce risk, banks shift their focus towards credit portfolio modeling and collecting information on the likelihood of repayment.

To measure the credit supply response to crop insurance availability, we use a newly

constructed dataset of county-level agricultural lending volumes that is linked county-level crop insurance data from the Risk Management Agency and other relevant county-level information. Several unobservable factors may influence both credit supply and crop insurance uptake, such as size of the farm sector and variation in use of financial and risk management service. To address the potential endogeneity between crop insurance and farm debt, we use policy changes affecting crop insurance, including the introduction of new crops and changes in uptake rates after an external shock. This allows for an examination of the causal relationship between crop insurance uptake rates and agricultural lending volumes at the county level. The dataset also contains information on the agricultural concentration of the banks in each county, which will allow for analysis of the influence of sector concentration on the response to crop insurance uptake.

The remainder of the paper is organized as follows. Section 2 outlines the conceptual framework for our empirical analysis. Section 3 summarizes our data (3.1) and empirical approach.

2 Conceptual framework

By offering a payment in the case of a drastic drop in price or yield, crop insurance serves as a government guarantee of some return for planting. Ben-Yashar et al. (2018) provides an economic model of how banks make lending decisions with the presence of a government guarantee:

$$P_y R + (1 - P_y)g - C > 0 \tag{1}$$

In this model, P_y represents the probability of a successful project, $R > 1$ is the loan repayment, $C \geq 0$ is the cost of lending, and g is the guaranteed government repayment. P_y, a normally distributed value between 0 and 1, has to be high enough to make the inequality true for the bank to decide to extend credit. When an agricultural producer acquires crop insurance, g becomes a positive value. As g increases, the necessary value of P_y for the bank to accept the loan falls. As crop insurance coverage expands and uptake increases, more

operations will have a positive value of g, which will lead to more operations meeting the minimum requirements to be offered credit. As g continues to increase, then the potential factors that could reduce P_y, such as yield and price risk, become less important to the lender. This would lead to an increased willingness from lenders to provide loans to farmers, and as a result the supply of credit would increase.

The way that banks respond to crop insurance could be impacted by the concentration of the bank's loan portfolio in agriculture. When banks have an increased concentration in a single sector, it becomes increasingly more difficult for banks to manage this risk, leading to an increased focus on credit risk modeling (Bülbül et al., 2019). As sector concentration increases, banks emphasize collecting more data on their potential clients so that they can develop a fuller view of what could impact creditworthiness. This trend suggests an increased value of crop insurance as concentration in agriculture increases. Crop insurance, since it can provide repayment up to the coverage level, would reduce the variability of the expected payout. With a greater concentration in agriculture, the value of the guaranteed repayment to the bank would increase since it leads to an increasing non-variable return to loans.

One aspect that could impact the relationship between crop insurance and credit supply is changes in the climate. Continued changes in climate patterns will introduce increased variability for firms, which will provide new challenges for firms with weather exposure, which encapsulates much of the agricultural sector (Thistlethwaite and Wood, 2018). This increased variability in weather patterns will introduce additional variance in P_y, which would make lending to agricultural productions less appealing to banks and introduce significantly more risk for firms with large agricultural portfolios. Crop insurance, by providing a guaranteed return even if changes in climate decrease yield, shifts attention away from the effect on P_y.

3 Data and empirical methods

Using the conceptual underpinnings of credit decisions provided by Ben-Yashar et al. (2018), we empirically test how banks' lending decisions respond to the increased government guar-

antees offered by crop insurance. One factor that has complicated past analyses of crop insurance and lending is the simultaneity of crop insurance uptake and credit decisions. We take advantage of changes in crop insurance policy to work around this issue. Availability of crop insurance for different crops in different areas of the country has not been consistent over the period that call report (bank) data is available, so we can take advantage of temporal changes in availability to make causal claims of crop insurance on credit supply. Further, we use county level panel datasets rather than cross-sectional datasets used in previous work (i.e., Pederson, 1986), which allows us to use policy changes over time, while controlling for fixed factors such as soil productivity, as a part of our empirical strategy.

There are a few national policy changes for crop insurance that can be used as a natural experiment. In 1995, the Crop Insurance Reform Act of 1994 made catastrophic risk protection mandatory for producers participating in other price support and production adjustment programs (Glauber, 2013). This was short-lived, with the requirement being eliminated just a year later in 1996. In addition to fully subsidizing the premiums for these low levels of insurance, the 1994 policy change increased subsidies for higher levels of coverage which sharply increased participation in the program (O'Donoghue et al., 2009). The Agricultural Risk Protection Act, passed in 2000, substantially increased the amount of subsidy available (Glauber, 2013). Revenue protection policies were first available in 1997, and by 2003 this type of policy covered more acreage than yield-based policies.

3.1 Data

3.1.1 Crop insurance data

Detailed crop insurance participation data at the county level is publicly available, through the USDA Risk Management Agency's Summary of Business. This data is disaggreated by many factors, including crop, type of insurance product, coverage levels, and unit structure. This data further allows us to know the value of the crop that was insured (liabilities) for each crop, by year. This data is first available in 1995. This data can be directly linked to other county-level data through the county fips code. One potential issue with the Summary

of Business data is that it only reports data for counties that had crop insurance policies purchased. We will obtain additional data on availability through other historic USDA data.

3.1.2 Bank data

Bank-level farm lending data was obtained from the Federal Deposit Insurance Corporation's (FDIC) Consolidated Reports of Condition and Income ("call reports"). The call report data were "cleaned" and assigned to counties, including agricultural loan volume and loan delinquency rates. The FDIC insured 5,477 institutions, including 4,774 commercial banks and 703 savings institutions as of the third quarter 2018 (FDIC, 2018). These institutions' call reports provide information on agricultural debt and delinquency, but do not provide any information on where their loans originated. However, institutions are subject to regulatory requirements that allow us to make assumptions about their geographic lending patterns. Specifically, we use a method that takes advantage of the annual Summary of Deposits survey and data contained in Community Reinvestment Act reports. The original call data is illustrated in figure 1, and our imputed, disaggrated call data is illustrated in figure 2

Call report data are obtained and cleaned using guidelines outlined in Den Haan et al. (2007). The banking universe is defined as FDIC-insured institutions within the United States that are chartered as either a commercial bank or savings banks. Agricultural data are extracted from call reports schedules RC-C (Loans and Lease Financing Receivables) and RC-N (Past Due and Nonaccrual Loans, Leases, and Other Assets). While loan volumes and select delinquency data are available as early as 1987, information on loans past due by 30 to 90 days are not present in the public call reports until Q1 2001.

We rely on Summary of Deposits survey (SOD) data to identify branches of each bank. The SOD is an annual survey that requires banks to submit a list of bank branches they operate by county FIPS code, as well as the deposits contained at each branch. Our universe of branches will be restricted only to bank branches that conduct retail services. An institution's agricultural loan volume is then assigned to each county in which they operate in proportion with interest rate expenses reported in the prior Census of Agriculture for both

real estate and production loans. These can then be summed at the county level to create estimates for county level real estate and production debt. This method of disaggregating loan volumes using the SOD and Census data is imperfect for two main reasons. First, institutions are not restricted from conducting some lending outside areas where they have physical presence. Second, several major agricultural lenders are chartered as limited purpose banks, and have few bank branches despite large loan volumes. These limited purpose lenders also tend to lend outside of their branch location.

To address these additional issues, we use available data from the Community Reinvestment Act (CRA) to disaggregate loan volumes. The purpose of the CRA is to encourage banks to originate loans in areas where they collect deposits, including low and moderate income neighborhoods. Only institutions meeting certain asset thresholds are required to submit information related to the CRA. As part of their submission, institutions report a subset of their small farm originations, defined as loans with original amounts under $500,000. However, small farm originations in the CRA are not broken down by real estate and production loan purposes. To obtain county estimates, each institution's small farm originations are summed at the county level over the prior ten year period. These sums are then used to proportionally distribute out both production and real estate loan volumes. For institutions that do not report CRA figures, distribution is done using the SOD data alone.

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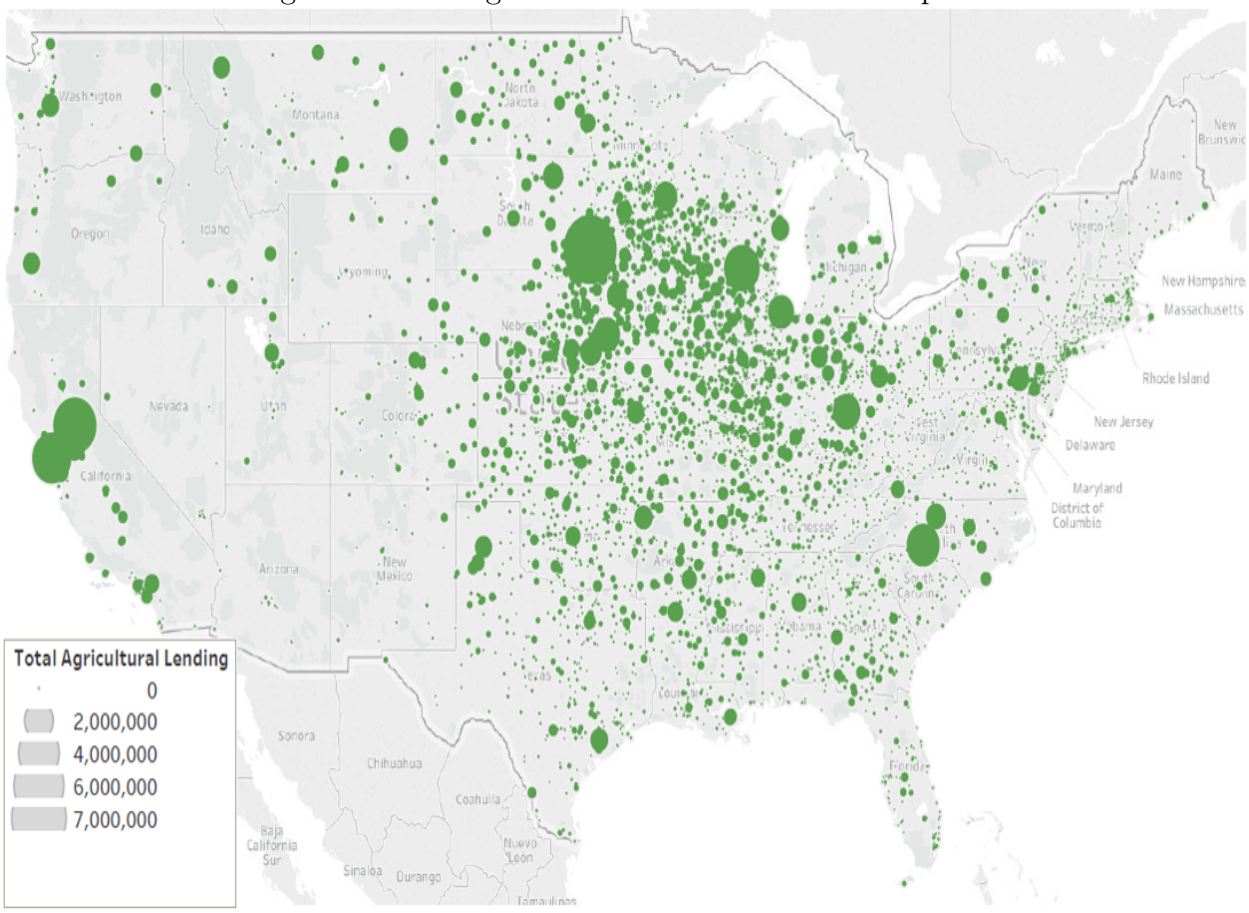
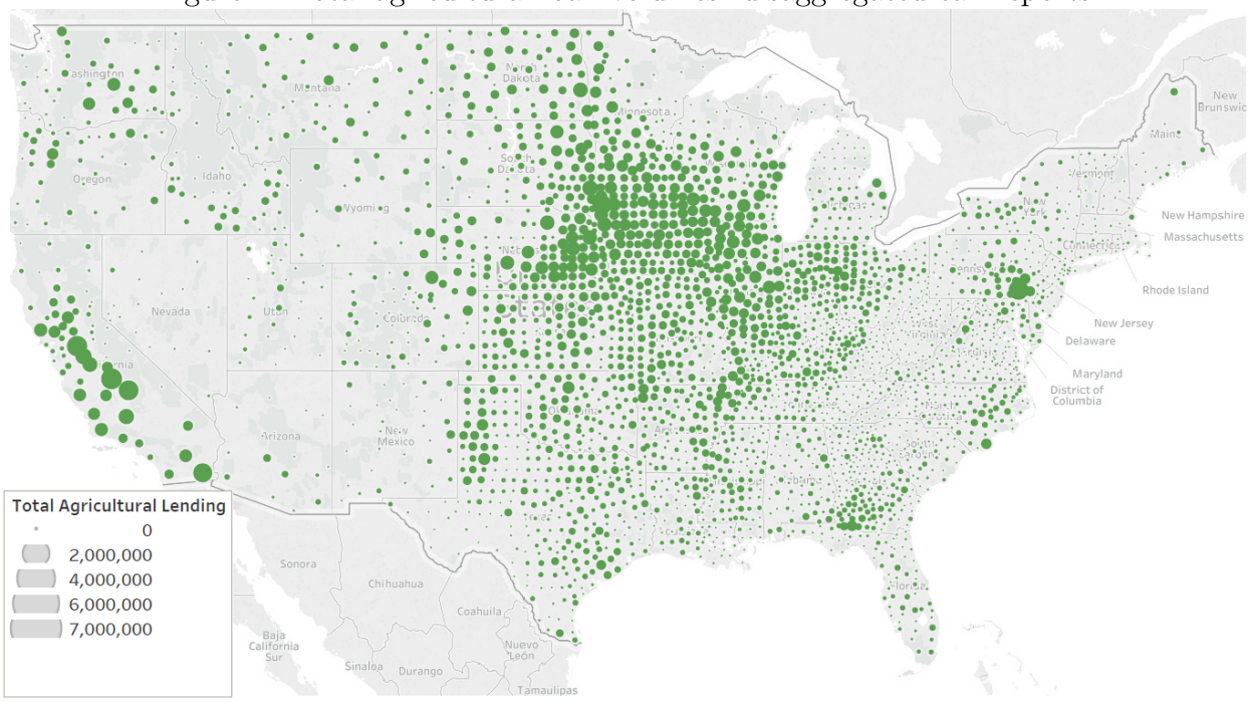
Figures

Figure 1: Total agricultural loan volumes: call reports



Source: Federal Financial Institutions Examination Council, Q2 2018

Figure 2: Total agricultural loan volumes: disaggregated call reports



Source: USDA National Agricultural Statistical Service and Economic Research Service, Agricultural Resource Management Survey (2017),Federal Financial Institutions Examination Council, Q4 2017 and Community Reinvestment Act Federal Deposit Insurance Corporation, Summary of Deposits (2017), Census of Agriculture (2012)