Risk Management and Financial Stability: Crop Insurance's Effect on Farm Bankruptcies

August 11, 2025

Abstract

This study examines the impact of crop insurance participation on farm bankruptcy rates in the United States (US) Midwest. Using a novel county-level panel dataset that combines Chapter 12 bankruptcy filings from the U.S. Courts with liability-based crop insurance participation measures from USDA's Risk Management Agency for the period 1990–2015, we investigate whether higher participation in crop insurance reduces the likelihood of severe financial distress among farms. We utilize instrumental variable fixed effects (IV–FE) models and a number of robustness checks to achieve the study objective. We find that higher crop insurance participation is associated with statistically significant reductions in farm bankruptcy rates. Specifically, a 1% increase in liability-based crop insurance participation is estimated to lower bankruptcy rates by 0.401 per 10,000 farms for corn and by 0.128 per 10,000 farms for soybeans. The findings indicate that crop insurance plays an important role in mitigating severe farm financial stress, with implications for the stability of both farm operations and credit markets.

Keywords: Crop Insurance, Farm Bankruptcy, Panel Data
JEL Codes: Q10, Q12, Q14

1 Introduction

The U.S. federal crop insurance program has evolved into the most prominent policy tool for managing production and revenue risk in agriculture. Since major legislative changes in the 1980s and early 2000s, participation has increased significantly as coverage options have expanded to more crops, additional plan types, and higher available coverage levels (Coble and Barnett, 2012; Glauber, 2004; Goodwin and Smith, 2010; Smith et al., 2017). This growth has been supported by large public investments. For example, USDA's Risk Management Agency (RMA) has distributed over $90 billion in crop insurance subsidies to offset the cost of coverage and encourage enrollment.

The main goal of the crop insurance program is to help protect farm income from unexpected and often damaging events such as drought, floods, pest outbreaks, or sudden drops in commodity prices. Indemnity payments from crop insurance can be a vital source of cash when farm revenues fall sharply, allowing producers to buy inputs for the next season, pay workers, and keep up with loan payments. For farms that operate with narrow margins or carry significant debt, these payments can make the difference between staying in business and shutting down after a poor production year. By softening the immediate impact of revenue losses, crop insurance not only improves short-term liquidity but may also influence a farm's long-term financial health. In particular, consistent participation in the program could potentially reduce the likelihood of severe distress outcomes, such as bankruptcy. Farm bankruptcy, particularly under Chapter 12 of the U.S. Bankruptcy Code, is a legal process allowing family farmers to reorganize debts while maintaining operations. Although farm bankruptcy filings are relatively infrequent compared to the total number of farms, they represent the extreme end of the financial distress spectrum. Unlike short-term liquidity issues or loan delinquencies, bankruptcy reflects insolvency that cannot be resolved without legal intervention. Understanding whether crop insurance participation lowers the probability of such an outcome is important for evaluating the program's effectiveness as a safety net.

The major objective of this study is to examine whether higher crop insurance partici-

pation reduces farm bankruptcies in the US Midwest. To achieve our objective, we utilize county-level data on Chapter 12 farm bankruptcy filings from the U.S. Courts' F-5A tables, available through the Administrative Office of the United States Bankruptcy Courts, for the years 1990 through 2015. We calculate bankruptcy rates using the number of Chapter 12 filings and the number of farms reported in the Census of Agriculture. Then, we collect county-level data on crop insurance participation from the U.S. Department of Agriculture (USDA) Risk Management Agency (RMA), which is measured as liability-based participation, incorporating both insured acreage and coverage levels. We also utilize weather and unemployment rate data collected from a variety of sources. Based on this panel dataset, We utilize IV-FE panel estimation methods that allow us to address potential endogeneity concerns and sharpen identification. We also conduct a number of robustness checks using alternative specifications and alternative estimation procedures to validate results from the baseline IV-FE models.

As the primary farm safety-net policy in U.S. agriculture, crop insurance has been widely studied for its impacts on a range of economic outcomes and producer behaviors. For example, prior research has examined how crop insurance participation influences crop acreage decisions (Yu et al., 2018), enterprise diversification (O'Donoghue et al., 2009), cover crop adoption (Connor et al., 2022), and the extent of environmental externalities (Weber et al., 2016; Lu et al., 2023). Moreover, there is a robust literature investigating the impact of crop insurance participation on debt use or default risk (DeLay et al., 2023; Ifft et al., 2015, 2013; Lee and Djogo, 1984; Pfleuger and Barry, 1986). For example, Ifft et al. (2015) found that farmers who participated in crop insurance tend to have more short-term debt, but not long-term debt, while DeLay et al. (2023) did not find a statistically significant relationship between crop insurance liability and debt. More recently, Lee et al. (2024) analyzed the effect of crop insurance participation on agricultural loan delinquency rates in the U.S. Midwest, finding that greater participation levels lead to lower agricultural delinquency rates.

Despite the robust literature addressing important aspects of farm financial outcomes,

much less is known about how crop insurance participation affects the most severe form of financial distress, farm bankruptcy. The farm bankruptcy literature has primarily focused on documenting patterns and identifying macroeconomic, structural, and demographic risk factors. For example, Dinterman et al. (2018); Dinterman and Katchova (2021) analyzed trends and regional variation in Chapter 12 filings, linking bankruptcy risk to commodity price downturns, rising debt-to-asset ratios, and adverse weather shocks. Katchova and Dinterman (2018) further highlighted that farm size, operator age, and off-farm income are important determinants of bankruptcy likelihood. However, none of these studies directly examine the role of crop insurance participation in mitigating bankruptcy risk.

Therefore, out study fills this research gap by providing new empirical evidence on whether higher crop insurance participation reduces farm bankruptcy. To the best of our knowledge, no prior study has explicitly estimated the relationship between crop insurance use and bankruptcy filings. This is a critical relationship to investigate because bankruptcy represents the most severe and long-term form of financial distress. By examining whether crop insurance participation reduces the farm bankruptcy, our study offers insight into whether the program is fulfilling its intended role of stabilizing farm finances during adverse production years and thereby protecting farm operations from irreversible financial collapse.

Findings from our study suggest that crop insurance participation has a statistically significant negative association with farm bankruptcy rates, suggesting that counties with higher levels of participation tend to experience fewer Chapter 12 filings. Specifically, our results imply that a 1 percentage point increase in liability-based crop insurance participation leads to a reduction of 0.401 bankruptcies per 10,000 farms for corn production and a decline of 0.128 bankruptcies per 10,000 farms for soybean production. This relationship remains robust across multiple model specifications. Overall, our empirical results indicate that crop insurance is an effective tool in mitigating farm financial stress by helping reduce the likelihood of farm bankruptcies.

The rest of this article is organized as follows. Section 2 provides background on Chapter 12 bankruptcy, farm financial stress, and the role of crop insurance. Section 3 presents a detailed description of the data sources. Section 4 describes our empirical approach. Section 5 provides a thorough discussion of the estimation results and discusses supporting results from various robustness checks. Lastly, implications, limitations, and future research directions are presented in the concluding section.

2 Background

2.1 Overview of Chapter 12 Bankruptcy

Bankruptcy, as defined by the U.S. Courts, is a federal legal process for addressing the debts of individuals and businesses, governed by Title 11 of the United States Code. While most cases are filed under Chapter 7, which liquidates a debtor's assets, certain chapters provide alternatives that allow debt restructuring and continued operation. Chapter 12 is one such option, which was enacted in 1986 through the Family Farmer Bankruptcy Act in direct response to the farm financial crisis of the early 1980s, when high interest rates, declining land values, and falling farm incomes forced many operations into insolvency (Aiken, 1987; Dinterman et al., 2018). Chapter 12 is designed for "family farmers" or "family fishermen" with "regular annual income," providing a streamlined debt reorganization process that allows farmers to continue operating while restructuring obligations.

Initially authorized as a temporary measure, Chapter 12 was extended 11 times before the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 made it permanent. BAPCPA also raised the debt limit (from the original $1.5 million in 1986 to $3.2 million in 2005, later increased to $4.1 million in 2010 and $10 million in 2019) and revised income tests to broaden eligibility. Qualifying farmers must be engaged in a farming operation—such as crop production, livestock, dairy, or poultry—meet the debt ceiling, and derive at least 50% of gross income from farming in the relevant tax years (Scott and Hall,

2021). Although not all financially distressed farms file for Chapter 12—due to ineligibility or lack of awareness, its filings are a targeted, sector-specific measure of extreme financial stress. Unlike delinquency rates, which capture short-term repayment problems, Chapter 12 filings represent a legal restructuring process typically initiated after other remedies have failed. As such, Chapter 12 bankruptcy rates provide valuable insights into the resilience of the farm sector and can serve as an important metric for evaluating the effectiveness of policy tools, including crop insurance, in mitigating severe farm financial distress.

2.2 Expansion of the Federal Crop Insurance Program

Prior to the Federal Crop Insurance Act of 1980, the crop insurance program was run on a limited basis and covered a limited number of crops and counties (Kramer, 1983; Goodwin and Smith, 2010; Glauber, 2004, 2013). However, the program largely expanded in county and crop coverage after the 1980 Crop Insurance Act was passed, even though initial participation was still low. When a drought spread from the Mid-Atlantic, Southeast, Midwest, Northern Great Plains, and Western United States in 1988, 25% of the damaged region was eligible for coverage for disaster assistance from Congress. After the Federal Crop Insurance Reform Act of 1994, government provided farmers with a premium-free "catastrophic" crop yield insurance instead of "ex post" disaster assistance. In 2000, Congress passed the Agricultural Risk Protection Act of 2000 (ARPA) for increase in crop insurance premium subsidies. Those subsidies rose to 60 percent of the premium costs, and producers increasingly participated in the program thereafter. The 2008 Farm Bill, the Food, Conservation, and Energy Act of 2008, introduced a pilot revenue-based counter-cyclical program ("ACRE") and included direct payment, counter-cyclical payments, average crop revenue election, and marketing loan. After the 2008 Farm Bill, the percentage of land insured through enterprise units largely increased (Coble and Barnett, 2012). Consequently, average coverage levels were higher than 70 percent of expected yields or revenues by 2015 (Smith et al., 2017).

As the primary federal risk management tool, crop insurance protects against yield and

revenue losses due to adverse weather, pests, and price declines. Indemnity payments can stabilize farm cash flows in low-yield or low-price years, helping producers meet debt obligations and reducing reliance on high-cost borrowing. This liquidity support has the potential to lower the likelihood of farms reaching severe financial distress that results in bankruptcy. Consequently, examining the relationship between crop insurance participation and Chapter 12 bankruptcy rates provides insight into the program's role in mitigating extreme farm financial stress.

3 Data

The data used in this study are collected from a variety of sources. First, the main dependent variable of interest is the measure of farm bankruptcy. We utilize the annual Chapter 12 bankruptcy filings data from the U.S. Courts' F-5A tables, which provide counts of bankruptcy filings by chapter and are compiled by the Administrative Office of the U.S. Bankruptcy Courts.[1] Chapter 12 bankruptcies are a specialized form of reorganization bankruptcy available only to family farmers (and, after 2005, family fishermen) that allows for debt restructuring while enabling the farm to continue operating. As such, Chapter 12 filings serve as a relatively precise indicator of severe financial distress in agriculture and a lower-bound estimate of total farm bankruptcies, since farms may also file under other chapters. Specifically, we calculate the farm bankruptcy rate by dividing the number of Chapter 12 filings in a county by the number of farms in that county, multiplied by 10,000 for ease of interpretation. County-level farm counts are taken from the USDA Census of Agriculture for census years and linearly interpolated for intercensal years. This approach adjusts for differences in farm population across time and space and is consistent with prior studies examining bankruptcy rates (e.g., Dinterman et al., 2018). As we mentioned in the Background section, one consideration with these data is that Chapter 12 filing behavior is

[1] Annual F-5A tables are available from the Federal Judicial Center and the Administrative Office of the U.S. Bankruptcy Courts since 1990. Data can be accessed at: https://www.uscourts.gov/statistics-reports/caseload-statistics-data-tables.

subject to eligibility requirements, such as debt and income tests, and may also depend on farmers' awareness of the program. Therefore, observed bankruptcy rates may understate the true incidence of severe financial distress. Nonetheless, because Chapter 12 is available exclusively to farms, it remains a valuable outcome measure for assessing severe financial distress in the agricultural sector.

After collecting farm bankruptcy data, we then gathered the information for our main independent variable of interest - a liability-based crop insurance participation measure. The primary data source is the county-level crop insurance data made publicly available through the Risk Management Agency (RMA) Summary of Business (SOB) database. We limit the insurance data to the following types of policies: yield protection (YP), revenue protection (RP), and revenue protection with harvest price exclusion (RPHPE). These policies comprise the majority of individual crop insurance policies used for corn and soybean production in the US Midwest. Specifically, we only consider crop insurance policy information for corn and soybeans in our analysis since it is the primary commodity crop in the study area. The county-level data we use geographically covers counties in the following twelve US Midwest states: Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Minnesota, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

The data from RMA, NASS, and Bridge® are necessary to calculate the liability-based measure of crop insurance participation we use in this study (as described in Goodwin et al. (2004) and Connor et al. (2022)). The liability-based measure of crop insurance participation is the ratio of 'total actual liability' in the county (for each year) over a measure of 'total possible liability'. Total actual liability for each county-year is reported in the RMA SOB database. On the other hand, total possible liability (for each county-year) is calculated by taking the product of the following: the futures market price for the crop, total planted acres for the crop (from NASS), the average crop yield for the preceding ten years (from NASS), and the maximum coverage level available in the county (Goodwin et al., 2004). Appropriate futures prices from the Bridge® database were used to be consistent with how

RMA calculates the projected price used in yield and revenue policies.

We chose to use the liability-based measure of crop insurance participation as our main independent variable of interest (i.e., instead of a simple ratio of insured to planted acres) because this liability-based measure accounts for increasing "effective" crop insurance protection through increases in coverage level. Note that the liability-based measure can increase with a higher coverage level, even when insured acreage does not change. An "effective" increase in insurance protection through a higher coverage level is not captured by a simple ratio of insured to planted acres. Hence, the liability-based measure captures both the "extensive" margin (i.e., changes in insured acreage) and "intensive" margin (i.e., change in coverage level) of participation. Nonetheless, we also utilize the ratio of insured to planted acres, average coverage levels, and total premiums as alternative crop insurance participation measures in our robustness checks.

Aside from data on farm bankruptcies and crop insurance participation, we also require data for a number of weather variables and variables that can proxy for prevailing economic conditions in a particular county-year (e.g., unemployment rates and net income variables). These variables are included as controls since each of them can influence farm bankruptcies in a county for a specific year. The data source for the weather variables is the Parameter Regression Independent Slopes Model (PRISM) climate group. This data source has been utilized in a number of studies that examined a variety of climate change issues over the years (See Annan and Schlenker (2015) for example) and is considered one of the best sources of weather and climate-related data. The weather variables include growing season precipitation (in cm), growing degree days (GDD), and harmful degree days (HDD). The precipitation variable represents the cumulative sum of precipitation received over the April to September growing season. The degree day measures provide information about the number of days a crop is exposed to certain temperature ranges. We use degree days between 10-29 °C for GDD, and degree days above 29 °C for HDD.[2] HDD essentially represents the

[2]We use the method in Schlenker and Roberts (2009) to calculate the GDD and HDD measures. These cutoffs have been widely used in climate econometrics literature when measuring the effects of degree days

days with temperatures potentially harmful to the cash crop, and GDD is more moderate temperatures that are not harmful to the crop. The advantage of representing warming in this way is that it allows for capturing the nonlinear relationship between temperatures and loan delinquencies.

The data for the unemployment rate were collected from the Bureau of Labor Statistics (BLS). The county-level unemployment data from BLS are available since 1990 at monthly intervals. Hence, we calculate the yearly county-specific unemployment rate by taking a simple average of the ratio between total unemployment and the sum of total unemployment and employment for each calendar year. In addition, the data for county-level farm net income were collected from the Bureau of Economic Analysis (BEA). As previously mentioned, these two variables represent the general economic conditions in the county for each year, which can generally influence farm profitability and liquidity (Briggeman, 2011; Key et al., 2019).

4 Empirical Strategy

4.1 Baseline Model

We estimate the effect of crop insurance participation on farm bankruptcies at the county-level based on the following baseline specification:

$$Bkcy_{it} = \beta_1 Ins_{it-1} + \boldsymbol{\beta}_2 \boldsymbol{W}_{it-1} + \boldsymbol{\beta}_3 \boldsymbol{X}_{it-1} + \lambda t + \gamma_i + \varepsilon_{it} \tag{1}$$

where $Bkcy_{it}$ is the farm bankruptcy measure in county i for year t, Ins_{it-1} is the one-year lagged liability-based measure of crop insurance participation, $\boldsymbol{W}_{it-1} = (W^1_{it-1}, ..., W^k_{it-1})$ is a vector of one-year lagged weather variables that include GDD, HDD, precipitation, and a squared precipitation term, $\boldsymbol{X}_{it-1} = (X^1_{it-1}, ..., X^k_{it-1})$ is a vector of other control variables that include unemployment rate and income measures, t is a linear time trend

on US corn and soybean yields (e.g., Annan and Schlenker (2015)).

(i.e., to control for unobservable trends that affect all counties the same way), γ_i represents the county fixed effects (i.e., to capture unobservable time-invariant confounders), and ε_{it} denotes the idiosyncratic error terms. The main parameter of interest in this study is β_1, which indicates whether lagged crop insurance participation has a statistically significant relationship with farm bankruptcies. Note that a lagged specification is used in (1) because the bankruptcy variable is measured as the total number of Chapter 12 filings over the full calendar year t. Given this timing, the potential indemnity payments from crop insurance coverage in year $t-1$, as well as prior-year weather shocks and local economic conditions, are more likely to drive the financial distress that culminates in bankruptcy filings during year t. Hence, a lagged specification is appropriate in this context.

Weather variables are included as controls in equation (1) because weather outcomes directly affect crop production and, consequently, the farm revenues available to meet debt obligations. For example, a severe drought (as indicated by high HDD) can reduce yields and farm incomes, potentially increasing financial stress and contributing to bankruptcy filings in the following year. County-level unemployment and farm income measures are also included to capture broader economic conditions that influence farm households' financial resilience. For example, during periods of widespread economic downturn, such as the 2007–2011 "Great Recession," farm operators often experienced reduced off-farm income and tighter credit conditions, which can exacerbate financial distress and raise the likelihood of bankruptcy. Controlling for these variables, along with county fixed effects and time trends, allows for better identification of the impact of crop insurance participation on farm bankruptcies.

We estimate Equation (1) by using instrumental variable (IV) based panel FE models (IV-FE), where the IVs where the IVs are correlated with the potentially endogenous main independent variable but uncorrelated with the outcome variable (i.e., satisfying the so-called IV exclusion restrictions). This approach addresses potential bias from time- and county-varying unobservables that may influence both insurance participation and farm bankruptcies. We follow the general "subsidy change" IV approach that has been utilized in recent

literature where a valid external instrument was needed for a crop insurance-related variable (Schoengold et al., 2014; Yu et al., 2018; DeLay, 2019; Connor and Katchova, 2020; Miao, 2020; Connor et al., 2022). Specifically, we follow Yu et al. (2018) where the set of instruments is based on policy changes to the suite of subsidy rates. These IVs are generated by dividing the annual subsidies for yield and revenue protection policies for a given coverage level (e.g., 65% and 75%),[3] by the sum of their associated total premiums. Moreover, to assess the validity of these instruments in the IV–FE regressions, we conduct three standard diagnostic tests. First, we use the Kleibergen-Paap rk Wald test to evaluate whether the IVs used in the estimation are weak or strong. A significant F-statistic value rejects the null hypothesis that the instruments are weak. Second, we use the Kleibergen-Paap rk LM test to test whether the instruments are underidentified. The null hypothesis for the Kleibergen-Paap rk LM test is that the IV used is underidentified. Last, we conduct the Hansen overidentification test and report Hansen J statistics. The null hypothesis for this test with multiple IVs is that the set of IVs used is valid.

4.2 Robustness Checks

We also conduct several robustness checks to validate the strength and stability of our main regression runs using the baseline empirical specification and estimation strategies described above. First, we consider alternatives to the crop insurance participation variable where, instead of the liability ratio variable, we use three different measures of crop insurance participation - percentage of total insured acres, average coverage level, and total premium amounts. Note that the percent insured acres variable is an "extensive" margin measure where changes in participation are based on whether the number of insured acres decrease or increase. It does not account for changes in crop insurance participation when insureds increase coverage (i.e., "intensive" margin change). Hence, we also consider a purely "intensive" margin measure - average coverage level in a county - as another measure of crop

[3]Specifically, we choose the 65% and 75% coverage level in our analysis because they are the most common coverage levels and span the full 26-year sample.

insurance participation. Another crop insurance participation measure we use is a total premium variable. This variable has been used in previous literature as another participation measure that encompasses both "extensive" and "intensive" margins (i.e., premiums change as coverage level or insured acres change) (Weber et al., 2016).

Second, we explore the effects of crop insurance participation on farm bankruptcies using data only for the "I" states: Illinois, Indiana, and Iowa, for the years 1990-2015. Implementing our analysis only for the three "I" states is appropriate because the predominant row crop produced in these three "I" states is corn and soybeans (i.e., suggesting that the farm bankruptcy outcome variable in these states will more likely be for corn and soybeans farms). Hence, this limited study area allows us to better match the main crop insurance variable (i.e., that pertains to insurance information from corn policies) to our farm bankruptcies dependent variable.

Third, since bankruptcy is often the culmination of financial pressures that accumulate over multiple years, short-term measures of crop insurance participation may not fully capture its potential long-run effects on farm financial stability. Therefore, we replace the one-year lag of crop insurance participation with multi-year moving averages to capture longer-term exposure to the program. Specifically, we construct unweighted three-year and five-year moving averages of participation rates, each ending in year $t-1$, so that they reflect the average participation over years $t-3$ through $t-1$, and $t-5$ through $t-1$, respectively. These measures smooth short-term fluctuations and capture the cumulative influence of crop insurance participation on farm financial conditions. We then re-estimate the IV–FE specification using these alternative measures, retaining the same controls, fixed effects, and instruments as in the baseline model specification.

Last, we utilize an alternative instrument recently introduced by Tsiboe and Turner (2023), which primarily relies on the current rating framework used by RMA (i.e., continuous rating). The main idea is that premium rates in the federal crop insurance program are determined via exogenously set rating parameters. Hence, the parameters, if known, can be

used to generate exogenous variation in premium rates that producers face when making crop insurance decisions. Following Tsiboe and Turner (2023), we adopt the strategy where the instruments are determined by the interaction of the continuous rating parameter calculated by RMA's "continuous rating formula" (Risk Management Agency [RMA], 2000) and the mean of Yu et al. (2018)'s instruments (i.e., mean of the subsidies for 65% and 75% coverage levels).

5 Results and Discussion

5.1 Baseline Model Results

The estimated parameters using the IV-FE models are presented in Table 2.[4] Regression results from the IV-FE models suggest that liability-based crop insurance participation has a statistically significant and negative relationship with farm bankruptcy levels. Counties with higher levels of crop insurance participation tend to have lower farm bankruptcies for both corn and soybean productions. In particular, a 1 percentage point increase in the liability-based crop insurance participation rate is estimated to lower bankruptcy rates by 0.401 per 10,000 farms for corn and by 0.128 per 10,000 farms for soybeans. These magnitudes are economically meaningful given the low base rate of Chapter 12 filings. Hence, these results support the notion that crop insurance does indeed help alleviate financial stress in the agricultural sector, highlighting the important income-smoothing role of crop insurance: indemnities in poor production years help farms meet operating and debt-service obligations, lowering the likelihood of bankruptcy. Based on the results in DeLay et al. (2023), it is likely that higher crop insurance coverage levels do not strongly encourage farmers to take on more debt than they can handle (i.e., such that debt use and financial risk do not substantially

[4]The first-stage regression results for the IV-FE models are presented in Appendix Table A1. The main IVs used in the IV-FE model pass the weak IV test (i.e., we reject the null hypothesis that the IVs are weak), the underidentification test (i.e., we reject the null hypothesis that the IVs are underidentified), and the overidentification test (i.e., we fail to reject the null hypothesis that the IVs are valid).

increase). We posit that business risk reduction provided by crop insurance is typically larger than the additional debt and financial risk farmers take on with higher crop insurance. The business risk reduction from income smoothing then allows farmers with crop insurance coverage to pay off debts on time in loss years, and avoid bankruptcy. Thus, this reduced bankruptcy risk also benefits lenders by limiting nonperforming loans and expected losses, supporting the resilience of local credit markets.

To better understand the economic significance of our estimated effect on farm bankruptcies, we conduct a back-of-the-envelope calculation. According to the U.S. Courts and USDA's Agricultural Resource Management Survey, the average annual Chapter 12 bankruptcy rate for major agricultural states is approximately 2 bankruptcies per 10,000 farms, which translates to approximately 380 filings per year given an estimated 1.9 million farms nationwide. Using our IV-FE corn estimate in Table 2, a 1 percentage point increase in liability-based crop insurance participation reduces the bankruptcy rate by 0.401 per 10,000 farms. This effect implies approximately 76 fewer Chapter 12 filings annually ($0.401 \times \frac{1.9 million}{10{,}000}$). While the exact dollar value of avoided bankruptcies depends on the debt load of affected farms, USDA ERS estimate total U.S. farm-sector debt at approximately $562 billion in 2025. Spreading that evenly across 1.9 million farms suggests an average debt per farm around $296,000. Thus, avoiding 76 bankruptcies could translate to approximately $22.5 million in debt preserved ($76 \times \$296{,}000$). These numbers, though approximate, suggest that modest increases in crop insurance participation can meaningfully cut bankruptcy filings, offering significant financial resilience to farms and reducing potential losses for lenders and local credit systems.

With regards to the control variables in Table 2, the estimated county-level effects largely follow expectations. For example, counties with higher unemployment rates are likely to have higher bankruptcy rates and the relationship is statistically significant. For the parameters associated with the weather variables, majority are statistically insignificant (with the exception of GDD).

5.2 Robustness Checks Results

Results of the robustness checks are presented in Tables 3-6. Findings from these robustness checks are all generally consistent with the results from our main model specification. For the first robustness check where we used the percentage of insured acres, average coverage levels, and premium amounts as alternative measures of crop insurance participation (Table 3), we find that the inferences are still largely consistent with those for the main model runs using the liability-based crop insurance participation measure in Table 2. That is, counties with higher crop insurance participation tend to have lower farm bankruptcies for both corn and soybean specifications, especially when using the percentage of insured acres and average coverage levels as the main measure of crop insurance participation. Then, for the robustness check where we used farm bankruptcy rate and crop insurance participation only for the "I" states, we find that a higher crop insurance participation rate leads to a statistically significant decrease in farm bankruptcies.

Results of the robustness check using 3-year and 5-year moving average of liability-based crop insurance participation are presented in Table 5. These results indicate that the negative relationship between crop insurance participation and bankruptcy risk persists when participation is measured over multi-year windows, consistent with the view that the financial stability benefits of insurance accrue over time and are not limited to a single production year. The slightly smaller and less precisely estimated corn coefficients for the 5-year average likely reflect the greater smoothing of variation in participation over longer horizons, which can reduce statistical power. For soybeans, the stability of the estimates across 3-year and 5-year averages suggests that sustained participation provides a consistent reduction in bankruptcy risk. Last, Table 6 reports the results of the robustness check using an alternative IV. In general, estimation results from the IV-FE models using the alternative instruments suggested by (Tsiboe and Turner, 2023) remain consistent with our baseline IV-FE model using the instrument suggested by (Yu et al., 2018).

6 Conclusion

The US federal crop insurance program plays a key role in the nation's farm safety net. While many studies have examined how crop insurance participation affects production choices, environmental outcomes, and farm finances, there has been no previous study directly investigating its effect on farm bankruptcy — a severe form of financial distress. This study fills this critical gap by examining the relationship between liability-based crop insurance participation and farm bankruptcies using a county-level longitudinal data set for the US Midwest from 1990-2015. We utilize IV-FE panel estimation methods that allow us to address potential endogeneity concerns and sharpen identification. A number of robustness checks were also conducted to examine the consistency of the results.

Our results suggest that the liability-based crop insurance participation measure has a negative and statistically significant relationship with Chapter 12 farm bankruptcy rates. Counties with higher levels of crop insurance participation tend to experience fewer bankruptcy filings, consistent with the idea that crop insurance provides an important buffer against negative yield or price shocks. Indemnity payments in poor production years appear to help farms maintain liquidity and meet debt obligations, thereby reducing the likelihood of entering bankruptcy. These findings support the notion that crop insurance is an effective tool for alleviating financial stress in agriculture and reducing pressure on the rural credit system. Results of our robustness checks using alternative crop insurance participation measures and alternative instrument sets generally support the main finding.

The core empirical result of this study supports the notion that crop insurance can reduce the most severe form of financial distress in farming. Lower bankruptcy rates associated with higher participation provide evidence that crop insurance contributes positively to the financial health of farm operations in the US Midwest. This benefit extends beyond producers to lenders, as reduced bankruptcy risk implies fewer loan losses and a stronger, more stable agricultural credit system. Policymakers may view this as an additional justification for maintaining or enhancing crop insurance support in Farm Bill debates.

Notwithstanding the important findings from the present study regarding the effectiveness of crop insurance in reducing financial stress, it is important to acknowledge study limitations and discuss promising avenues for future research. First, the analysis relies on county-level aggregate data rather than individual farm-level data. Using micro-level data, such as from USDA's Agricultural Resource Management Survey (ARMS), could provide more detailed insights into how participation affects bankruptcy risk at the farm level. Second, the study focuses on the U.S. Midwest and primarily uses crop insurance data for corn and soybeans. Future research could extend this analysis to other regions (i.e., Southeast and West) and to a wider range of crops to assess whether the bankruptcy-reducing effect is geographically and commodity specific. Third, our data end in 2015, and more recent information would be valuable for evaluating the role of crop insurance in the context of recent trends, including the historically low bankruptcy rates of the past several years. Addressing these areas would not only improve the external validity of the findings but also deepen our understanding of how crop insurance participation influences farm financial stability across different production environments and policy contexts. We leave all these potential extensions for future work.

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Table 1: Description and Summary Statistics of Variables

		Corn		Soybeans	
Variable	Description	Mean	Sd	Mean	Sd
Bkcy	Bankruptcy rate (No. of Chap 12 filings per 10,000 farms)	3.6809	10.3057	3.3115	9.3427
Ins	Liability Based Insurance Participation (%)	41.7445	25.2160	42.2844	24.9772
Insured_pct	Percentage of insured acres (%)	68.9311	25.8489	68.7425	25.3275
Coverage	Average coverage level (%)	67.3416	7.8979	68.1381	7.3086
Premium	Total crop insurance producer-paid premium value (*million*$)	3.1714	4.2852	3.2830	4.3702
GDD	Growing degree days (0-29°C, *thousand days*)	1.6286	.2910	1.6498	.2849
HDD	Harmful degree days (above 30°C, *thousand days*)	.0227	.0274	.0225	.0273
Prec	Precipitation (*cm*)	.5759	.1571	.5895	.1521
Unemp	Unemployment rate	.0519	.0236	.0522	.02296
Income	Farm net income (*billion* $)	.0222	.0283	.0230	.0285

Table 2: Effects of Crop Insurance Participation on Farm Bankruptcies Using IV-FE: Corn & Soybean

	Corn	Soybean
Ins_{it-1}	-0.4014***	-0.1280***
	(0.1526)	(0.0323)
GDD_{it-1}	4.2709***	1.9629***
	(1.3338)	(0.7331)
HDD_{it-1}	-12.9605**	-6.8137
	(6.1783)	(5.0864)
$\text{Precipitation}_{it-1}$	-2.4605	3.3548
	(3.1499)	(2.9626)
$\text{Precipitation squared}_{it-1}$	-1.2506	-3.9529*
	(2.1827)	(2.0726)
$\text{Unemployment Rate}_{it-1}$	56.2050***	35.3587***
	(7.3215)	(4.6932)
Time Trend	0.7266*	0.0618
	(0.3904)	(0.0833)
County FE	Yes	Yes
Observations	21127	19774
Wald F-statistic	10.37***	58.22***
Kleibergen-Paap rk LM statistic	22.38***	127.17***
Hansen J statistic	0.07	1.91

Note: (1) This table shows the combined results of our base IV-FE models. The dependent variable is the farm bankruptcy level, and the independent variable is one-year lagged liability-based crop insurance participation. (2) Column (1) presents the results for corn production, and Column (2) presents the results for soybean production. (3) Standard errors are clustered by county. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effects of Crop Insurance Participation on Farm Bankruptcies Using IV-FE: Alternative Crop Insurance Participation Measures

	Corn			Soybeans		
	(1)	(2)	(3)	(1)	(2)	(3)
Percent Insured Acres$_{it-1}$	-0.4578**			-0.2829**		
	(0.2163)			(0.1387)		
Average Coverage Level$_{it-1}$		-0.3117***			-0.5555***	
		(0.1085)			(0.1391)	
Premium$_{it-1}$			1.1591**			0.8650***
			(0.5105)			(0.2781)
GDD$_{it-1}$	1.7629**	2.5982***	4.5427***	1.4849**	3.2545***	3.6357***
	(0.7983)	(0.8425)	(1.5946)	(0.7368)	(0.9165)	(1.1417)
HDD$_{it-1}$	35.3505	-26.6276***	-21.1253***	20.4963	-26.6091***	-12.1642**
	(24.7125)	(6.6006)	(6.1377)	(15.4907)	(6.9300)	(5.2271)
Precipitation$_{it-1}$	35.2646**	-5.9169*	1.0945	24.0571**	-6.3761*	4.0504
	(17.8660)	(3.3991)	(3.4384)	(11.7849)	(3.3847)	(3.2002)
Precipitation squared$_{it-1}$	-26.3766**	2.5317	-2.5561	-18.0610**	3.3884	-4.1514*
	(12.5838)	(2.3456)	(2.4141)	(8.2637)	(2.3485)	(2.2317)
Unemployment Rate$_{it-1}$	-30.9041	69.9256***	34.1179***	-8.5611	97.2745***	35.1345***
	(35.5493)	(10.2642)	(7.0870)	(24.7279)	(14.6367)	(5.0213)
Time Trend	0.7431	-0.1119*	-0.7216***	0.3790	0.0421	-0.5940***
	(0.4923)	(0.0665)	(0.1875)	(0.3160)	(0.0776)	(0.1106)
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21128	21127	21128	19774	19742	19774
Wald F-statistic	4.56**	105.72***	8.52***	8.55**	40.95***	19.50***
Kleibergen-Paap rk LM statistic	9.59***	187.88***	16.55***	18.55***	91.29***	36.74***
Hansen J statistic	2.34	1.64	1.74	7.41***	0.07	2.09

Note: (1) This table shows the combined results of the robustness check: using three alternative crop insurance participation measures. The dependent variable is the farm bankruptcy level, and the independent variable is the one-year lagged crop insurance participation. (2) Column (1) presents the results using percent insured acres, Column (2) presents the results using average coverage level, and Column (3) presents the results using premium. (3) Standard errors are clustered by county. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Effects of Crop Insurance Participation on Farm Bankruptcies Using IV-FE: 'I' States only

	Corn	Soybean
Ins_{it-1}	-0.2607**	-0.1023**
	(0.1225)	(0.0433)
GDD_{it-1}	4.0754**	1.8632
	(1.8995)	(1.1464)
HDD_{it-1}	-15.3857*	-13.6968*
	(9.1212)	(8.2210)
$\text{Precipitation}_{it-1}$	-2.7041	2.9656
	(4.2318)	(4.4981)
$\text{Precipitation squared}_{it-1}$	0.2561	-3.4039
	(2.7468)	(3.1220)
$\text{Unemployment Rate}_{it-1}$	19.8977***	9.7924
	(7.4124)	(7.7854)
Time Trend	0.5007	0.0589
	(0.3334)	(0.1138)
County FE	Yes	Yes
Observations	6827	6849
Wald F-statistic	10.58***	27.45***
Kleibergen-Paap rk LM statistic	20.36***	50.94***
Hansen J statistic	0.16	0.71

Note: (1) This table shows the combined results of the robustness check: using 'I' states (Iowa, Illinois, and Indiana) only. The dependent variable is the farm bankruptcy level, and the independent variable is one-year lagged liability-based crop insurance participation. (2) Column (1) presents the results for corn production, and Column (2) presents the results for soybean production. (3) Standard errors are clustered by county. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Effects of Crop Insurance Participation on Farm Bankruptcies Using IV-FE: 3-Year & 5-Year Moving Average

	Corn		Soybeans	
	(1)	(2)	(1)	(2)
$\overline{\text{Ins}}^{(3)}_{i,t-1}$	-0.3725*		-0.0973***	
	(0.2138)		(0.0372)	
$\overline{\text{Ins}}^{(5)}_{i,t-1}$		-0.4420		-0.1287**
		(0.3270)		(0.0592)
$\overline{\text{GDD}}^{(3)}_{i,t-1}$	7.1985*		1.7819	
	(4.2626)		(1.7981)	
$\overline{\text{HDD}}^{(3)}_{i,t-1}$	-16.6463		-4.5382	
	(11.2304)		(8.7320)	
$\overline{\text{Precipitation}}^{(3)}_{i,t-1}$	-8.5616		3.2707	
	(6.9964)		(5.4744)	
$\overline{\text{Precipitation squared}}^{(3)}_{i,t-1}$	2.2404		-4.7255	
	(4.4370)		(3.8038)	
$\overline{\text{Unemployment Rate}}^{(3)}_{i,t-1}$	81.1201***		42.9427***	
	(18.0468)		(5.9936)	
$\overline{\text{GDD}}^{(5)}_{i,t-1}$		16.7165		5.8691*
		(10.2632)		(3.0652)
$\overline{\text{HDD}}^{(5)}_{i,t-1}$		-54.3721**		-7.2143
		(26.7722)		(13.0150)
$\overline{\text{Precipitation}}^{(5)}_{i,t-1}$		-4.4344		10.9850
		(10.2401)		(7.0050)
$\overline{\text{Precipitation squared}}^{(5)}_{i,t-1}$		0.1077		-10.8896**
		(6.9840)		(4.8413)
$\overline{\text{Unemployment Rate}}^{(5)}_{i,t-1}$		121.4163***		52.6315***
		(43.3852)		(7.3867)
Time Trend	0.5731	0.6461	-0.0294	0.0309
	(0.5057)	(0.7108)	(0.0926)	(0.1422)
County FE	Yes	Yes	Yes	Yes
Observations	21665	21713	20168	20221
Wald F-statistic	4.68***	2.27	50.93***	28.08***
Kleibergen-Paap rk LM statistic	10.15***	4.88**	115.09***	62.84***
Hansen J statistic	0.001	0.12	1.62	1.85

Note: (1) This table shows the combined results of the robustness check: using 3-year and 5-year moving averages. The moving average is calculated as the mean of the variable's value from year $t-1$ back to year $t-3$ or $t-5$. The dependent variable is the farm bankruptcy level, and the independent variable is the 3-year or 5-year moving average of liability-based crop insurance participation. (2) Column (1) presents the results using a 3-year moving average, and Column (2) presents the results using a 5-year moving average. (3) Standard errors are clustered by county. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Effects of Crop Insurance Participation on Farm Bankruptcies Using IV-FE: Alternative IV

	Corn	Soybean
Ins_{it-1}	-1.2878	-0.1402***
	(0.7881)	(0.0392)
GDD_{it-1}	7.1878	1.1911
	(4.6303)	(0.8030)
HDD_{it-1}	-13.6544	-7.1167
	(8.8301)	(4.9580)
$\text{Precipitation}_{it-1}$	-8.8677	4.7883*
	(6.3140)	(2.9073)
$\text{Precipitation squared}_{it-1}$	-0.2304	-4.9551**
	(2.9602)	(2.0457)
$\text{Unemployment Rate}_{it-1}$	59.5059***	28.9912***
	(17.3810)	(4.4019)
Time Trend	3.1543	0.1220
	(2.0886)	(0.0997)
County FE	Yes	Yes
Observations	19984	18727
Wald F-statistic	2.65	94.43***
Kleibergen-Paap rk LM statistic	2.88**	104.49***
Hansen J statistic	0.00	0.00

Note: (1) This table shows the combined results of the robustness check: using alternative IV. Following Tsiboe and Turner (2023), we adopt the strategy where the instruments are determined by the interaction of the continuous rating parameter calculated by RMA's "continuous rating formula" (Risk Management Agency [RMA], 2000) and the mean of Yu et al. (2018)'s instruments (i.e., mean of the subsidies for 65% and 75% coverage levels). The dependent variable is the farm bankruptcy level, and the independent variable is one-year lagged liability-based crop insurance participation. (2) Column (1) presents the results for corn production, and Column (2) presents the results for soybean production. (3) Standard errors are clustered by county. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A1: First stage regression results for the IV-FE model: liability-based crop insurance participation as a function of IVs and exogenous variables

	(1)	(2)
tl_sb_60_65	1.3646***	
	(0.3879)	
tl_sb_70_75	1.2534***	
	(0.4459)	
$\tau\times$ mean_sb_65_75		11.2224
		(6.8992)
GDD_{it-1}	7.0754***	5.5798***
	(0.5603)	(0.6547)
HDD_{it-1}	8.2842	0.4126
	(5.1243)	(5.5198)
$Precipitation_{it-1}$	-1.1361	-6.2031***
	(2.2505)	(2.2916)
$Precipitation\ squared_{it-1}$	-2.4287	0.5830
	(1.6370)	(1.6681)
$Unemployment\ Rate_{it-1}$	34.0225***	17.9092**
	(7.2821)	(7.2551)
Time Trend	2.5079***	2.6414***
	(0.0277)	(0.0284)
County FE	Yes	Yes
Observations	21127	19984

Note: (1) This table presents the first stage regression results for the IV-FE models utilized in our empirical model specifications. (2) Column (1) shows the first stage regression results of our main baseline model specification using aggregate subsidy rate for 65% and 75% coverage levels, and Column (2) shows the results of using the interaction of the continuous rating parameter τ and mean of the subsidy rate for 65% and 75% coverage levels. (3) Standard errors are clustered by county. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$