CRAEA WORKING PAPER SERIES

Does Size Matter? Distribution of Crop Insurance Subsidies and Government Program Payments Across U.S. Farms

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CRAEA Working Paper 2017-01

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Date: October 8, 2017

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Abstract:
This study uses farm-level information from the ARMS database to evaluate the distribution of payments from major 2014 farm bill safety net programs—federal crop insurance, Agricultural Risk Coverage, and Price Loss Coverage—across farm size. Results indicate that farms within the top decile for crop sales receive over two-thirds of the payments from these programs. Recent legislative proposals to implement payment caps on each farm are shown to impact a relatively small percentage of farms that are almost entirely within the top decile of crop sales. However, implementing these caps is likely to result in as much as $2.51 billion in taxpayer savings. These help provide direction for continued efforts to design cost-effective, equitable agricultural safety net policies.

Keywords: ARC, ARMS, crop insurance, distribution, farm-level, PLC, subsidies

JEL Codes: Q18, H23

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Introduction

Who receives what benefits from farm subsidy programs has been a focus of economics research throughout the evolution of U.S. agricultural policy. Despite being a politically controversial issue, economists have continued to take on these analyses in a call summarized in the early 1970s by D. Gale Johnson: "Any governmental program that involves substantial expenditures by taxpayers and consumers should be periodically evaluated" (Johnson, 1973, pg. 21). In the mid- and late-2000s, these types of analyses led to widespread criticism of many agricultural support programs—including the Direct Payments (DP), Counter-cyclical Payments (CCP), Average Crop Revenue Election (ACRE), and Supplemental Revenue Assurance (SURE) programs—by economists, policy makers, and the media (Antle and Houston, 2013; Orden and Zulauf, 2015). A series of studies consistently showed that farm subsidies, including direct payments, more intensively targeted toward larger-scale commercial farms and relatively high-income households (Kirwan, 2009, 2012; Hopkins, 2001; Key and Roberts, 2007; Misha, El Ostra and Guillespie, 2009; White and Hoppe, 2002; Key and Roberts, 2003). These findings were very similar to the results found in earlier studies that assessed agricultural programs as far back as the 1960s (for example, see Bonnen 1968; Schultze 1972; Lidman 1983; Johnson and Short, 1983).

The 2014 Agriculture Act (the 2014 farm bill) terminated the DP Program along with three other initiatives, the CCP, ACRE, and the SURE programs. However, the 2014 farm bill replaced CCP and ACRE with two new initiatives, the Price Loss Coverage (PLC) and Agricultural Risk Coverage (ARC) programs. Together with the federally subsidized crop insurance program, a new Stacked Income Protection insurance program for cotton (widely

known as STAX) and a new Dairy Margin Protection (MPP) program, ARC and PLC comprise what is widely referred to as the current farm safety net. Since 2014, ARC, PLC, and the federal crop insurance program have provided, and are expected to continue to generate the bulk of market and production-related farm subsidies to farmers. These subsidies, estimated to be $12–$14 billion per year (Congressional Budget Office, 2017), are targeted mainly to producers of program crops.[1] The Congressional Budget Office (2017) also estimated that between 2017 and 2027, the majority of ARC, PLC and crop insurance payments will flow to producers of just three crops—corn, soybeans, and wheat.[2]

In light of the substantial estimated public expenditures on these new agricultural support programs, this study also takes on Johnson's (1973) call to evaluate the economic equity of the 2014 farm bill safety net programs. To our knowledge, we are also the first to use farm-level data to estimate joint distributions of subsidy payments from ARC, PLC, and crop insurance programs across U.S. farms. We combine data from the Agricultural Resource Management Survey, the 2012 Census of Agriculture, the USDA Risk Management Agency, and the Farm Service Agency to estimate distributions of subsidy payments by farm size and across other characteristics such as farm household wealth, total household income and off farm income. We then use these estimates to examine potential benefit-cost trade-offs for agricultural producers and taxpayers resulting from changes to the structure of current safety net programs. Specifically, we assess impacts of recent policy proposals to limit ARC, PLC, and crop insurance

[1] Crops eligible for PLC and ARC payments include barley, chickpeas, corn, dry peas, grain sorghum, lentils, oats, peanuts, rice soybeans, wheat and a wide range of minor oil seed crop including canola, crambe, flaxseed, mustard, rapeseed, safflower, sesame seed and sunflower. Over 130 crops are eligible for federal crop insurance subsidies (Smith, 2017).

[2] In 2017, corn, soybeans and wheat together received $4.458 billion in crop insurance premium subsidies, 73 percent of the total amount of $6.07 billion in premium subsidies paid to all 130 or more crops in the program. In 2016, ARC and PLC payments for all crops amounted to $5.283 billion, of which corn ($3.752 billion), wheat ($756 billion) and soybeans ($328 billion) received 85 percent ($4.502 billion).

payments by lowering farm households' income-based eligibility requirements based on taxable adjusted gross incomes and placing caps on per farm programs (ARC and PLC) and crop insurance premium subsidies.[3]

We estimate that in 2014 and 2015, approximately 60% of total crop insurance subsidies and ARC and PLC government payments were distributed to producers who were in the top decile (the highest ten percent) of the crop sales distribution. Moreover, nearly 40% of subsidy and program payments were received by farmers in the top five percent of crop sales. We also show that over 50% of farms that fall in the lower 70% of the crop sales distribution received no subsidy or program payments. Additionally, nearly 50% of farms in the top crop sales decile received a payment from at least one subsidized agricultural safety net program. Further, the results indicate that placing even the most stringent proposed restrictions on existing agricultural programs and crop insurance subsidies would impact producers who are in the top 5–7% of the crop sales distribution, but result in a 30–40% reduction in public expenditures.

These results indicate that current agricultural safety net policies, including those enacted in the 2014 farm bill, largely skew subsidy payments to producers in the upper tail of the farm sales distribution. Despite five to six decades of changes to agricultural policy, these findings are consistent with those in Bonnen (1968), Schultze (1972), Lidman (1983), and Johnson and Short (1983), as well as those in more recent research. Additionally, we show provide evidence of increasing concentration of benefits among the largest and wealthiest farms. These insights help

[3] A $40,000 cap on per farm crop insurance premium subsidies was included in the Assisting Family Farmers Through Insurance Reform Measures (AFFIRM) Act, first introduced by Senators Jeff Flake (R- AZ) and Jeanne Shaheen (D-NH) and Representatives Ron Kind (D-WI) and Jim Sensenbrenner (R-WI) in 2015 and reintroduced in 2017. The Act would limit the total value of crop insurance subsidies to $40,000 per person each year and end subsidies for those with an adjusted gross income of more than $250,000.

characterize the current distribution of farm program payments and provide direction for continued efforts to design cost-effective, equitable agricultural safety net policies.

Data and Methods

Data on individual farm and farm operator characteristics were obtained from the 2014 Agricultural Resource Management Survey (ARMS), which includes the most recently available survey responses. The ARMS is an annual national survey of agricultural producers conducted by the USDA National Agricultural Statistical Service. Each survey incorporates a Phase III dataset, which provides farm business and farm household information. The Phase III data include information on farm-level operator characteristics, farm business financial ratios, farm income and expense records, financial assets, crop production information, participation in crop insurance and government programs, non-farm income and county-level identifiers.

The analysis is based on 2014 ARMS survey responses because, in addition to providing the most recently available data, it is the first year to provide information about each farm's elections with respect to the ARC and PLC programs introduced in the 2014 farm bill. Additionally, as with ARMS data for previous years, the 2014 survey also includes data on farm level crop insurance expenditures in 2014. In conjunction with information about county-level crop insurance coverage levels selections, these expenditures are used to estimate the premium subsidies received by each farm.[4]

The 2014 information on each farm's ARC and PLC choices can be used to estimate program payments in subsequent years because farmers had to allocate base acres into either the

[4] We only focus on crop insurance products for major row crops. Even though some livestock insurance products are offered through the federal crop insurance program, USDA RMA Summary of Business Reports data show that livestock insurance accounted for 0.94% in 2014, 1.25% in 2015, and 0.53% in 2016 as a proportion of total liability. Additionally, livestock insurance subsidies account for approximately 1% of total crop insurance subsidies.

ARC or PLC programs for the entire period (2014–2018) of the 2014 farm bill. These selections, therefore, include the 2015 and 2016 crop years for which data on county-level per acre ARC payments and per unit PLC payments are reported by the USDA Farm Service Agency. Price Loss Coverage and Agricultural Risk Coverage subsidies, by definition, are only available to producers of crops, and the ARMS reports enrollment information for all operations that allocated base acre to ARC or PLC. However, some operations classified as farms have very few crop sales and, as a group, contribute very small proportions of total U.S. crop production. Therefore, to obtain a representative sample of agricultural crop producers receiving ARC, PLC, and federal crop insurance program subsidies, we exclude farms reporting less than $1,000 in total crop sales, zero crop acres (although depending on timing they may have received subsidies in 2014 related to crop production in previous years), or for which over 50% of total farm sales revenue came from commodities other than crops or livestock (for example, timber).

In addition, in the analysis of the distribution of crop insurance subsidies, we consider farmers who produce corn, soybeans, wheat, and cotton. For the crop years 2014–2016, these crops accounted for 73.6% of total liability for the total national federally subsidized crop insurance book of business. In estimating the distribution of ARC and PLC program payments, and total government payments across ARC, PLC, and crop insurance subsidies, we include only corn, soybean, and wheat farmers, because almost all producers elected to enroll cotton base acres into the STAX program.[5] The initial data set constructed using the ARMS contains 15,947 unweighted observations.

[5] The STAX program requires that enrolled acres be in active production. Orphan base acres, which can be planted to any crop, can take advantage of the ARC and PLC programs.

Distribution Definition and Sample Weighting

Several farm-level indicators can be used to characterize economic returns from agricultural farm operations relative to other farms and to their ability to obtain payments from commodity crop programs. We use crop sales as the measure of interest for several reasons. First, there is precedence for using this measure based on numerous previous research efforts (for example, see Johnson and Short (1983) for a summary of several such studies). Second, while measures such as wealth, total farm acreage, or gross income from sales could also be reasonable indicators of economic status, they may be less informative for assessing programs such as the ARC, PLC, and crop insurance, which are tied to either active crop production, market prices, or both. As such, we assess program payment and insurance subsidy receipts across the distribution of farms' crop sales.[6]

The ARMS uses a multiphase, multiframe, stratified, probability-weighted design, and the survey provides weights for each farm-level observation.[7] Using these weights in empirical analysis of the data enables analytical results to more closely represent the population of U.S. farm operations. In this study, we use these weights in two stages.

In the first stage, the weights define the distribution of crop sale values. To define each decile of the weighted crop sales distribution, we first apply the ARMS weights to the farm-level crop sales data, order the farms by weighted sales values, and then divide the resulting ordered distribution into ten parts. By weighting each crop sales value observation, the numbers of unweighted farm observations in each decile of the weighted data set differs across deciles. That

[6] We do also check the robustness of the crop sales measure by conditioning program and subsidy receipts on other possible economic status measures. The results indicate nearly identical qualitative results across other measures including wealth, total farm acreage, or gross income from sales. This is not surprising given the high degree of correlation between these measures, which is supported by data in Table 1.

[7] The USDA Economic Research Service (2017) provides a full description of the survey design method.

is, there are an unequal number of unweighted farm-level observations in each weighted decile; however there is an equal number of weighted farm-level observations in each weighted decile.

We validate the application of the weights to the 2014 ARMS crop sales sample by comparing the weighted distribution of farms by crop sales to the distribution of farms by crop sales obtained from the 2012 U.S. Census of Agriculture. Table A1 of the appendix shows the distribution of farms by crop sales obtained from the 2014 ARMS data using the ARMS weighting scheme results in a similar distribution to that based on the 2012 U.S. Census of Agriculture.

In the second step of the weighting procedure, we calculate the values of the variables of interest by applying the 2014 ARMS weights within each weighted crop sales distribution decile. That is, after allocating each farm-level observation to the appropriate decile of the weighted crop sales distribution, the same weights are applied to the variables of interest for each farm within those deciles (for example, ARC subsidy payments or crop insurance subsidies).

Crop Insurance Analysis

We use farms' responses about their federal crop insurance expenses to estimate premium subsidies each farm receives, because data on premium subsidy payments is not directly reported in the ARMS. Ideally, premium subsidies would be estimated using factors that are correlated with individual subsidy rates. Two factors are particularly relevant in determining the effective subsidy rate received by each farm. First, crop insurance premium subsidies depend on the coverage level selected by a farm in its crop insurance contracts. Second, subsidy rates are affected by the choice of the farm to either cover all of a crop being raised on the farm under a

single contract (called an enterprise unit) or to obtain coverage at smaller levels of aggregation (known as optional units and basic units).

Two characteristics must be evident to ensure that coverage levels and unit selections can be used to estimate subsidy rates. First, each measure must be predictive of subsidy rates. Coverage levels will, through the structure of the crop insurance program, alter subsidy rates because coverage affects total premium rates. Additionally, Figure B1 of the appendix shows that coverage levels vary systematically by region. For example, corn and soybean policies are generally insured at higher coverage levels in Illinois, Indiana, and Iowa, but at lower levels outside the Upper Midwest and Heartland regions. Thus, we control for regional differences in coverage levels to more accurately estimate farm-level subsidy rates and subsidy levels. The second characteristic is that crop sales are uncorrelated with premium subsidies. The data presented in appendix Table A2 and Table A3 indicate that coverage levels and unit selections are not systematically linked to crop sales.

Using spatial variation in farm-level coverage level and unit selections, we estimate farm level subsidy rates. Specifically, we compute the average subsidy rate for each of the four crops—corn, cotton, soybeans, and wheat—based on county-level data from the USDA Risk Management Agency (RMA), as shown in appendix Figure B2. We then merge these county-level subsidy rates with farm-level ARMS observations and, for each farmer, estimate the subsidy for each commodity based on the proportional product mix of commodities for each farm.[8] Specifically, the subsidy rate (SR) for farmer i in county c who produces a mix of k commodities is

[8] This analysis was also conducted assuming an average subsidy rate of 62.4% for all producers. The results were mostly similar to the presented results, though we find that the presented results are more accurate given the regional variation in coverage level determination.

$$SR_i = \sum_{k=1}^{4} SR_{kc} \left(\frac{Q_{ik}}{Q_{iT}}\right), \quad (1)$$

where Q represents the number of acres devoted to commodity k, and Q_{iT} is the total number of acres across all commodities produced on farm i.

We validate the robustness of this farm-level subsidy estimation method in two ways. First, we simply assumed a national average subsidy rate of 62.4% for all farms in the sample.[9] Second, we used insured units and coverage level selections reported in the ARMS. While both alternative methods provides qualitatively similar farm-level subsidy rate estimates to our preferred method, each also has important weaknesses.

When assuming an average subsidy rate for all farms, average nation-wide subsidies less accurately reflect actual average county-level variation in subsidies, as shown in figures B1 and B2. Additionally, more than half of farmers completing the ARMS did not provide coverage level and unit selection information, and we were unable to determine whether this information was simply not supplied or whether it was omitted because a farmer did not purchase a crop insurance product. Figure B2 of the appendix shows the estimated county-level crop insurance subsidy rates using our preferred method. A visual comparison of Figures B1 and B2 indicates similar patterns, providing support for our approach for estimating premium subsidies at the farm level. Next, to assess whether there is a systematic relationship between farm size and crop insurance choices, we examine different coverage level and unit selections across a range of farm characteristics, such as total crop sales, total livestock sales, net worth, total insurance expenditures, total crop acres, and crop-specific planted acres. Data in Tables A2 and A3 do not indicate a clear relationship between farm size and insurance selections.

[9] The effective subsidy rate of 62.4% was reported as the effective rate for the 2015 crop year. This rate is similar to the average subsidy rate from 2012-2016, which was 62.3%.

Using the preferred subsidy rate calculation method, we compute the total estimated crop insurance premium subsidy for each farm ($CISUB_i$). First, we collect information about each farm's out-of-pocket total spending on federal crop insurance ($CIEXP_i$), which is reported in the ARMS. Then, this value is multiplied by the ratio of the farm's estimated subsidy rate, SR_i (based on its estimated coverage level), to one minus that subsidy rate; that is,

$$CISUB_i = CIEXP_i(SR_i/[1 - SR_i]). \quad (2)$$

Government Programs Analysis

The ARMS data include information on a crop-by-crop basis about the number of base acres that a farm has chosen to allocate to the ARC–Individual coverage, ARC–County coverage, or PLC program. Base acre program elections can be made only once during the 2014 farm bill period, 2014–2018. Hence, the 2014 ARMS data on base acre allocations can be used to estimate farm-level ARC and PLC payment distributions for any of the crop years between 2014 and 2018 period covered by the 2014 farm bill. The program election data indicate that corn, soybean, and wheat farms have elected to enroll less than 1% of their base acres into the ARC–Individual program. Thus, we focus only on the ARC–County (referred to as simply ARC from here) and PLC programs.

Data reported by the USDA Farm Service Agency (FSA) are available for 2014 and 2015 county-level ARC payments and the 2014–2016 PLC payment rates for corn, soybeans, and wheat. We combine these data with the ARMS farm-level data on base acre elections to calculate total ARC and PLC payments that the farms received. ARC payments were made in 2014, but no PLC payments were made for corn, soybeans and wheat in this year because national average market prices for those commodities exceeded the levels that would trigger PLC payments. In

2015, however, both ARC and PLC payments were made and are expected to be substantial in subsequent years (Congressional Budget Office, June 2017 baseline forecast). Thus, our analysis of the distribution of subsidies by farm characteristics focuses on ARC, PLC and crop insurance subsidies paid to farmers for the 2015 crop year, because outlays made in 2015 provide an opportunity to examine the joint nature of the payment distributions for the three safety net programs. [10]

Absent restrictions on per farm payments, total 2015 ARC and PLC payments would have exceeded $250,000 for approximately 0.04% of all farms. However, the 2014 farm bill specifies that no farm is able to receive PLC and ARC subsidies exceeding $250,000.[11] Therefore, estimated payments for operations that would have exceeded $250,000 were capped at that amount.

Additionally, to validate that the ARMS farm-level program payment data reflect the population of U.S. agricultural operations, we compare weighted base acre allocations in the ARMS to the actual base acre allocations reported by FSA for all corn, soybean, and wheat acres enrolled in the PLC and ARC programs. The data in Appendix Table A4 indicate that the weighted ARMS data closely corresponds to the population data provided by the FSA.

Distribution of Crop Insurance Subsidies and Program Payments

Table 1 reports descriptive statistics for the weighted sample of 15,947 farms. In the weighted sample as a whole, farms have average crop sales of $252,347, average livestock sales of

[10] This effectively assumes that farmers did not change their crop insurance coverage level decisions in 2015 and 2016, as a result of ARC and PLC. In fact, realized coverage levels for corn, cotton, soybeans, and wheat between 2014 and 2016 are nearly identical between years (USDA RMA Summary of Business).

[11] While the ARMS data do not provide information of whether an operation was registered to a single producer (which has a $125,000 payment cap) or as a family operation, we assume that the majority of enterprises are family owned. For example, the U.S. Census of Agricultural reported that nearly 97% of U.S. farming operations are family owned.

$64,865, and an average net worth of $1.6 million. A comparison of the weighted means and medians for each variable indicates that the distributions are positively skewed; that is, a relatively small number of producers have very high levels of crop sales, livestock sales, and high levels of net worth. For example, while the annual weighted mean of total crop sales is $252,347, the weighted median is $145,575, and farms in the 90th decile of the crop sales distribution received, on average, $1.29 million. Similarly, the weighted median net worth is $1.26 million, but the mean is $1.62 million and $5.93 million for farms in the top decile.

Crop Insurance Subsidy Distributions

Table 1 also presents statistics for key variables in each decile of farms distributed by value of crop sales. For example, farms in the top tenth decile (the top ten percent of farms based on value of crop sales) have an average net worth of $5.46 million, more than three times the estimated weighted average of $1.62 million for the whole sample. These farms also, on average, plant 2,090 acres to crops, have $1.8 million in crop sales, receive $156,385 from livestock sales, pay an average of $27,961 in out-of-pocket federal crop insurance expenses (which amount to an average of $18.92 per acre), and earn $52,431 in off-farm income. This group also receives 67.9% of all crop insurance premium subsidies. In contrast, farms at the median value of crops sales have an average net worth of $1.11 million, plant approximately 203 crop acres, earn $64,617 in off-farm income[12], spend $1,296 on crop insurance, and receive only 1.7% of total premium subsidies.

Table 1 also shows the estimated crop insurance subsidy rates, which are calculated using

[12] Off-farm income tends to be relatively high for the lowest three crop sales deciles, while flattening out for the remaining top 7 deciles. This variation in off-farm income results in a right skewed distribution where the mean and median for the sample are 74.6k and 32.5k, respectively. Additionally, the 10th and 90th percentile for off-farm income are $0 and 117.5k, respectively.

equation (1) and are presented across the crop sales distribution. The estimated average amount of subsidy received by a farm in the top ten percent of farms by crop sales is $46,089 at an average rate of $29.63 per acre.

Figure 1 presents the distribution of crop insurance subsidies across weighted crop sales quantiles. Farms in the top crop sales decile receive 67.9% of all insurance premium subsidies. This is likely because these farms are both larger and more productive, on a yield per acre basis. Specifically, the average size (crop sales value) of the farms in the top decile is more than twice as large as that of farms in the second largest decile. Crop sales per acre, which average $14,230 for the top decile are also 114% higher than for the second largest decile, in which average sales per acre are $6,652. Additionally, subsidies per acre are 20% higher for farms in the top decile than for the next two deciles, a consequence of higher per acre liabilities that largely derive from higher per acre sales. Thus subsidies per acre, on average, are $5.00 higher for farms in the top decile than for farms in the next two highest deciles.

Figure 1(b) provides additional quantile breakdowns within the top 20% of farms. For example, farms within the top two percent of crop sales receive 30.2% of all premium subsidy payments, at a rate of $49.89 per acre. On a per acre basis, this amount is nearly double the average for those in the top 20% ($25.27), and more than four times higher than the average subsidy per acre of $12.28. Figure 1 presents clear evidence that subsidies per acre increases as crop sales increase.

ARC and PLC Payment Distributions

Figure 2 presents the distribution of 2015 ARC and PLC payments across the weighted crop sales distribution. The figure shows the average of the sum of ARC and PLC payments made to

each farm within a crop sales decile as well as the proportion of total government payments received by farms in the decile. The data in Figure 2(a) indicate that farms in the lowest 70% of the crop sales distribution received average payments of approximately $2,500, and the aggregate payments received by the lower 70% of farms represent 7.8% of all ARC and PLC payments. For farms with sales in excess of the 70th percentile, per farm payments increase exponentially with farm size, with farms in the top decile receiving average payments of $65,022. On aggregate, these farms received an estimated 58.3% of all government program payments made to corn, soybean, and wheat producers in 2015.

Figure 2(b) shows that the majority of payments are concentrated in the top 20% of the crop sales distribution. In 2015, 82.1% of all ARC and/or PLC payments were received by those farms. Moreover, within the top 20 percent group, ARC and PLC subsidy payments increase substantially with farm size. The average ARC/PLC subsidy payment for farms in the top 5th percentile was approximately $91,000; farms in the top two percent received average payments of $133,000; and farms in the top one percent of crop sales received average payments of $169,000. Further, total ARC and PLC payments to farms in the top 1% of the crop sales distribution accounted for nearly 14% of all payments made in 2015. In addition, over one-third of all ARC and PLC subsidy payments were made to farms in the top 5% of the crop sales distribution.

Data describing total ARC and PLC payments made in 2015 to corn, soybean, and wheat producers reveal even starker differences in the size of ARC and PLC payments across the crop sales distribution. Total payments to farms in the bottom 90% of the crop sales distribution were approximately $358 million, while payments made to farms in the top 10% of the distribution were $502 million. That is, the top 10 percent of farms (in terms of market revenues) received

$144 million more in PLC and ARC payments than the remaining 90% of all other farms. Further, in total, farms in the top 5% of the crop sales distribution received approximately the same amount of ARC and PLC payments ($299 million) as all of the payments received by the bottom 90%.

Government Payment and Crop Insurance Payment Distributions

Table 2 shows farm-level receipts of the sum of ARC, PLC, and crop insurance premium subsidies. The data include the ARC and PLC payments estimated to have been received by farms in 2015. Each farm's crop insurance premium subsidies are assumed to be those they would have received if, in 2015, each farm's out-of-pocket crop insurance payments were approximately the same as those that were actually observed for 2014. As discussed above, there is only marginal inter-year variability between coverage levels and insured acres for producers of the four major row crops, and projected prices were also relatively similar in 2014 and 2015.[13]

General per farm payment patterns are similar to those in Figure 2, but per farm payment levels are slightly attenuated because some farms received only one or two of the possible ARC, PLC and crop insurance subsidy payments. However, the estimates reported in Table 2 show that, on a per farm basis, combined ARC, PLC, and crop insurance subsidy payments were substantially larger than the ARC and/or PLC payments alone. For example, when crop insurance subsidies were included, total estimated payments to farms in the top decile of the crop

[13] The projected price for revenue protection policies was $4.62 per bushel in 2014 and $4.15 per bushel in 2015 for corn, $11.36 per bushel in 2014 and $9.73 per bushel in 2015 for soybeans, and $7.02 per bushel in 2014 and $6.30 per bushel in 2015 for wheat (USDA Risk Management Service, 2017). While these prices are similar, we do acknowledge that our use of 2014 ARMS data to approximate crop insurance subsidy payments in 2015 would likely marginally overestimate premium subsidies. However, because projected prices between 2014 and 2015 changed by only 11–15%, the potential upward bias is expected to be minimal. Moreover, the relative allocation of subsidy payments across the distribution of farms is not likely to change, because all farmers face the same project prices.

sales distribution were nearly $3 billion, compared to $0.5 billion if only ARC and PLC payments are considered. The top 20% received nearly $4 billion in program and subsidy payments, of which nearly half was received by the top five percent of farms. Table 2 also shows that farms for which crop sales are in the bottom 80% of the sales distribution receive only 18.1% of total ARC, PLC, and crop insurance subsidy payments. These payments are approximately equal to the payments received by farms in the top 2% of the crop sales distribution.

Figure 3 shows the distribution of farms that received payments from each of the different programs in 2015. For example, 99.4% of farms in the lowest ten percent of the distribution of farms by farm crop sales received no subsidy payments related to the ARC, PLC or crop insurance subsidy programs. Further, over half of the farms in the bottom 70% of the crop sales distribution received no payments or subsidies. Conversely, 51.5% of farms in the top 20% of crop sales received payments from at least the ARC or PLC programs or a crop insurance subsidy, and 8.8% of those farms received payments from two of the three possible sources. This suggests that corn, soybean, and wheat farms with large market sales not only have a better than 50% chance of receiving a government payment, but that the payment they do receive will almost certainly be larger than those received by the vast majority of other farms.

Analysis of Policy Changes on Payments Across the Farm Distribution

The data indicate that producers who receive the majority of total PLC and ARC programs and crop insurance subsidy payments also own the largest farms, generate the highest crop sales revenues, and have the highest amounts of wealth. Farms who fall into the upper part of the size, sales, and wealth distributions are also generally the least vulnerable to adverse shocks in

production and market prices (Schurle and Tholstrup, 1989; Purdy, Langemeier, and Featherstone, 1997; Barry, Escalante, and Bard, 2000). While such subsidies do truly aid these producers in overcoming financial challenges during unfavorable periods, it is also likely that a potentially significant proportion of these payments are not required to help farm operations to bridge periods of financial downturns. The burden of these excess payments falls on U.S. taxpayers.

We investigate the effects on agricultural producers and taxpayer savings from expanded limits on government program payments and subsidies. Specifically, we consider four potential policy proposals: introducing caps only on crop insurance subsidies; reducing the total amount received from ARC and PLC payments to a $125,000 maximum per farm; limiting the sum of ARC, PLC, and crop insurance subsidy payments to $250,000; and limiting the sum of ARC, PLC, and crop insurance subsidy payments to $125,000.

Table 3 presents estimates of the impact of imposing a cap of $40,000 on insurance premium subsidies. If this cap were to have been placed on payments made in 2014, the total impact of such a cap would result in payment reductions of $2.02 billion but affect only 4.97% of farms. Additionally, 97% of payment reductions would come from payments made to farms within the top two deciles. These farms would experience an average reduction of $13,168 in premium subsidies, receiving 42% of total premium subsidies that were actually paid to those farms. Of the total $2.02 billion reduction in premium subsidies, approximately 77% of savings would come from lower payments made to farms who received over $100,000 in premium subsidies in 2014. The remaining 23% of savings would come from subsidy payment reductions to farms within the bottom 80% of crop sales.

Table A5 reports the estimated impacts of enacting three levels of per farm crop insurance subsidy caps in 2014: $50,000, $40,000, and $30,000. The data indicate that even under the most stringent $30,000 cap, only 6.88% of all farms would be affected (i.e., would have received subsidies above $30,000 in 2014 but would be capped at $30,000 under the payment restrictions). However, the $30,000 subsidy ceiling would result in approximately $2.51 billion in taxpayer savings, 43.2% of total subsidies. That is, on average, for every 1% of farmers affected by a $30,000 cap, taxpayers would realize approximately $36.5 million in savings. The results provided in Table A5 also show that a less restrictive subsidy cap of $50,000 is estimated to result in 30% savings to taxpayers ($1.74 billion), while affecting less than four percent of farms. The results also indicate that the majority of savings will be realized by reducing payments to corn and soybean producers. Depending on the cap amount, reductions in payments to producers of these commodities account for 59 and 61% of funds that would not have been paid. For wheat and cotton producers, approximately 33% of subsidies would not have been received in 2014.

Table 4 presents a summary of the distributional impacts from limits on combined ARC and PLC payments. The table presents results only for farms in the top 20% of crop sales, because almost no farms in the bottom 80% of crop sales would be affected. The data show the average per farm savings—the amount of ARC and PLC payments that would not have been paid in 2015—and the proportion of farms affected by a $125,000 cap across different portions of the crop sales distribution. For example, the cap would impact 17.2% of corn, soybean, and wheat farms enrolled in the program. However, 40% of those farms (6.9% of all farms) are in the top one percent of crop sales, and 65% are in the top 2% of the crop sales distribution.

Table 4 also shows the total savings associated with the $125,000 cap on total ARC and PLC payments. The results indicate that the overwhelming majority of total savings (99%) would be generated through payment reductions to farms that are in the top 10% of the crop sales distribution. Further, 74% of savings would be generated from farms in the top 2% of distribution, and 66% of savings from those in the top, 99th percentile. Additionally, if the $125,000 cap had existed in 2015, total savings in government spending would have been approximately $70 million. However, approximately $64 million of those savings would be realized by reducing payments to farms in the top 5% of the crop sales distribution. That is, farms below the 95th percentile of the crop sales distribution would incur trivial or no changes in program payments.

Results provided in Table 4 also show the impacts that could have been realized if there was a $250,000 per farm cap on the sum of ARC, PLC, and crop insurance subsidy payments. The general patterns of the savings distribution and affected farms are similar to that associated with the $125,000 cap on ARC and PLC payments, but the level of savings is significantly larger. For example, while the largest average per farm savings by limiting total ARC and PLC payments to $125,000 would have been approximately $6,800 (for farms in the top 1% of crop sales), savings associated with a $250,000 cap on PLC, ARC, and crop insurance subsidies would have averaged $26,200 per farm savings for the top 1% of farms.

Overall, the majority of the savings from the $250,000 cap on ARC, PLC, and crop insurance premium subsidies would come from reduced payments to farms in the top 5% of the crop sales distribution. Of the total $273 million in estimated savings, two-thirds would be realized by reducing payments to farms in the top 1% of the sales distribution. Nearly 80% of

these savings, over $217 million, would be realized by reductions in payments to the top 2% of farms in the crop sales distribution.

Finally, Table 4 also presents the estimated savings and affected farms resulting from the strictest policy: a $125,000 ceiling on the combined ARC, PLC, and crop insurance premium subsidies. Under this policy, approximately 3% of farms whose crop sales are between the 50th and 90th deciles would be affected, but for these farms, the average reduction in ARC, PLC, and premium subsidy payments would be $70. For farms in the top 10% of crop sales, the average per farm payment reduction would have been approximately $25,600, resulting in total savings of nearly $650 million in government outlays. This represents over 95% of the total savings that could have been obtained were the $125,000 cap placed on total program payments and subsidies in 2015.

Concluding Remarks

In the early 1970s, Schultze (1971) and Lidman (1972) reported that the largest 4–7% of farms received over 40% of agricultural price support program benefits, while those in the lower 40% of the sales distribution received less than seven percent. The results presented in our research show that, over forty years later, surprisingly little has changed with respect to the distribution of farm subsidies, even though substantial adjustments were made to the programs. Specifically, we show that payments from the most recently enacted ARC and PLC programs and per acre crop insurance subsidies are positively related with farm-level crop sales, and that larger farms receive most of those payments. The consistency with which the last 50-years of research has shown that agricultural safety net program benefits are concentrated among the largest, wealthiest farms raises important questions about the inconsistency between the observed outcomes of those programs

and the major rationale for farm safety net programs: that they exist to protect all agricultural producers against production, price, and income risks.

If the objective of cost-effective farm safety net policies is to ensure a stable food supply by helping farms manage otherwise volatile revenues, then the current programs do not direct taxpayer funds in ways that effectively protect farm operations that are most vulnerable to such shocks. Market forces have provided incentives for farm operations to consolidate and recognize economies of scale and scope. However, we show that those farms are also most likely to be the largest beneficiaries of the three major farm programs that provide over seventy percent of all federal funds paid to farmers. Further, these farms are also likely to be the least vulnerable to production and price shocks that adversely affect their revenues and costs (Schurle and Tholstrup, 1989; Purdy, Langemeier, and Featherstone, 1997; Barry, Escalante, and Bard, 2000).

Policies that limit payments could aid in reducing the disproportionate allocation of agricultural program benefits to farms that appear to have little need of help in managing financial risks. We show that several policies that cap crop insurance subsidies and ARC and PLC benefits could result in substantial reductions in federal outlays without any adverse implications for 90% (and in some cases, more) of U.S. farms. These policies have recently been proposed by federal legislators and are likely to be discussed during upcoming farm bill debates. This research provides important insights about the potential trade-offs if these or similar policies are enacted.

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Table 1. 2014 Weighted Farm-level Descriptive Statistics

	Total Crop Sales (000)										
Decile	Lower Bound	Upper Bound	Mean	Crop Sales Per Acre	Total Livestock Sales (000s)	Net Worth (000s)	Gross Farm Income (000s)	Off-Farm Income (000s)	Total Crop Acres	FCIC Insurance Expense (000s)	Estimated Insurance Subsidy (000s)
0–10	1.0	2.5	1.8	277.1	8.2	487.0	25.9	88.7	31.2	0.0	0.0
10–20	2.5	4.5	3.5	388.2	13.5	557.1	35.9	70.7	51.2	0.1	0.1
20–30	4.5	8.9	6.5	664.9	25.1	726.0	48.4	162.6	60.7	0.1	0.1
30–40	8.9	17.4	12.3	967.7	33.5	805.7	66.3	70.5	86.8	0.3	0.5
40–50	17.4	35.0	25.9	1,646.6	67.9	991.5	124.6	58.5	152.7	0.8	1.3
50–60	35.0	65.6	49.7	2,011.0	50.7	1,114.3	137.8	64.6	202.9	1.3	2.1
60–70	65.6	120.0	89.6	3,873.3	83.2	1,501.7	216.8	64.2	330.5	2.6	4.4
70–80	120.0	253.0	176.9	4,080.7	95.4	1,857.4	331.6	58.2	480.3	4.9	7.6
80–90	253.0	593.8	389.4	6,652.5	116.3	2,710.7	612.0	52.4	859.4	10.6	16.0
90–100	593.8	------	1,768.2	14,230.8	156.4	5,459.4	2,155.1	52.4	2,090.1	28.0	46.1
Mean		253.2		3,477.9	64.9	1,620.3	375.3	74.6	434.4	4.9	7.8

Notes: The total unweighted observation count is 15,947. Data are from the 2014 Agricultural Resource Management Survey. Observations are weighted using appropriate version weights provided in the ARMS data. All variables are measured in dollars are presented in US dollar (USD) value. Total insurance premium includes both farmer-paid premiums and premium subsidies.

Table 2. ARC, PLC, and Crop Insurance Subsidy Receipts

Crop Sales Percentile	Average Payment per Farm (USD)	Total Payments (million USD)	Proportion of Total Payments
Lowest 10%	11.30	0.17	0.00%
10%-20%	25.03	1.40	0.03%
20%-30%	73.60	4.42	0.09%
30%-40%	218.45	13.08	0.27%
40%-50%	764.36	44.76	0.92%
50%-60%	2,125.89	123.55	2.54%
60%-70%	3,528.00	203.28	4.18%
70%-80%	8,720.64	490.97	10.09%
80%-90%	19,128.67	1,018.26	20.93%
Top 20%	37,107.57	3,983.07	81.88%
Top 15%	44,350.87	3,577.98	73.56%
Top 10%	54,813.03	2,964.40	60.94%
Top 5%	70,253.34	1,864.05	38.32%
Top 2%	92,509.01	978.61	20.12%
Top 1%	111,720.11	601.80	12.37%

Notes: The total unweighted observation count is 15,947. Data are from the 2014 Agricultural Resource Management Survey. Observations are weighted using appropriate version weights provided in the ARMS data.

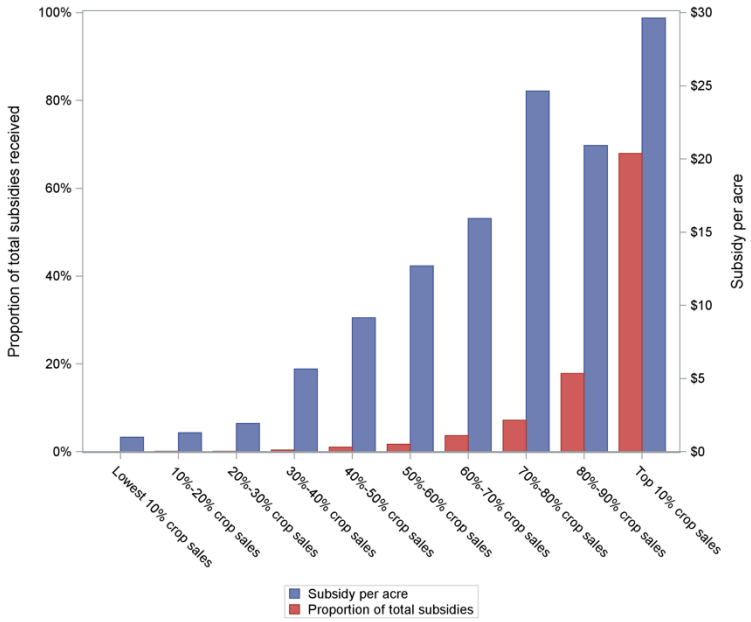
Table 3. Hypothetical Incidence of Proposed Insurance Subsidy Cap

Crop Sales Percentile	Avg. Payment Reduction per Farm (USD)	Total Payment Reduction (million USD)	Proportion of Farms Affected within Percentile Group	Avg. Subsidies per Farm (USD)	Percentage of Payment Reduction as a Proportion of Total Subsidies
	$40,000 cap on crop insurance subsidies per farm				
0% - 30%	0.8	0.2	0.01%	87.0	0.88%
30%-40%	6.8	0.5	0.02%	482.7	1.41%
40%-50%	68.9	5.1	0.30%	1,312.1	5.25%
50%-60%	126.6	9.4	0.41%	2,116.8	5.98%
60%-70%	754.3	55.8	1.19%	4,373.9	17.25%
70%-80%	576.6	42.7	2.10%	7,625.3	7.56%
80%-90%	2,474	183.0	9.58%	15,991.3	14.47%
Top 20%	13,167.9	1,947.9	22.84%	31,043.4	42.42%
Top 15%	17,001.1	1,885.9	28.32%	37,173.3	45.73%
Top 10%	23,857.0	1,764.9	36.09%	46,089.3	51.76%
Top 5%	35,815.8	1,323.8	43.87%	59,212.3	60.49%
Top 2%	55,991.0	827.4	45.66%	77,216.9	72.51%
Top 1%	77,937.3	575.8	41.93%	96,491.2	80.77%
All	2,347.1	2,016.4	4.97%	7,824.6	30.00%

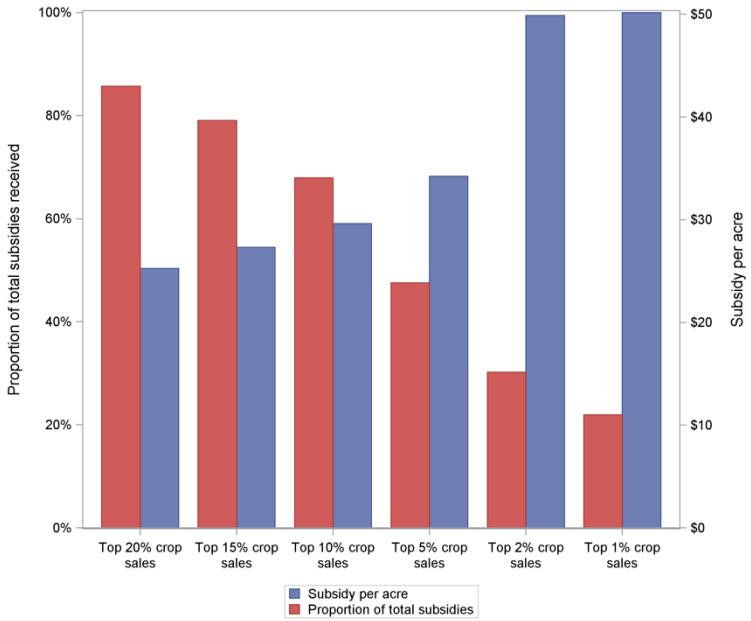
Table 4. Hypothetical Incidence of Proposed ARC, PLC, and Insurance Subsidy Caps

Crop Sales Percentile	Avg. Payment Reduction per Farm (USD)	Total Payment Reduction (million USD)	Proportion of Farms Affected within Percentile Group
	$125,000 cap on ARC and PLC payments		
80%-90%	8.96	0.62	0.03%
Top 20%	511.17	70.21	0.78%
Top 15%	681.55	70.21	1.04%
Top 10%	1,013.49	69.59	1.53%
Top 5%	1,874.39	64.39	2.80%
Top 2%	3,828.66	52.61	4.29%
Top 1%	6,812.60	46.79	6.88%
	$250,000 cap on ARC, PLC, and crop insurance subsidies		
80%-90%	3.46	0.24	0.01%
Top 20%	1,987.43	272.97	1.04%
Top 15%	2,649.88	272.97	1.39%
Top 10%	3,971.88	272.73	2.07%
Top 5%	7,738.32	265.83	3.76%
Top 2%	15,851.82	217.84	6.12%
Top 1%	26,227.88	180.13	9.08%
	$125,000 cap on ARC, PLC, and crop insurance subsidies		
50%-60%	4.13	0.28	0.02%
60%-70%	18.00	1.26	0.04%
70%-80%	44.63	3.07	0.15%
80%-90%	211.86	14.55	0.72%
Top 20%	4,838.06	664.50	4.50%
Top 15%	6,369.12	656.09	5.75%
Top 10%	9,465.43	649.95	8.27%
Top 5%	16,662.35	572.39	11.87%
Top 2%	30,249.28	415.70	17.75%
Top 1%	46,328.95	318.18	22.62%

Notes: Scenarios based on realized 2015 ARC and PLC payments and approximate 2015 crop insurance subsidy rates. Impacted farms are those who would have received payments and/or subsidies in 2015 but would not have under each hypothetical cap scenario. Total payment reduction represents the value of expenditures that were distributed as program payments and/or crop insurances subsidies in 2015 but would have not been distributed under each hypothetical cap scenario. Only crop sales percentiles in which farms would have been affected are presented.

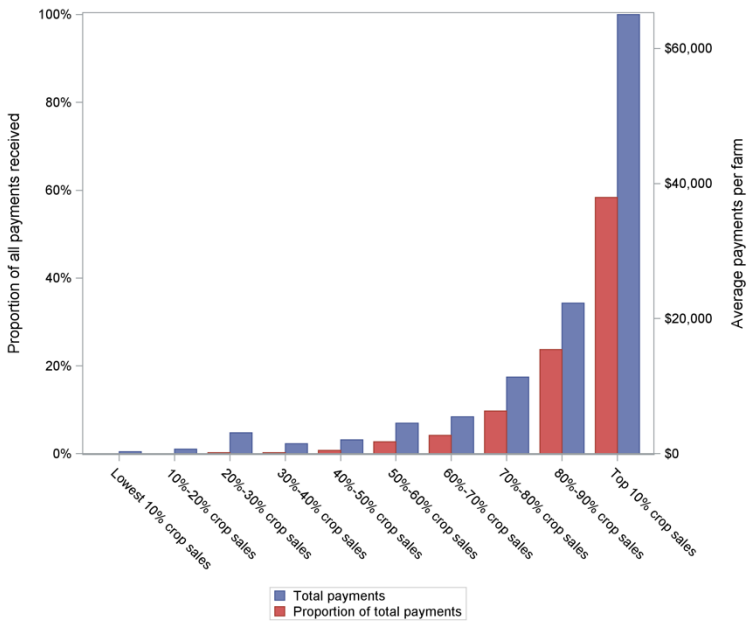


(a) Crop Insurance Subsidy Payment Distributions by Crop Sales Deciles

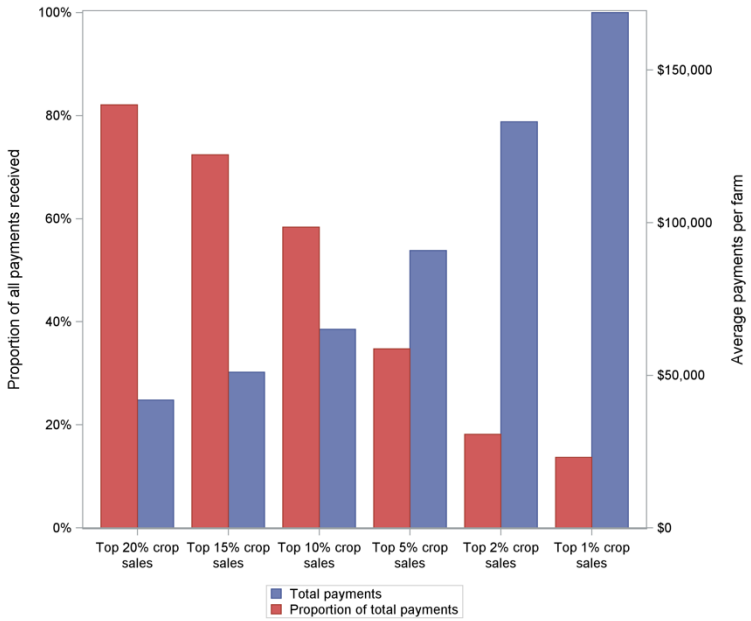


(b) Crop Insurance Subsidy Payment Distributions for Farms in the Top 20% of Crop Sales

Figure 1. Crop Insurance Subsidy Payments Across Farms in the Weighted Crop Sales Distribution

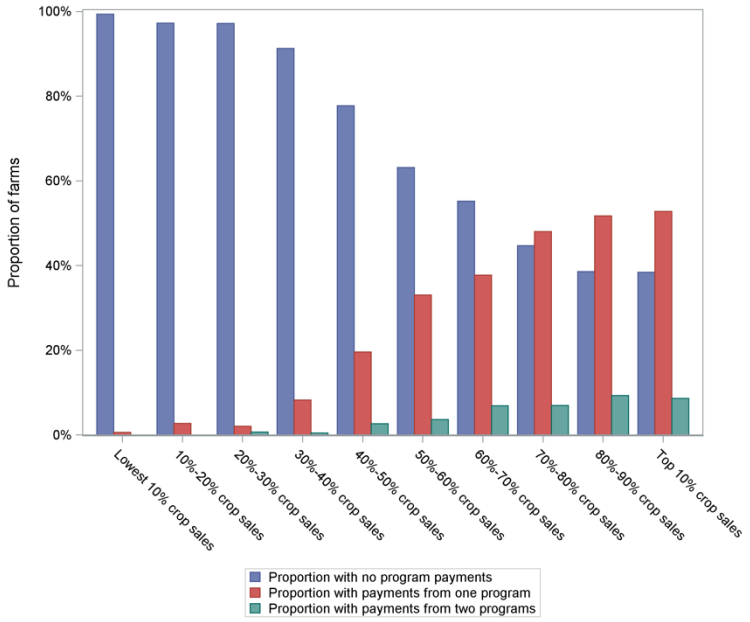


(a) ARC and PLC Payment Distributions by Crop Sales Deciles

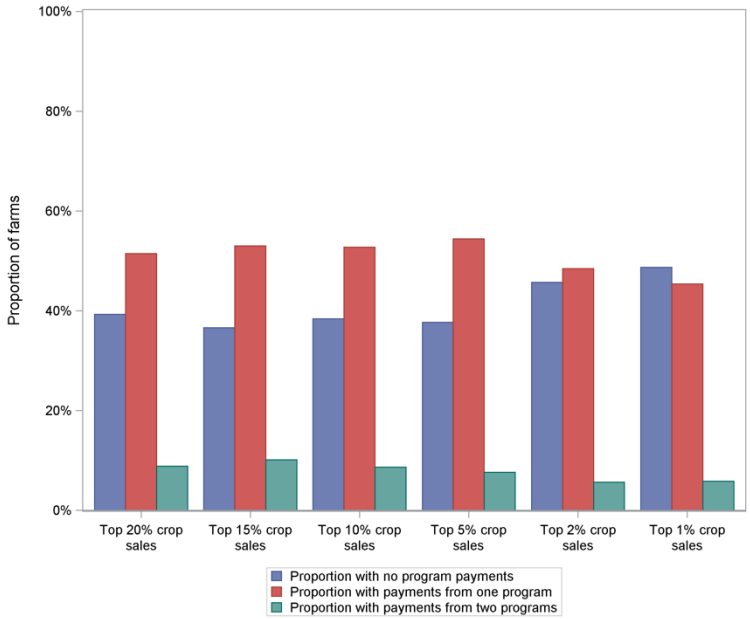


(b) ARC and PLC Payment Distributions for Farms in the Top 20% of Crop Sales

Figure 2. ARC and PLC Per Farm Payments Across Farms in the Weighted Crop Sales Distribution



(a) Proportion of Farms Receiving Payments, Crop Sales Deciles



(b) Proportion of Farms Receiving Payments, Farms in the Top 20% of Crop Sales

Figure 3. Proportion of Farms Receiving Payments from ARC, PLC, and/or Crop Insurance Subsidies Across Farms in the Weighted Crop Sales Distribution