From Bailouts to Buy-Up: How CFAP and MFP Reshaped Insured Acres and Coverage Choices*

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Abstract

U.S. farmers and ranchers have received unprecedented levels of ad hoc aid through the Market Facilitation Program (MFP) and the Coronavirus Food Assistance Program (CFAP). We ask whether these large, unconditional payments altered farm decisions under the Federal Crop Insurance Program. Using county-year observations from 2018 to 2024 and fixed-effects panel regression models, we find that CFAP payments to crop producers ($12 billion net) are associated with an estimated 3.6 million–acre reduction in insured acreage; a striking unintended consequence that masks substantial heterogeneity. Underneath the aggregate estimates, large opposing effects are present. We find that MFP payments led to no net change in acreage but drive substantial compositional shifts: participation falls at lower coverage levels and rises at higher levels. In contrast, disaster-linked programs (WHIP, ERP) exhibit positive associations with both acres and policies, reflecting mandatory purchase requirements rather than voluntary behavior. Overall, our findings underscore that large, unconditional cash transfers can substantially reshape the crop-insurance risk pool, reducing overall acreage coverage under CFAP while redistributing participation across coverage tiers under MFP. These results take on heightened policy relevance as new ad hoc assistance programs continue to be enacted, suggesting these unintended interactions with crop insurance may persist.

Keywords: Ad hoc disaster aid, crop insurance, counter-cyclical programs, U.S. agricultural policy
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1. Introduction

Agricultural producers operate in an environment characterized by substantial uncertainty arising from extreme weather events, pests and plant diseases, and market volatility. Effective risk management is therefore crucial, not only to protect individual farm operations but also to ensure the stability of the national food supply. In the United States (U.S.), federal support for risk management primarily comes from three sources: subsidized crop insurance via the Federal Crop Insurance Program (FCIP), direct commodity support through counter-cyclical programs (i.e., ARC and PLC), and compensation for unanticipated natural or economic shocks via ad hoc assistance programs (Turner et al. 2023; Baldwin et al. 2024). While these mechanisms aim to mitigate unforeseen agricultural losses, they differ significantly in structure, incentives, and fiscal implications. FCIP offers a market-based approach in which producers and the government share the cost of insurance through subsidized premiums. By contrast, ad hoc programs provide reactive, ex-post financial assistance to producers, typically without requiring prior enrollment or premium payments. Counter-cyclical programs fall somewhere in the middle, requiring prior enrollment, but without any collection of premiums, making them free from the producer's perspective. The relationship between these programs, particularly between ad hoc programs and crop insurance, represents a longstanding area of concern in agricultural policy. In particular, policy discussions going back to the 1980s discuss the idea that the availability of disaster aid undermines producers' incentives to participate in formal insurance coverage (Government Accountability Office 1980, 1989). However, despite ongoing efforts to develop a comprehensive and actuarially sound insurance system, both ad hoc assistance and crop insurance have continued to expand simultaneously in the recent decade. This parallel growth raises fundamental questions about the interaction between the two mechanisms, their relative effectiveness, and the behavioral responses they provoke among producers.

The purpose of this paper is to revisit the question of whether there are unintended consequences of ad hoc disaster assistance, in the form of crowding out demand for formal agricultural insurance. Using county-level data on the FCIP from the USDA Risk Management Agency (RMA) and data on ad hoc disaster payments from the Farm Service Agency (FSA), we specify a fixed effects panel model to examine the demand response of crop insurance to recent ad hoc disaster programs. Our primary programs of interest are the Market Facilitation Program (MFP) and Coronavirus Food

Assistance Program (CFAP) due to their unique program design that offered widespread eligibility and unconditional cash transfers, making them arguably exogenous to on-farm losses and prior insurance enrollment. In addition to these programs of interest, we also control for the other major sources of financial farm support over this time period including the Wildfire and Hurricane Indemnity Program (WHIP)[1], the Emergency Relief Program (ERP), as well as the existing counter-cyclical commodity support programs which include the Agriculture Risk Coverage-County Option (ARC-CO) and Price Loss Coverage (PLC) programs. Our findings suggest a statistically significant crowding-out effect in which CFAP payments in the year prior are correlated with decreases in extensive margin crop insurance demand. MFP payments exhibit a similar correlation, but with limited statistical significance. However, this aggregate effect masks considerable heterogeneity that exists across insurance plans, coverage levels, and commodities. Overall, our results suggest that recent unconditional cash transfers from ad hoc assistance programs are unlikely to have prompted a mass crowd-out effect, but may have altered how participation is distributed across the FCIP. Most notably, our results suggest that additional assistance is 1) correlated with shifts away from lower crop insurance coverage levels towards higher coverage levels and 2) correlated with shifts from revenue-based insurance plans towards yield-based insurance plans.

Our results contribute to the literature on the interaction between ad hoc disaster assistance and crop insurance in several ways. First, our study is the first, to our knowledge, that assesses the effect of ad hoc assistance on crop insurance decisions in a case where payments are arguably exogenous. Although past literature has looked at the effect of ad hoc assistance on crop insurance decisions, these studies have had to contend with the fact that payments are typically highly endogenous to both on-farm losses and prior crop insurance decisions (Deryugina and Kirwan 2018; Turner and Tsiboe 2022; Maisashvili et al. 2023). In particular, eligibility for ad hoc assistance is typically predicated on actual on-farm losses or a county-level index that is correlated with losses. In contrast, actual received payments are conditional on crop insurance coverage levels and/or offset by any received crop insurance indemnity. This source of endogeneity can be addressed to some degree using instrumental variables techniques (Deryugina and Kirwan 2018). A more problematic issue is

[1] We use "WHIP" to refer to both the original WHIP and the later implemented WHIP+ program.

that many ad hoc assistance programs have temporary mandatory purchase requirements in which receipt of ad hoc disaster assistance requires a producer to purchase crop insurance at a specified coverage level for a certain amount of time. This effect, which may not be addressed through instrumental variable methods, makes interpretation of results difficult since it becomes impossible to separate actual preference-driven decisions from mandated compliance in aggregated data. The CFAP and MFP programs are unique in this regard, since payments were based on national-level measures that were arguably uncorrelated with actual on-farm losses. Additionally, neither CFAP nor MFP required the purchase of crop insurance after receipt of payments.

Our results also contribute to the literature by focusing exclusively on the modern policy environment and incorporating all sources of major financial assistance to farmers. Past literature has typically focused on historical programs implemented before 2011 (Deryugina and Kirwan 2018) or examined single programs in isolation (Turner and Tsiboe 2022; Maisashvili et al. 2023). It is not clear that previous results generalize to the current policy environment. For one, the post-2017 period represents a fundamental shift in both the scale and scope of ad hoc disaster assistance (Baldwin et al. 2024). Since 2017, ad hoc disaster assistance has represented a much higher share of total budgetary expenditures compared to the preceding decade, with the magnitude of disbursed dollars from ARC, PLC, CFAP, MFP, ERP, and WHIP matching the magnitude of crop insurance indemnity payments ($85 billion versus $86 billion from 2017-2024). When accounting for farmer-paid crop insurance premiums, the net transfer to farmers from crop insurance declines to $51 billion, highlighting how ad hoc and standing counter-cyclical programs have become the dominant form of government transfers to agricultural producers. Additionally, our study period covers an unusually stable period in crop insurance public policy with no major changes to the core crop insurance policies (RP, YP, RPHPE, and APH), the legislatively set subsidy rate, or crop insurance premium rating methods.[2]

[2] The 1990s were characterized by large changes in crop insurance participation due to changing subsidy rates and implementation (and later revocation) of mandatory purchase requirements in the Federal Crop Insurance Reform Act of 1994 (Agricultural Policy Team 2025). These changes also heavily modified the actuarial performance of the program and created a major structural shift in loss ratios. Premium rating methods were also overhauled with the introduction of the continuous rating formula in 2000. The 2008 Farm Bill increased premium subsidy rates for enterprise unit structures (Tsiboe et al. 2025). Major changes also occurred in 2011, which was the first year the current revenue and yield-based policies (RP, RPHPE, and YP) were available. A major downward revision to corn and soybean premium rates also occurred in the 2011/12 crop year.

Furthermore, past literature covering the post-2017 period has not considered the evolving role of counter-cyclical payment programs in the relationship between ad hoc disaster aid and crop insurance. Since the 2018 Farm Bill, ARC and PLC have allowed more frequent updating of election decisions, with annual modifications permitted since 2020, making these programs closer substitutes to traditional crop insurance policies (Turner et al. 2023).

The next section provides a general background on the FCIP and ad hoc assistance programs, including discussions of the different program designs of recent ad hoc assistance programs and how those program designs are expected to alter crop insurance purchasing behavior. The following two sections discuss our dataset and empirical model, respectively. The penultimate section presents our results before the final section concludes.

2. Background on FCIP and Ad Hoc Aid

The FCIP was established under the Crop Insurance Act of 1938 in response to the Great Depression and Dust Bowl, to protect against losses from extreme weather and natural disasters for wheat in major producing areas (Shields 2015). Participation remained low during the program's early decades, mainly because coverage was limited to a narrow range of crops. Between 1970 and 1980, a series of major natural disasters and extreme weather events caused widespread crop losses across the U.S. In response to repeated disaster declarations, Congress enacted numerous emergency relief measures to provide financial assistance for crop production failures. The continued provision of ad hoc disaster payments may have altered producers' expectations when facing catastrophic yield losses, as these programs effectively offered insurance-like protection through direct payments (Goodwin and Smith 1995). These recurring payments diminished the incentive for producers to participate in the voluntary crop insurance program, contributing to its limited adoption.

A major turning point for FCIP came with the Federal Crop Insurance Act of 1980 (the 1980 Act), followed by a series of legislative reforms intended to expand participation and reduce dependence on ad hoc disaster assistance (Glauber 2004; Smith and Goodwin 1996). The 1980 Act extended coverage to more crops and regions, introduced a premium subsidy covering 30% of producer-paid premiums, and established a public-private partnership by allowing private insurance companies to deliver and service policies. Although the goal of this legislation was to encourage participation

and shift producers from reliance on emergency disaster relief toward ex ante risk management (Goodwin and Smith 1995), participation remained modest at around 20% through the early 1990s.

In an effort to supersede ad hoc disaster relief, Congress passed the Federal Crop Insurance Reform Act of 1994 (the 1994 Reform Act), which made enrollment in crop insurance mandatory for producers seeking eligibility for deficiency payments, price support programs, certain loans, and other USDA benefits (Babcock and Hart 2005).[3] At a minimum, producers were required to enroll in Catastrophic (CAT) coverage, which indemnified crop losses exceeding 50% of historical yields at 55% of the market price (Young et al. 2001). The Act also established the Risk Management Agency (RMA) in 1996 to administer FCIP. It introduced the Non-insured Crop Disaster Assistance Program (NAP) for commodities not covered by crop insurance (Knight and Coble 1997). The mandatory coverage provision led to a sharp increase in program enrollment, with more than 180 million acres insured by 1998, over three times the insured acreage in 1988 (Glauber 2004). However, many producers opted for the free CAT coverage, limiting the program's potential to reduce disaster assistance expenditures meaningfully.

Crop insurance has since undergone further expansion through successive farm bills, consolidating its central role as the primary agricultural risk management tool for U.S. producers. By 2024, insured acreage exceeded 540 million acres, covering over 90% of eligible planted acres for commodity crops and protecting more than $159 billion in liabilities across more than 100 crops (USDA-RMA, Summary of Business). It is worth noting that the 2014 Agricultural Act replaced direct payments with new commodity support programs, including Agriculture Risk Coverage (ARC), Price Loss Coverage (PLC) (Orden and Zulauf 2015).

Despite the success of crop insurance, a new wave of ad hoc disaster assistance programs emerged beginning in 2017. The Bipartisan Budget Act of 2018 authorized $2.36 billion for the Wildfires and Hurricanes Indemnity Program (WHIP) in response to an unusually active hurricane and wildfire season. WHIP explicitly incorporated crop insurance status into payment calculations, offering higher compensation rates for producers with existing FCIP or NAP policies. With prolonged

[3] This mandatory purchase requirement was partially repealed in 1996 such that crop insurance was only required to be eligible to disaster assistance payments.

disaster events in 2018 and 2019, Congress expanded the program into WHIP+, allocating more than $4.5 billion in total funding (Stubbs 2020).

MFP introduced a different form of ad hoc assistance, compensating producers for income losses associated with retaliatory tariffs on U.S. agricultural exports by major U.S. trade partners in the 2018-2019 trade war. Totaling $23 billion across 2018 ($9.6 billion) and 2019 ($14.5 billion), MFP became one of the largest farm payment programs in recent decades (Carter and Steinbach 2020; Grant et al. 2021). Authorized under the Commodity Credit Corporation (CCC) Charter Act, MFP payments were based on actual production of eligible commodities in 2018 or on planted acreage in eligible counties in 2019, and did not require prior enrollment in crop insurance.

In addition to MFP, the CFAP provided emergency relief to agricultural producers facing market disruptions from the COVID-19 pandemic. With total disbursements exceeding $31 billion, $11.8 billion under CFAP 1 and $19.2 billion under CFAP 2, CFAP became the largest agricultural assistance program in U.S. history (Schnepf 2019). Payments were based on commodity-specific price declines, inventories, or acreage, depending on the phase of the program (Belasco and Smith 2021). Like MFP, CFAP did not require prior crop insurance enrollment. The size and scope of these programs highlighted the enduring political appeal of direct payments, while raising concerns about their long-term implications for the farm safety net. More recently, the Emergency Relief Program (ERP) was authorized to provide $10 billion in assistance for losses related to qualifying natural disasters in 2020 and 2021. ERP replaced WHIP+ with a more structured and integrated approach, relying on data from FCIP and NAP to calculate payments based on actual insured losses (Stubbs 2023). All ERP recipients were required to purchase crop insurance or NAP coverage for the next two available crop years, linking the program more explicitly to formal risk management tools.

2.1 Program Design Features and Theoretical Linkages with Crop Insurance

The expansion of ad hoc disaster assistance since 2017 encompasses programs with different design features that create varying theoretical relationships with crop insurance participation. Understanding these design differences is crucial for interpreting empirical results, as the heterogeneous program structures generate distinct behavioral incentives and constraints that can lead to crowding-out, crowding-in, or mandated complementarity effects.

2.1.1 Theoretical Framework for Program Linkages

The relationship between ad hoc disaster assistance and crop insurance participation depends critically on program design features that determine: (1) payment conditionality on insurance status, (2) temporal linkage requirements for future insurance purchases, and (3) mechanical integration with existing insurance data and systems. These design elements create different theoretical predictions about farmer behavioral responses.

Crowding-Out Mechanisms: Traditional economic theory suggests that ad hoc disaster payments should reduce demand for crop insurance through classic moral hazard effects. When farmers anticipate government assistance following disasters, their willingness to pay for private insurance coverage declines (Deryugina and Kirwan 2018). This effect should be strongest for programs that provide large, unconditional payments regardless of insurance status.

Crowding-In Mechanisms: Conversely, programs that explicitly reward insurance participation or integrate payments with insurance data can create complementary relationships. When ad hoc assistance is structured to supplement rather than substitute for insurance coverage, or when payments are conditional on maintaining insurance, the programs may encourage rather than discourage private risk management.

Mandated Complementarity: Some programs create artificial complementarity through explicit requirements that recipients purchase crop insurance in future years. While this generates positive statistical relationships between disaster aid and insurance participation, it reflects policy mandates rather than voluntary behavioral responses.

2.1.2 Program-Specific Design Features and Expected Effects

Building on the theoretical framework, recent ad hoc assistance programs differ substantially in how they interact with crop insurance, reflecting variation in design features such as insurance conditionality, data integration, and forward-linkage requirements. These structural elements imply distinct behavioral responses, ranging from substitution to complementarity. Table 1 summarizes key program characteristics and classifies each according to its expected theoretical relationship with

FCIP participation. The remainder of this section examines these programs individually, linking design features to their predicted effects on insurance demand.

Wildfire and Hurricane Indemnity Program (WHIP/WHIP+, 2017-2019): WHIP explicitly incorporates crop insurance status into payment calculations and offers higher compensation rates for producers with existing FCIP or NAP policies. This design creates direct financial incentives for insurance participation and should generate complementary rather than substitutive relationships. The graduated payment structure based on insurance coverage level provides additional incentives for farmers to maintain or upgrade their coverage.[4] Mandatory purchase requirements further create artificial complementarity.

Market Facilitation Program (MFP, 2018-2019): With $23 billion in payments based on production or planted acreage, MFP likely reflects the crowding-out scenario. The program provided large payments without any insurance requirements or status-based adjustments, creating pure income effects that should reduce insurance demand. The systematic nature of trade-related losses across entire commodity sectors amplifies the moral hazard concerns, as farmers may anticipate similar future assistance for systemic shocks.

Coronavirus Food Assistance Program (CFAP, 2020-2021): As the largest agricultural assistance program in U.S. history ($31 billion), CFAP similarly provided payments based on commodity losses, inventories, or acreage without insurance linkages. The program's unprecedented scale and broad eligibility criteria likely strengthened expectations of future government assistance during major disruptions, potentially creating substantial crowding-out effects.

Emergency Relief Program (ERP, 2020-2021): ERP combines both mechanical integration with crop insurance data and explicit future purchase requirements. The program calculates payments based on actual insured losses, creating tight linkages with existing insurance systems. More importantly, all ERP recipients are required to purchase crop insurance or NAP coverage for the subsequent two crop years, creating mandated rather than voluntary complementarity.

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[4] One exception to this is for farmers at the 85% coverage level. As discussed by (Turner and Tsiboe 2022), the marginal payment increase is zero for the 85% coverage level and creates an incentive to reduce coverage to the 80% level.

2.1.3 Endogeneity in the Aid–Insurance Relationship

The empirical relationship between ad hoc disaster assistance and crop insurance participation is complicated by multiple forms of endogeneity. These challenges vary sharply across programs and should be addressed to avoid misinterpreting program effects as behavioral responses (Deryugina and Kirwan 2018). The first issue is simultaneity bias, which arises when disaster aid formulas explicitly incorporate a producer's current insurance coverage. Under programs such as WHIP and ERP, payment calculations use insurance coverage levels or indemnity amounts to determine aid, mechanically linking observed aid receipt to insurance participation. As a result, positive correlations between ad hoc payments and insurance coverage may overstate voluntary complementarity and instead reflect the structure of the payment formula itself. Second, third-factor causality introduces spurious correlation when unobserved shocks jointly affect both insurance demand and aid eligibility. For example, a localized drought may lead farmers to increase their insurance coverage while simultaneously triggering eligibility for ad hoc payments. This issue is relevant for programs associated with crowding-out, such as MFP and CFAP, where payments are not conditioned on insurance status but may still correlate with exogenous risk exposure. Third, policy-induced mechanical correlation arises when aid programs impose explicit insurance purchase requirements as a condition of eligibility. For instance, ERP mandates that aid recipients purchase FCIP or NAP coverage for two subsequent crop years at or above a minimum coverage level. Such requirements ensure a positive statistical relationship between aid receipt and future insurance participation, but this reflects compliance rather than any underlying change in farmer preferences or risk perceptions. This form of endogeneity is most relevant for programs classified under mandated complementarity.

These sources of bias differ in both nature and severity across programs. WHIP and ERP exhibit severe endogeneity. Payment formulas use graduated factors tied to farmers' existing coverage decisions, which creates a direct source of simultaneity bias. Additionally, mandated future purchase requirements impose artificial complementarity that biases coefficients upward irrespective of genuine behavioral responses. Alternatively, neither of these issues applies to MFP and CFAP. These systemic, sector-wide programs paid unconditional cash transfers based on acreage or production in response to trade and pandemic shocks. Neither the payment formula nor the eligibility rules incorporated

insurance status, and no linkage requirements applied. This design largely eliminates mechanical correlations, leaving voluntary, expectation-driven behavior as the primary source of any demand response. For these reasons, our analysis places special emphasis on MFP and CFAP, as their effects provide the cleanest evidence on how large, unconditional payments influence crop insurance participation.

3. Data and Approach

3.1 Data

Data for our analysis primarily comes from public USDA data sources. Crop insurance participation comes from RMA's Summary of Business file and payments from ad hoc programs and counter-cyclical programs (i.e., ARC and PLC) were obtained from FSA's publicly available payment files. We limit crop insurance data to observations within the 2018-2024 crop years participating in one of the primary individual crop insurance policies (i.e., Revenue Protection, Yield Protection, Revenue Protection with Harvest Price Exclusion, and Actual Production History). Collectively, these insurance plans represented 88% of total insured crop liabilities in the FCIP for the 2024 crop year. Four primary metrics were retained for crop insurance participation analysis: total insured acres, the acreage-weighted average coverage level, total policies sold, and indemnities per acre. The first three serve as our main dependent variables, capturing different measures of crop insurance participation across the intensive and extensive margin.

Our key explanatory variables are payments from four major ad hoc disaster assistance programs implemented during our study period: the MFP, CFAP, WHIP, and ERP. For each program, we construct two measures: total payments (in millions of dollars) received by each county in each year and the number of unique payments made to each county and year. We include several control variables to account for other factors affecting crop insurance participation. Lagged indemnity payments per acre control for recent insurance experience that may influence future participation decisions (i.e., recent losses may serve as a salient motivator to purchase crop insurance coverage for the current year). Payments from traditional counter-cyclical programs (ARC-CO and PLC) are included to account for the availability of alternative programs that cover some of the same losses the crop insurance policies protect against. As an additional control variable, we retrieved

the average county base rate for corn, soybeans, and wheat at the 65% coverage level from RMA's actuarial data master. This represents the crop insurance premium rate (in cents per dollar of insured liability) before any farm-specific pricing components are applied, capturing temporal and spatial variation in crop insurance prices.

Our final dataset consists of county-year observations spanning 2018-2024, covering almost all U.S. counties. Table 2 presents descriptive statistics for all variables used in our analysis. The average acreage-weighted coverage level of the crop insurance policies in each county was 71%, with the average number of purchased policies being equal to 764. County-level payment data indicate that CFAP had the highest average payment amount per county-year observation at $1.65 million, followed by MFP ($1.26 million), ERP ($0.58 million), and WHIP ($0.18 million). The average number of unique payments made from each program is the same as the total payments, with CFAP delivering an average of 222 payments per county per year, followed by MFP (158), ERP (48), and WHIP (24). Among the counter-cyclical programs, PLC had the higher average payment amount per year at just over $620,000 per county, with ARC-CO payments coming in at an average of $200,000 per year. The average number of unique payments per year, again, follows the exact ordering as disbursed dollars, with PLC at 158 and ARC-CO at 109. County-level crop insurance premium-based rates averaged 9 cents per dollar of insured liability, and the average indemnity per acre was $67.50. Although ad hoc programs are typically specified for a particular event or crop year, the timing of payments typically occurs after that crop year has ended. Payment data was aggregated using the actual payment date of each transaction, meaning our dataset reflects when funds were disbursed. The distribution of payments over time is depicted in Figure 2.

3.2 Empirical Approach

To estimate the impact of ad hoc agricultural disaster assistance programs on crop insurance participation, we employ a fixed effects panel data model that exploits county-level variation in program payments over time. Our baseline empirical model takes the following form:

$$\text{IHS}(Y_{ct}) = \alpha + \sum_{j} \beta_j \text{IHS}(Payment_{j,c,t-1}) + \gamma \cdot X_{ct} + \delta_c + \lambda_t + \epsilon_{ct} \tag{1}$$

where Y_{ct} represents our crop insurance outcome variables for county c in year t. We examine three key measures of crop insurance participation: total insured acres, acreage-weighted average coverage level, and total policies sold. $Payment_{j,c,t-1}$ denotes the lagged values of payments from ad hoc program j in county c and year $t-1$, where j indexes the programs of interest. A feature of any metric tracking payments is that they tend to have heavily right-skewed distributions, making a data transformation that corrects for this desirable. Another feature of ad hoc assistance payments is the prevalence of zero values (i.e., no payments for a particular program were made in a given county and year). These two features motivate the use of the inverse hyperbolic sine (IHS) transformation for many of the variables in our model since it achieves a similar result as taking the natural log of the data while being able to accommodate zero values without arbitrary modifications (i.e., such as adding one before taking the log). Like a log transformation, the IHS transformation also allows our results to be interpreted as elasticities (Bellemare and Wichman 2020).

X_{ct} is a vector of time-varying county-level control variables including lagged IHS-transformed indemnity payments per acre, and crop insurance base premium rates. County fixed effects (δ_c) control for unobserved time-invariant county characteristics that may influence both disaster aid eligibility and crop insurance participation. Year fixed effects (λ_t) account for national trends in crop insurance participation and policy changes affecting all counties simultaneously. The parameters of interest are β_j, which capture the impact of an increase in lagged payments from each ad hoc program j on crop insurance outcomes. We estimate separate models using dollar amounts of program payments and the number of unique payments received. Standard errors are clustered at the county level.

Identification of any causal relationship between ad hoc disaster payments and crop insurance participation measures is predicated on the assumption that, conditional on county and year fixed effects and our control variables, the timing and magnitude of ad hoc program payments are exogenous to unobserved factors affecting crop insurance participation decisions. As was discussed in the previous section, in some cases, this assumption can be violated. However, for our primary programs of interest, MFP and CFAP, the relationship between these programs and crop insurance demand is arguably exogenous, given that they were for large systemic market disruptions and did not have localized eligibility requirements linked to individual farm losses.

One important limitation of the baseline empirical approach outlined above is that it masks potential heterogeneity in treatment effects across different facets of the FCIP. If ad hoc disaster assistance programs have differential effects on farmers' crop insurance decisions depending on their chosen policy, pooling these effects into a single coefficient may lead to misleading conclusions. For instance, if payments have negative effects on participation at lower coverage levels but positive effects at higher coverage levels, the aggregate coefficient may appear as null results, masking these economically meaningful heterogeneous responses. To address this limitation, we extend our baseline model to allow for observed heterogeneity by incorporating interaction terms between ad hoc program payments and dummy variables that represent either a specific crop insurance coverage level, crop insurance plan, or crop. Our extended model takes the form:

$$IHS(Y_{kct}) = \alpha + \sum_{k}\sum_{j} \beta_{j,k} \cdot IHS(Payment_{j,c,t-1}) \times D_{k,ct} + \gamma \cdot X_{ct} + \delta_c + \lambda_t + \epsilon_{ct} \qquad (2)$$

where $Payment_{j,c,t-1}$ represents lagged payments from program j (MFP, CFAP, WHIP, ERP, ARC, and PLC) in county c and year $t-1$, and $D_{k,ct}$ is a dummy variable indicating unit k (where k either represents the faceting variable). The interaction coefficients $\beta_{j,k}$ capture the effect of program j payments on crop insurance outcomes, Y_{kct}, specifically for unit k. Importantly, because FSA payments are not disaggregated by crop or coverage level, $Payment_{j,c,t-1}$ does not get re-indexed with k, like the outcome variable does. In other words, this means the treatment variable represents the total across all values of k.

4. Results

Table 3 reports panel fixed effects regression results. Focusing on results based on the total dollar amount of payments, MFP payments in the year prior are associated with an increase in the average coverage level, and no statistically significant change in total purchased policies or insured acreage. Results for CFAP payments suggest reductions in insured acres, increases in average coverage levels, and decreases in purchased policies. It is worth stressing here that reduced demand at the extensive margin (acres or policies) can create indirect increases at the intensive margin (coverage level) if the reductions in acres or policies are not uniformly distributed across the spectrum of coverage levels

(ex: reductions in acres at lower coverage levels raise the average coverage level of the remaining insured acres). However, the reverse is not true (i.e., changes in coverage level have no corresponding effect on insured acres or policies). In contrast to MFP and CFAP, WHIP and ERP payments exhibit an exclusively positive relationship with crop insurance demand in the following year. Using the unique number of payments as the measure of ad hoc assistance levels produces results that, when statistically significant, are consistent with the results based on total disbursed dollars.

The contrast between our results for disaster-linked programs (WHIP/ERP) versus systemic assistance programs (MFP/CFAP) warrants careful interpretation. WHIP and ERP show exclusively positive relationships with crop insurance outcomes, while MFP and CFAP exhibit negative effects on insured acres despite positive effects on coverage levels. As discussed in prior sections, this pattern is consistent with systematic upward bias affecting the disaster-linked programs. The positive WHIP and ERP coefficients likely reflect a combination of: (1) mandatory compliance with linkage requirements rather than voluntary behavioral responses, (2) third-factor causality induced by common disaster shocks affecting both aid receipt and insurance demand, and (3) any genuine crowding-in or crowding-out effects that may exist.

Overall, despite the statistical significance of our estimates, the implied per-county elasticities remain small. In Table 3, the coefficient on lagged CFAP dollars in the insured-acres regression (–0.005) means that a 1 percent increase in prior-year CFAP payments is associated with a 0.005 percent reduction in insured acres. At the county sample mean ($1.65 million in CFAP payments and 89,864 insured acres), a 1 percent increase (an extra $16,500) corresponds to about five fewer insured acres per county. However, the unprecedented scale of CFAP magnifies these small elasticities into sizable national effects. Of the $31 billion for the CFAP program, $12 billion actually went to crop producers. Applying these total payments received by crop farmers to that same marginal effect implies roughly 3.6 million fewer insured acres nationwide, about 0.7 percent of the roughly 540 million acres enrolled in the FCIP, a very sizable shift for a policy shock.

Additionally, the aggregated results in Table 3 potentially mask important heterogeneity across subsets of the data. To investigate this heterogeneity, we estimated the interaction model specified in Equation 2, which allows the effects of ad hoc program payments to vary across different facets

of the data. Results based on the unique number of payments disbursed, decomposed by insurance policy coverage level, are reported in Appendix Figures A.1 and A.2 which show the effects on acres and policies, respectively (analogous results using total dollars of disbursed payments are in Appendix Figures A.3 and A.4).

These estimates make it clear that there are notable differences in results across coverage levels. The decompositions reveal opposing effects for every disaster assistance program, where lower coverage levels show reduced extensive margin demand, while higher demand is observed at higher coverage levels. In the case of the WHIP and ERP programs, this pattern is expected. The mandatory purchase requirements for both WHIP and ERP stipulated that recipients of aid must purchase crop insurance at the 60% coverage level or higher. In effect, this means any recipients of payments that held policies with low coverage levels were forced to increase their coverage levels.

While this pattern for WHIP and ERP likely reflects explicit program design features, the similar pattern observed for MFP and CFAP reveals the heterogeneous income effects these unconditional payment programs create across different farmer types. Without access to farm-level observations, interpretation of these results is somewhat speculative. Farmers at low coverage levels, who have already purchased policies with very large deductibles, could see ad hoc disaster aid as a final straw that incites total dropping of coverage. In contrast, farmers at higher coverage levels (who presumably are more risk-averse) use the additional funds to buy up to a higher coverage level. Alternatively, farmers at low coverage levels could be facing cash constraints and using the cash injection to move to their preferred higher coverage levels once their liquidity constraints were alleviated.

As is the case with different coverage levels, varied results are also expected and observed across different types of insurance plans. Results decomposed by insurance plan type are depicted in Appendix Figures A.5 and A.6. For both extensive margin measures of demand (i.e., policies sold and insured acres), demand among revenue-based plans is generally positively correlated with payment disbursements. The exception to this is PLC payments, which are negatively correlated with demand. This is not surprising since, by design, if PLC payments are made, then the PLC trigger price (i.e., the effective reference price) is close to the market price. In effect, this means

PLC starts providing similar price protection to revenue-based policies, which makes it sensible for a producer to switch from revenue to yield-based policies.

Appendix Figures A.7 and A.8 report results decomposed into two major groupings of crops: Row crops and "All other crops". Like the insurance plan decompositions, opposing effects are also consistently observed in the measures of extensive margin demand across crops. In particular, the crowding out effect of CFAP and MFP appears to be concentrated among "All other crops," whereas major commodity row crops exhibit positive correlations with disbursed aid. Given that row crops tend to insure at slightly higher coverage levels (row crops have an acreage weighted coverage level of 75% in our sample compared to 68% for all other crops) suggests some of the heterogeneity in coverage levels may be driven by diverging behavior across commodity type. For cash-constrained farmers at low coverage levels, these payments could be acting more like liquidity injections, giving them the resources to buy the coverage they actually wanted. But for farmers who chose low coverage because they genuinely prefer self-insurance, the same payments reinforce that strategy by reducing their perceived need for formal coverage. However, decomposing results by both coverage level and crop type reveals heterogeneous effects across coverage levels for row crops only (Appendix Figures A.9 and A.10).[5]

Overall, the heterogeneity in effects observed across each facet of the data highlights an issue with pooled analysis, as is presented in Table 3, namely that the mix of positive and negative correlations across different subsets of the FCIP results in aggregate effects that appear to be economically negligible. For example, as was previously mentioned, the elasticity of -0.005 was reported for the effect of CFAP dollars on insured acres. The same effect decomposed by coverage level is approximately -0.36 for the 55% coverage level and 0.66 for the 80% coverage level. In other words, the pooled analysis obfuscates diverging effects that are, in some cases, orders of magnitude above what the pooled results would suggest.

[5] Results across coverage levels for all other crops suffer from reduced statistical power and resulting large confidence intervals. Given that many of the "All other crops" are specialty crops grown in limited regions of the country, further decomposing results by coverage level reduces the analytical sample size for each point estimate even further.

4.1 Robustness Checks

To assess the robustness of our main IHS results, we implement several alternative econometric specifications that test different functional form assumptions and estimation approaches. Our key independent variables are all right-skewed and include many zero values, making application of an inverse hyperbolic sine (IHS) transformation a desirable choice. However, the IHS transformation is notably not scale invariant (Aihounton and Henningsen 2020; Bellemare and Wichman 2020). To assess the sensitivity of our results to scaling effects, we estimate a model that uses logarithmic transformations in the place of IHS transformations, where we add 1 to each value to avoid taking the log of zero (i.e., $\log(x+1)$). Additionally, we perform two more robustness checks at altered data scales that scale our raw data up and down by a factor of 10. Finally, we run a Poisson Pseudo Maximum Likelihood model with high-dimensional fixed effects. This specification has the advantage of explicitly modeling zero values. The key regressors were logged to frame the estimated coefficients as semi-elasticities, making them comparable to the other model specifications. The key coefficient estimates from all of these specifications are reported in Appendix Figure A.11, which shows that differences do exist across specifications; however, the results are largely qualitatively consistent across specifications.

5. Conclusion

Our analysis provides the first examination of how unconditional ad hoc disaster payments influence crop insurance participation. For CFAP, we find evidence of payments crowding out demand for crop insurance at the extensive margin (insured acres and total policies). At the same time, the effect of MFP is statistically insignificant in aggregate estimates. Decomposing the effect by coverage level suggests that crowding out at the extensive margin is concentrated at low coverage levels, which results in indirect effects that increase the average coverage level (intensive margin). Further, decomposing results by coverage level, insurance plan, and crop type suggests diverging responses to ad hoc assistance that result in attenuation of estimated effects towards zero in our pooled analysis. In reality, these modest effects appear to be composed of effects that are large in magnitude, but that mostly cancel out across the spectrum of available policy options. From a policy perspective, this suggests that widespread crowding out/in is unlikely to universally occur from large unconditional

cash transfers, but that the composition of the FCIP risk pool can change, which may have future actuarial or budgetary implications.

While the county-level approach used here yields important insights about aggregate patterns and program heterogeneity, several limitations affect the interpretation of our findings and point toward promising directions for future research. First, our county-level analysis necessarily aggregates across the individual farms where risk management decisions are made. This aggregation may mask important heterogeneity in behavioral responses across different farm sizes, organizational structures, financial conditions, and risk preferences. For example, large commercial operations and small family farms likely respond very differently to the same policy incentives. This implies that our approach cannot distinguish between these fundamentally different decision-making entities. A related concern is that publicly available data sources for ad hoc disaster payments do not decompose payments by crop or crop insurance contract. In our pooled analysis, this is not a problem. However, decomposing outcomes by coverage level, crop, or insurance plan means the corresponding independent disaster payments variables now suffer from measurement error, which is expected to manifest as attenuation bias. This means the estimated effects that incorporate observed heterogeneity may well be lower bounds on the true effect size.

These limitations point toward future research needed that uses confidential, linked farm-level data from RMA and FSA. Such data would address our key constraints by enabling direct observation of individual farm decision-making units and accompanying disaster payments. Additionally, farm-level data would permit direct observation of linkage requirement compliance, which has muddled the interpretation of previous results focused on traditional ad hoc assistance programs like WHIP and ERP. Additionally, farm-level data would also increase statistical power, which is particularly important for subsets of FCIP where participation is lower and/or geographically limited (i.e., specialty crops).

In the wake of the 2025 American Relief Act's (enacted in Dec. 2024) $30 billion in ad hoc farm aid—on top of existing commodity supports, and recently increased crop-insurance subsidy rates, the role that ad hoc disaster assistance plays in the farm safety net continues to be a policy-relevant topic. Our results offer several insights for ongoing debates over federal farm support—particularly

their scale under the ARA and the broader subsidy landscape (Smith and Belasco 2025). These findings indicate that farmers' responses vary sharply by coverage level, plan type, and commodity, patterns that may influence the design and outcomes of future farm bill risk management provisions.

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Tables and Figures

Table 1: Program Design Features and Expected Linkages with Crop Insurance

Program	**Years**	**Funding**	**Design Features**	**Linkage Requirements**	**Expected Effect**	**Key Mechanisms**
WHIP/WHIP+	2017–2019	$6.86B	Indemnity offset; graduated payment factors based on insurance status	Higher payments for insured producers/ mandated purchase requirements	Complementary/ Mandated	The payment formula creates an incentive to maintain coverage. Mandates create additional artificial complementarity.
MFP	2018–2019	$23B	Production or acreage-based payments; no insurance integration	None	Crowding-Out	Large unconditional payments reduce perceived need for insurance; classic moral hazard
CFAP	2020–2021	$31B	Commodity losses, inventory, or acreage-based; no insurance linkage	None	Crowding-Out	Largest program in history; unrestricted payments create expectation of future bailouts
ERP	2020–2021	$10B	Payments based on actual insured losses; structured integration with FCIP/NAP	Payments based on insured losses/ mandated purchase requirements	Complementary/ Mandated	Payment formula based directly on insured losses. Mandates create additional artificial complementarity.

Table 2: Descriptive Statistics

Variable	Mean	SD	Min.	Max.
Insured Acres	89,864.29	117,225.37	2.00	925,701.00
Acreage Weighted Coverage Level (%)	70.87	6.67	50.00	85.00
Total Policies Sold	764.35	997.44	1.00	7,273.00
MFP (Million $)	1.26	3.59	0.00	56.52
CFAP (Million $)	1.65	5.69	0.00	242.34
WHIP (Million $)	0.18	0.78	0.00	22.56
ERP (Million $)	0.58	2.45	0.00	67.67
ARC-CO (Million $)	0.20	0.77	0.00	18.82
PLC (Million $)	0.62	1.88	0.00	35.06
MFP (Unique Payments)	158.02	385.16	0.00	5,258.00
CFAP (Unique Payments)	222.84	534.44	0.00	7,247.00
WHIP (Unique Payments)	24.18	105.49	0.00	3,086.00
ERP (Unique Payments)	47.67	139.83	0.00	2,880.00
ARC-CO (Unique Payments)	109.29	272.17	0.00	4,422.00
PLC (Unique Payments)	158.67	340.65	0.00	3,971.00
Base Rate (cents)	9.03	6.55	0.44	51.90
Indemnity / Acre ($)	67.50	203.14	0.00	7,464.90

Table 3: Fixed Effects Regression Results - IHS Specification

Dependent Variables:	IHS(Insured Acres)		IHS(Avg. Cov. Level)		IHS(Policies)	
Program Metric:	Dollars	Payments	Dollars	Payments	Dollars	Payments
Variables						
IHS(MFP_{t-1})	0.003	-0.004*	0.007***	0.003***	-0.001	-0.001
	(0.003)	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)
IHS($CFAP_{t-1}$)	-0.005**	-0.004**	0.002***	0.000	-0.003*	-0.004***
	(0.003)	(0.002)	(0.000)	(0.000)	(0.002)	(0.001)
IHS($WHIP_{t-1}$)	0.007***	0.003***	0.003***	0.000**	0.009***	0.004***
	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
IHS(ERP_{t-1})	-0.003	-0.006***	0.004***	0.001***	0.005***	0.002
	(0.003)	(0.002)	(0.000)	(0.000)	(0.002)	(0.001)
IHS(ARC_{t-1})	-0.002	-0.001	-0.001***	0.001***	-0.001	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
IHS(PLC_{t-1})	0.011***	0.000	-0.003***	0.000	0.004**	0.000
	(0.002)	(0.001)	(0.000)	(0.000)	(0.002)	(0.001)
IHS((Indemnity / Acre)$_{t-1}$)	0.002	0.002	0.003***	0.003***	0.007***	0.008***
	(0.002)	(0.002)	(0.000)	(0.000)	(0.001)	(0.001)
Base Rate (cents)	0.004*	0.004*	0.000	0.000	0.004***	0.004***
	(0.002)	(0.002)	(0.000)	(0.000)	(0.001)	(0.001)
Fixed effects						
County	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics						
Observations	13,110	13,110	13,110	13,110	13,110	13,110
R^2	0.996	0.996	0.954	0.954	0.998	0.998
Within R^2	0.003	0.005	0.052	0.041	0.013	0.016

Standard-errors clustered at the county-level in parentheses,

*Statistical significance: ***: 0.01, **: 0.05, *: 0.1*

Figure 1: Payment Trends Over Time: Crop Insurance Indemnities vs FSA Payments

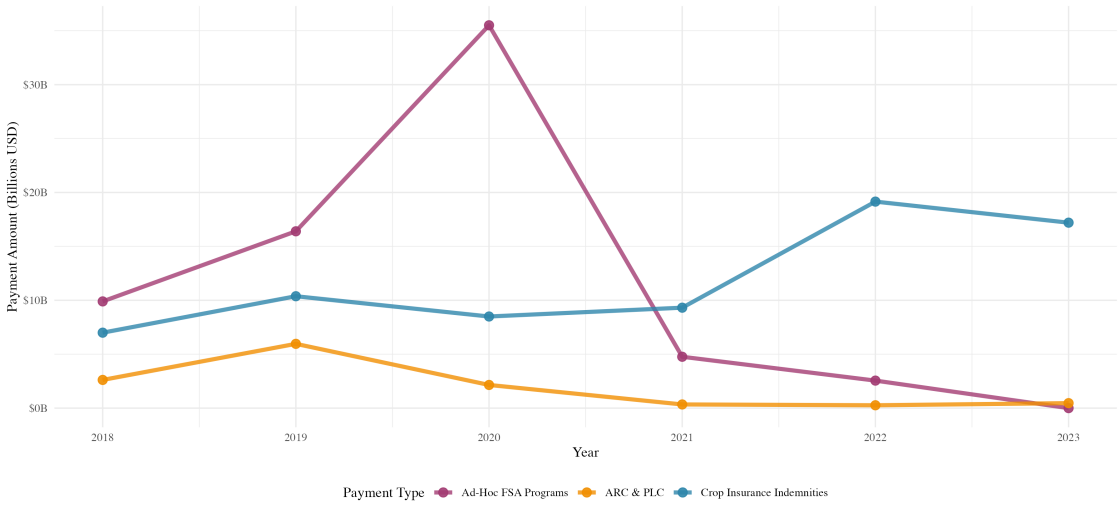


Figure 2: Distribution of Payments over Time

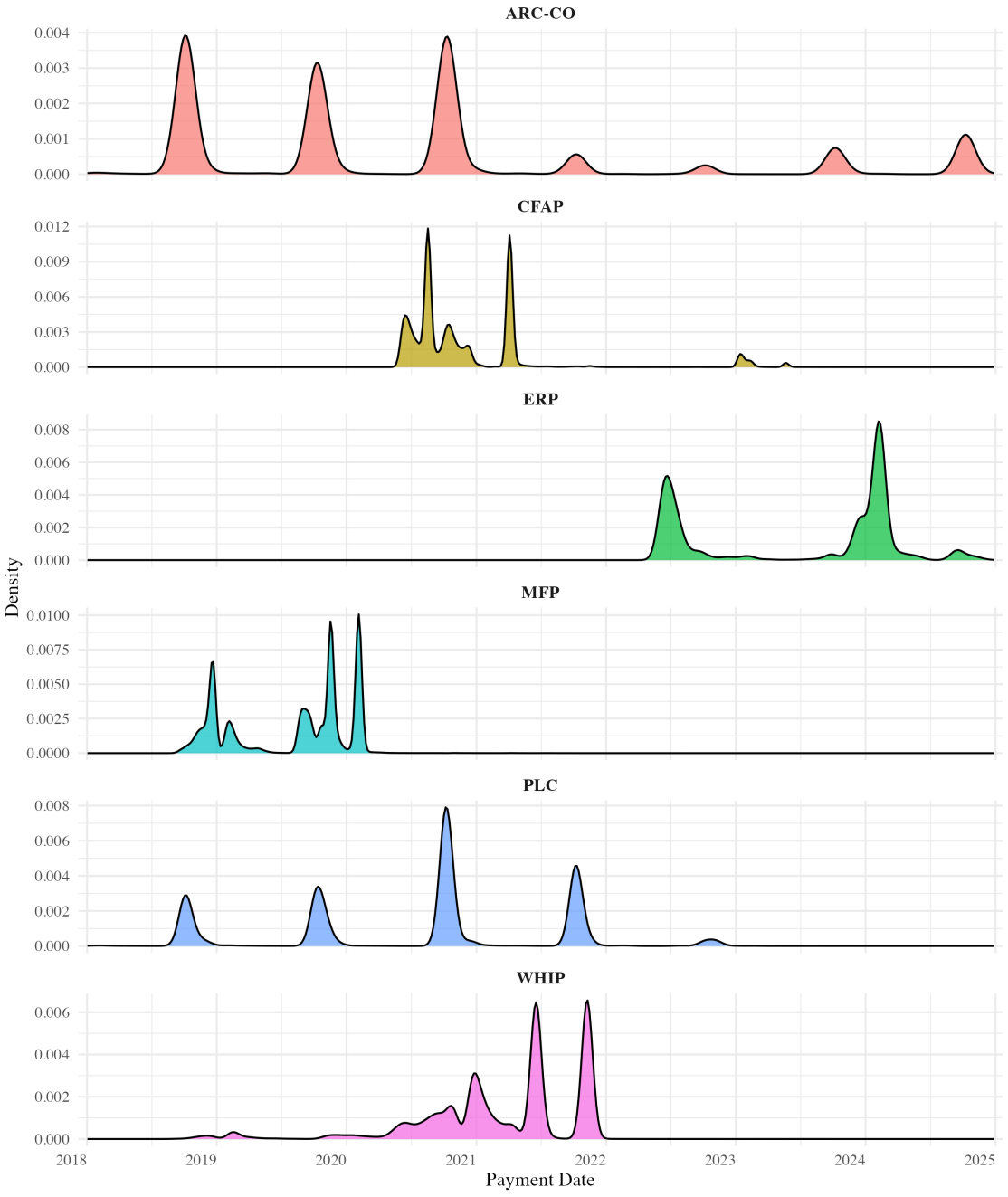
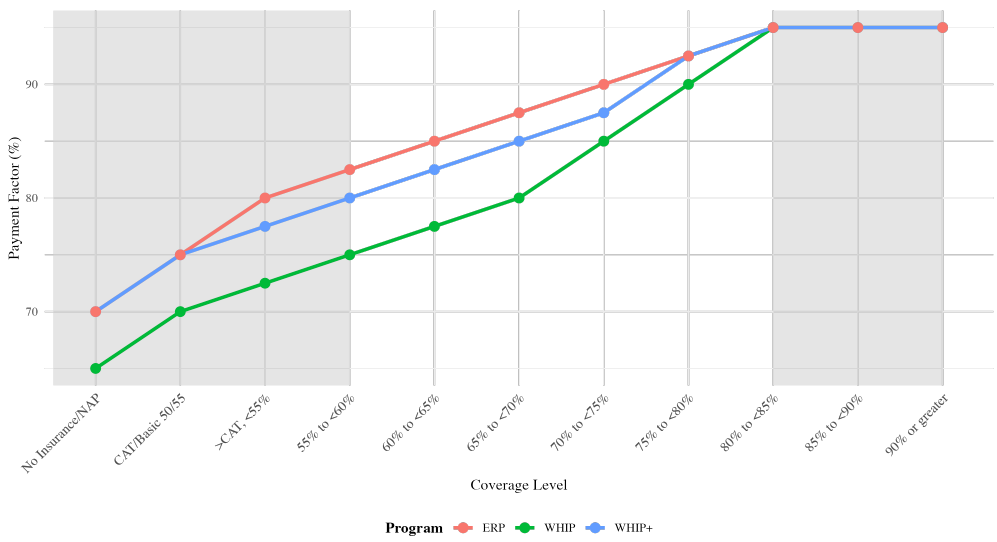


Figure 3: Payment Factors by Coverage Level for WHIP, WHIP+, and ERP Programs



Appendix Tables and Figures

Figure A.1: Effects of Unique Ad hoc Payments on Insured Acres by Coverage Level

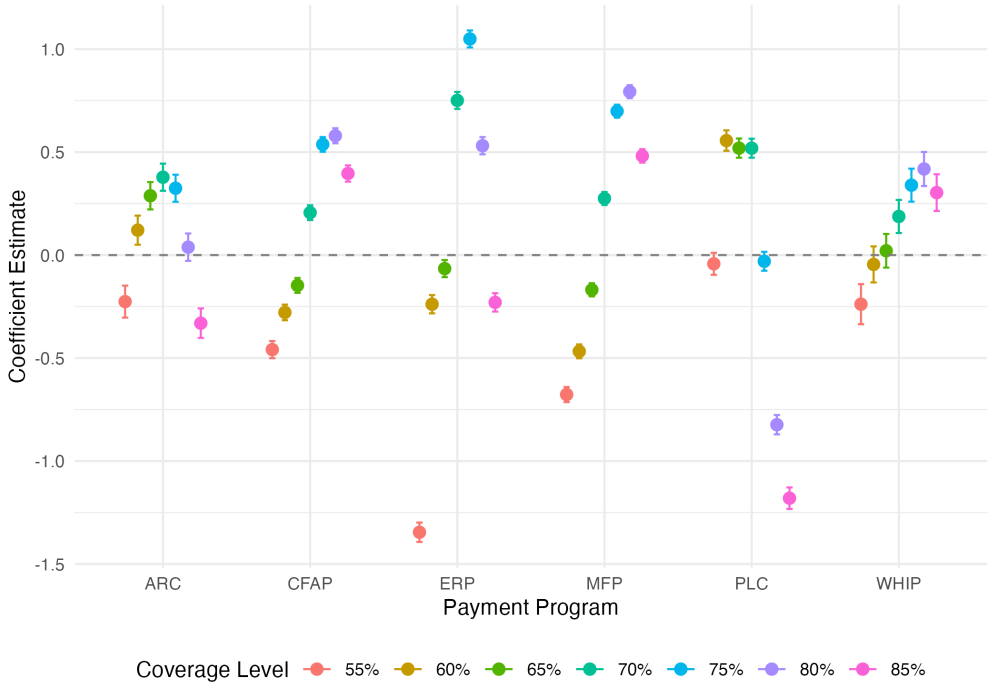


Figure A.2: Effects of Unique Ad Hoc Payments on Total Policies by Coverage Level

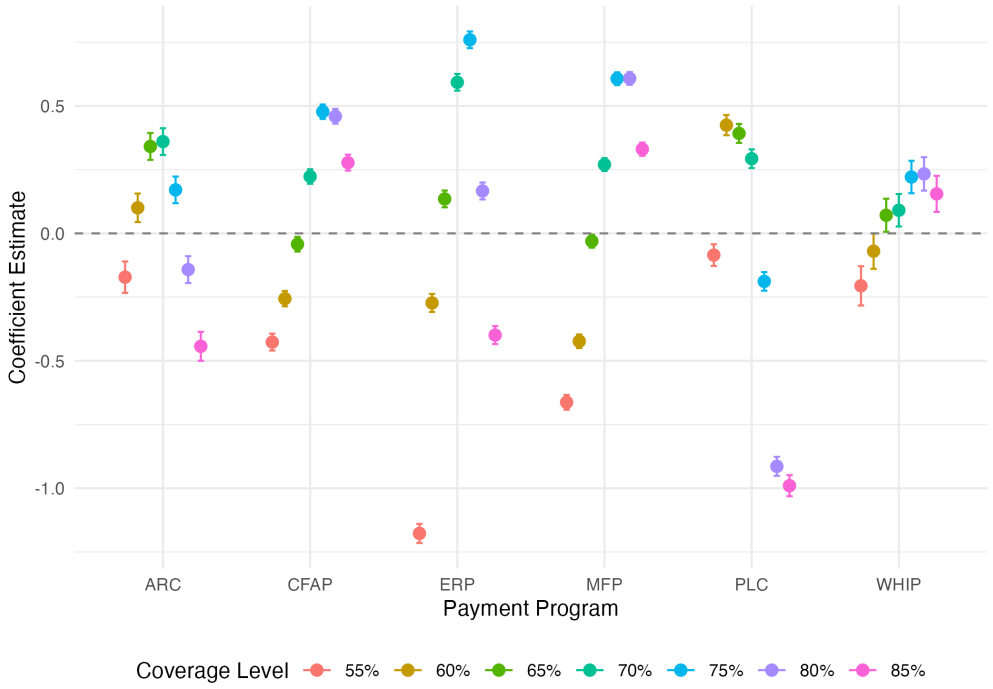


Figure A.3: Effects of Total Ad Hoc Dollars on Insured Acres by Coverage Level

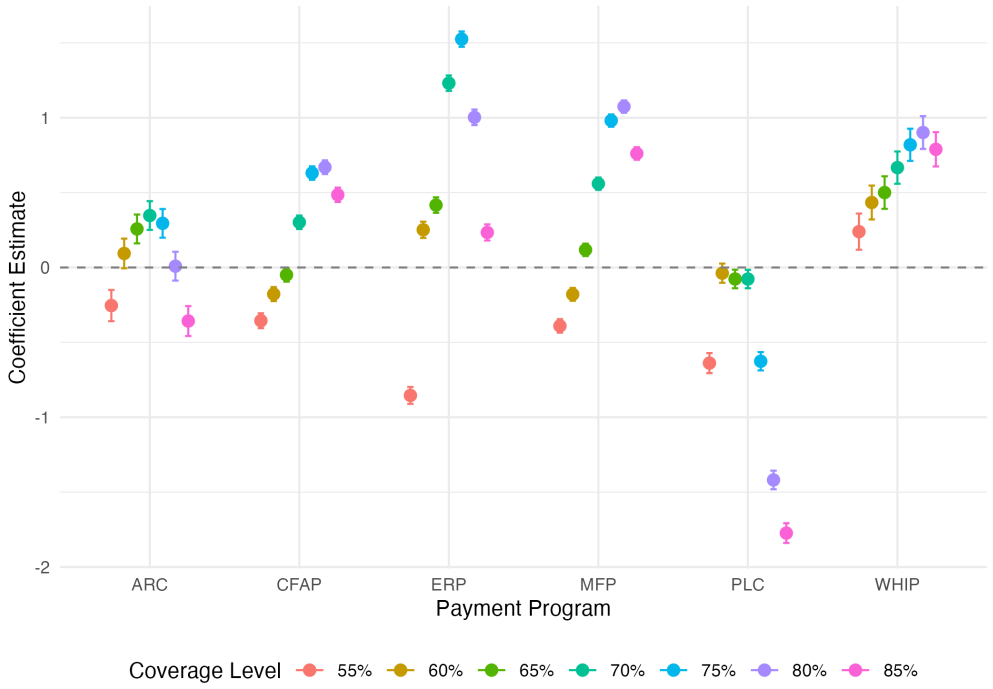


Figure A.4: Effects of Total Ad Hoc Dollars on Total Policies by Coverage Level

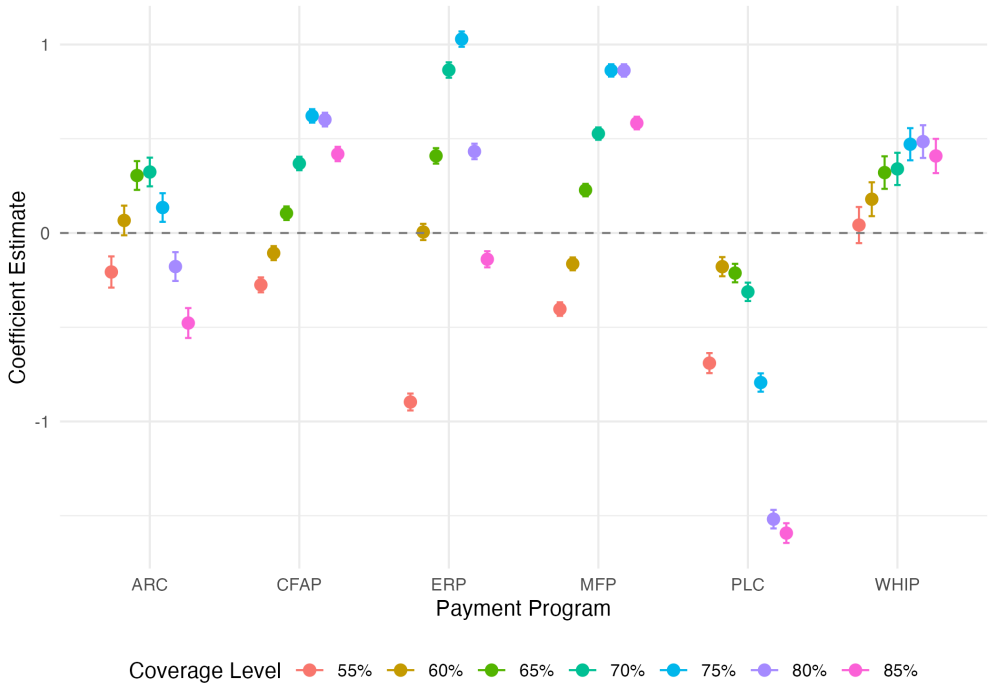


Figure A.5: Effects of Total Ad Hoc Dollars on Crop Insurance Demand by Insurance Plan

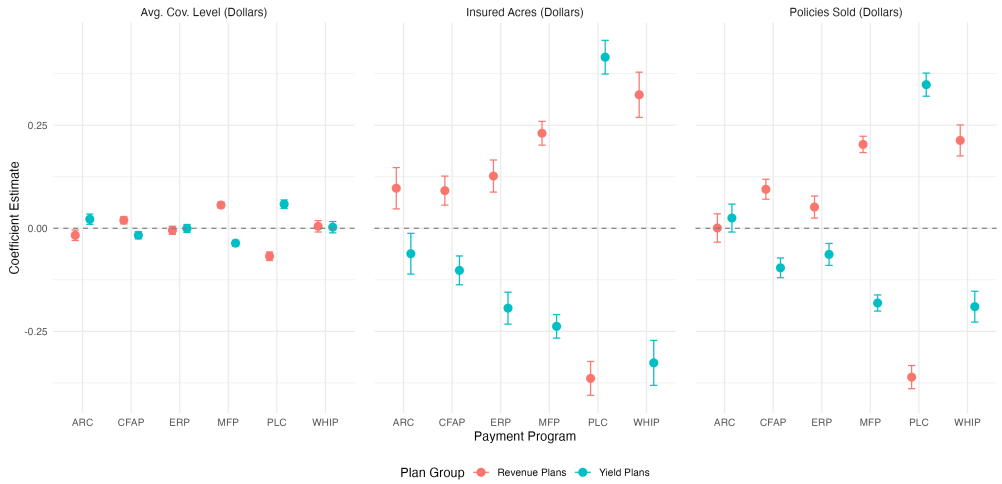
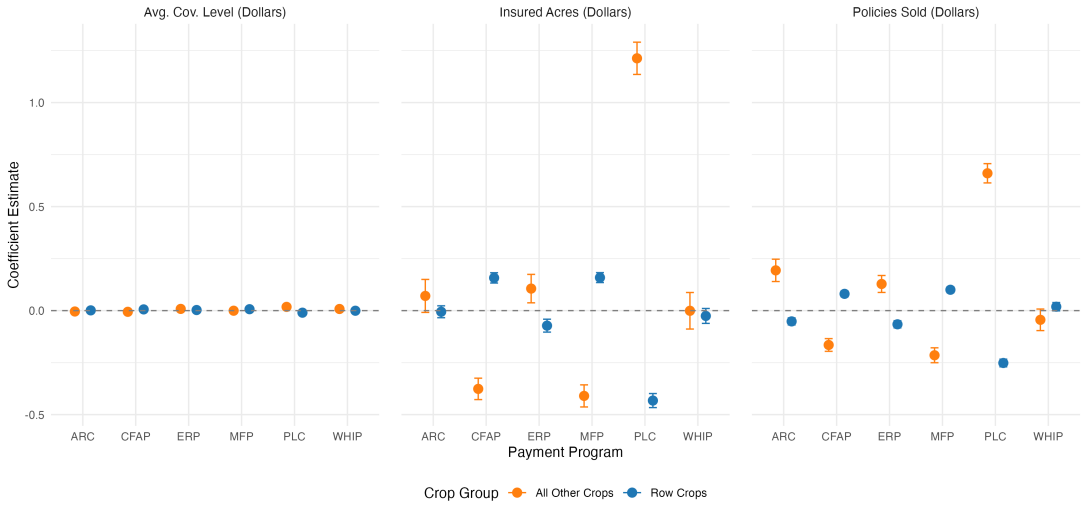


Figure A.6: Effects of Unique Ad Hoc Payments on Crop Insurance Demand by Insurance Plan

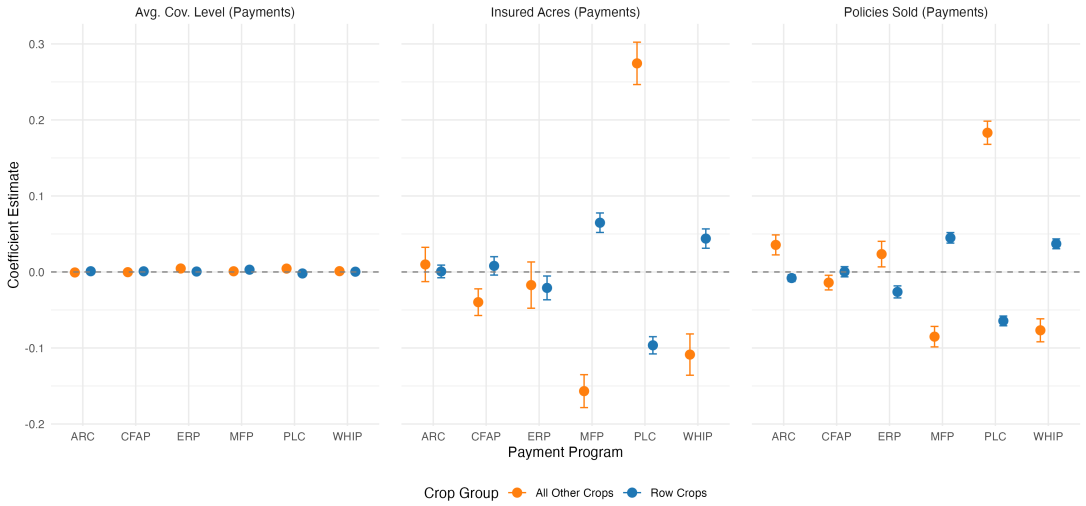


Figure A.7: Effects of Total Ad Hoc Dollars on Crop Insurance Demand by Crop Type



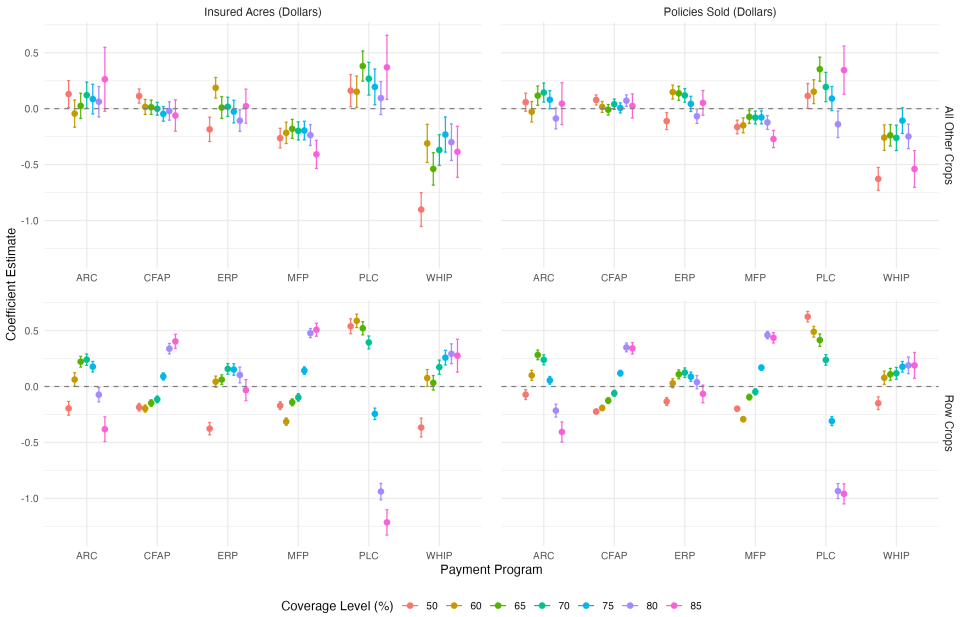
Note: Row Crops include barley, buckwheat, burley tobacco, camelina, canola, cigar binder tobacco, cigar filler tobacco, cigar wrapper tobacco, corn, cotton, cotton ex long staple, cultivated wild rice, dark air tobacco, fire cured tobacco, flax, flue cured tobacco, fresh market beans, fresh market sweet corn, grain sorghum, hemp, hybrid corn seed, hybrid popcorn seed, hybrid seed rice, hybrid sorghum seed, hybrid sweet corn seed, maryland tobacco, millet, mustard, oats, peanuts, popcorn, potatoes, rice, safflower, sesame, silage sorghum, soybeans, sugar beets, sugarcane, sunflowers, sweet corn, sweet potatoes, triticale, and wheat.

Figure A.8: Effects of Unique Ad Hoc Payments on Crop Insurance Demand by Crop Type



Note: Row Crops include barley, buckwheat, burley tobacco, camelina, canola, cigar binder tobacco, cigar filler tobacco, cigar wrapper tobacco, corn, cotton, cotton ex long staple, cultivated wild rice, dark air tobacco, fire cured tobacco, flax, flue cured tobacco, fresh market beans, fresh market sweet corn, grain sorghum, hemp, hybrid corn seed, hybrid popcorn seed, hybrid seed rice, hybrid sorghum seed, hybrid sweet corn seed, maryland tobacco, millet, mustard, oats, peanuts, popcorn, potatoes, rice, safflower, sesame, silage sorghum, soybeans, sugar beets, sugarcane, sunflowers, sweet corn, sweet potatoes, triticale, and wheat.

Figure A.9: Effects of Total Ad Hoc Dollars on Crop Insurance Demand by Crop Type and Coverage Level



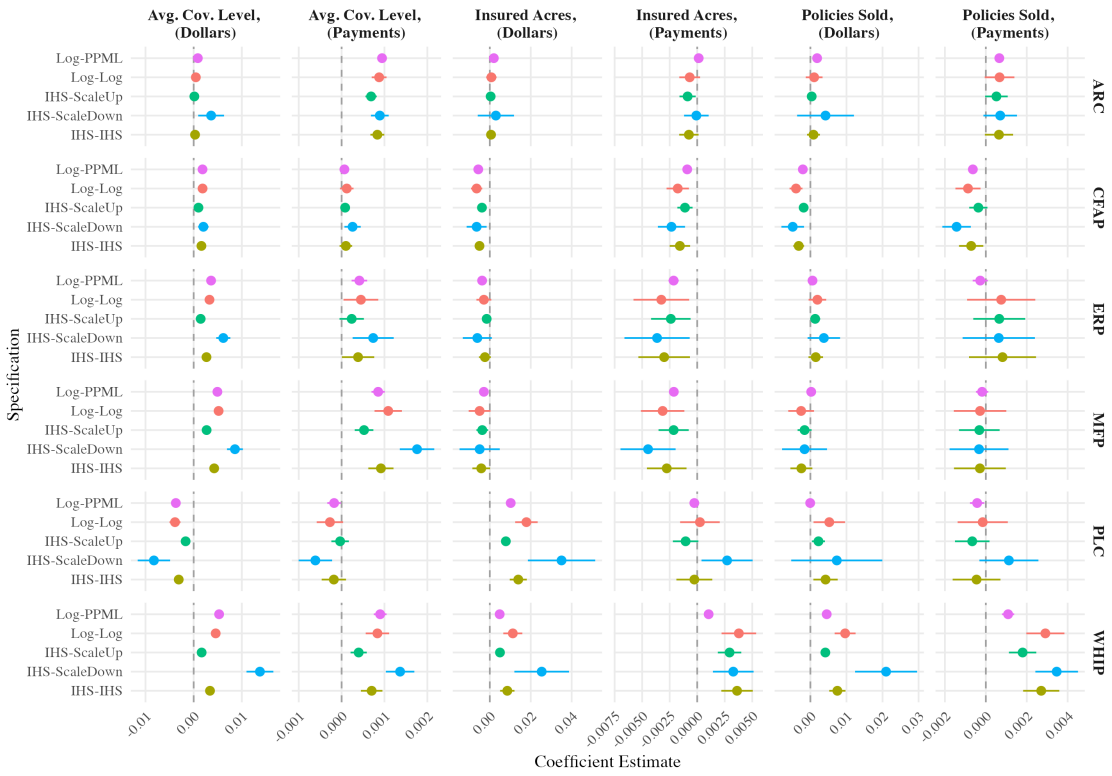
Note: Row Crops include barley, buckwheat, burley tobacco, camelina, canola, cigar binder tobacco, cigar filler tobacco, cigar wrapper tobacco, corn, cotton, cotton ex long staple, cultivated wild rice, dark air tobacco, fire cured tobacco, flax, flue cured tobacco, fresh market beans, fresh market sweet corn, grain sorghum, hemp, hybrid corn seed, hybrid popcorn seed, hybrid seed rice, hybrid sorghum seed, hybrid sweet corn seed, maryland tobacco, millet, mustard, oats, peanuts, popcorn, potatoes, rice, safflower, sesame, silage sorghum, soybeans, sugar beets, sugarcane, sunflowers, sweet corn, sweet potatoes, triticale, and wheat.

Figure A.10: Effects of Unique Ad Hoc Payments on Crop Insurance Demand by Crop Type and Coverage Level



Note: Row Crops include barley, buckwheat, burley tobacco, camelina, canola, cigar binder tobacco, cigar filler tobacco, cigar wrapper tobacco, corn, cotton, cotton ex long staple, cultivated wild rice, dark air tobacco, fire cured tobacco, flax, flue cured tobacco, fresh market beans, fresh market sweet corn, grain sorghum, hemp, hybrid corn seed, hybrid popcorn seed, hybrid seed rice, hybrid sorghum seed, hybrid sweet corn seed, maryland tobacco, millet, mustard, oats, peanuts, popcorn, potatoes, rice, safflower, sesame, silage sorghum, soybeans, sugar beets, sugarcane, sunflowers, sweet corn, sweet potatoes, triticale, and wheat.

Figure A.11: Elasticity Estimates Across Specifications



Note: Error bars represent 95% confidence intervals.