Capitalizing Conservation: Farmland Value Effects of CRP Enrollment

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February 2026

Abstract

Farmland accounts for over 80% of farm sector assets and is critical for farm profitability, land tenure decisions, and rural development. The Conservation Reserve Program (CRP), the largest U.S. land retirement program, pays farmers fixed rental payments to retire land from production and implement conservation practices. Despite its scale and budget, the effects of CRP enrollment on farmland values are not well understood. We combine transaction-level sales data for all Kansas farmland from 2010 to 2024 with geospatial CRP contract data to estimate how enrollment affects land prices. We find that CRP participation reduces land values: a fully enrolled parcel experiences a 27% discount, each additional year under contract lowers values by $14 per acre, and each additional dollar of rental rate increases values by $2 per acre. Across the 91,000 acres of CRP-enrolled land in our sample, we estimate an aggregate land market discount of $45 million. These acres are also estimated to sequester roughly 685,000 metric tons of CO_2 equivalent.

Keywords: Conservation Reserve Program; Easement; Land values; Soil; Carbon sequestration

1. Introduction

Farmland is a fundamental asset to the agricultural economy (Taylor et al. 2021; Wu and Lin 2010), influencing farm profitability, land tenure decisions, and rural development (USDA ERS 2025). Farmland represents the largest share of farm sector assets (over 80%), and its value is a key indicator of the sector's financial well-being (Burns et al. 2018; USDA ERS 2025). For instance, fluctuations in the value of farmland affect producers' ability to refinance or restructure farm debts. Additionally, farms that are more financially leveraged may be faced with insurance coverage requirements from their lenders (DeLay et al. 2023; Ifft et al. 2015). Farm real estate assets in 2025 are forecasted to top $3.6 trillion, while real estate debts are forecasted to top $374 billion. Over time, the portion of total farm debts comprised of real estate debt has been growing in real terms and is forecasted to exceed 66% in 2025 (USDA ERS 2025). Formally established by the Food Security Act of 1985, the Conservation Reserve Program (CRP) is the largest land retirement program in the U.S. And, while the CRP is the largest single USDA conservation program (by budget), the impacts of CRP enrollment on farmland values are not well understood. In short, CRP pays farmers a fixed rental payment in exchange for idling land from production and implementing a conservation practice. Between 1990 and 2010, the CRP routinely idled 30+ million acres of farmland in the U.S. In more recent years, the enrollment cap has been set at around 25 million acres (Pratt 2023).

The primary objective of this paper is to uncover how enrollment in CRP affects farmland values. We take a hedonic approach to understanding how the core characteristics of CRP enrollment, namely the proportion of the parcel enrolled, time remaining under contract, and rental rate, are capitalized into farmland. We combine data on every agricultural land transaction in Kansas between 2010 and 2024 with CRP enrollment and contract data spatially delineated at the common land unit (CLU). Uncovering the impact of CRP enrollment on land value has been a particular challenge because land transaction data do not generally detail the terms of any CRP contract(s) present at the time of sale (e.g., Taylor et al. 2021). We use transaction-level farm sales data together with geospatial data on parcel boundaries and CRP contract data at the CLU-level to precisely match CRP enrollment information with each land transaction.

We find clear evidence that the proportion of the parcel enrolled in CRP, time remaining under contract at the time of sale, and CRP rental rate are priced into land values. A parcel whose acreage is 100% enrolled in CRP faces a 27% land market discount ($881/acre) on average. Moreover, the distribution of the effect of acres enrolled is found to be approximately linear—land values decline linearly as the proportion of the parcel enrolled in CRP increases. An additional year under contract at the time of sale reduces land values by about $14/acre. An additional dollar written into the CRP contract rental rate increases land values by about $2/acre.

Across Kansas, we find the CRP land value discount ranges from about 21% to over 30% depending on the agricultural district. We do not detect any spatial patterns of CRP land market discounts that would be consistent with systematic differences in agricultural productivity across regions. Additionally, we use our estimates to illustrate the implications of precisely matching CRP contract information on an acreage basis rather than the basis of presence/absence (as has been done in previous hedonic studies). We find that CRP treatment, defined as a presence/absence measure, overestimates (underestimates) the “true” land market discount for parcels enrolling a small (large) proportion of their acreage. In total, we predict that land values for parcels that transacted between 2010 and 2024 were $45.0 million lower due to active enrollment in CRP at the time of sale. This amounts to an approximate discount of $34,500 per transaction, when averaged over all transactions having CRP contracts.

Additionally, we compare the predicted loss in farmland values associated with CRP enrollment to the environmental benefits generated through carbon sequestration from land retirement. To quantify carbon outcomes, we link acreage enrolled in each CRP practice and the duration of enrollment to the USDA COMET-Planner. Across approximately 91,000 acres of observed CRP transactions, we estimate that enrolled land sequestered roughly 684,566 metric tons of CO_2 equivalent over the life of the contracts. When this sequestration is evaluated against the estimated $45.0 million aggregate reduction in land market values attributable to CRP enrollment, we derive an implied average land market “cost” of $66.2 per metric ton of CO_2 equivalent sequestered. This implied cost can be compared directly to carbon offset programs (Wongpiyabovorn et al. 2023 provides a review) to gauge whether CRP delivers carbon benefits at competitive costs.

The most closely related paper is Taylor et al. (2021), which also used transaction-level sales data from Kansas. Two key innovations provided by this paper are the ability to match CLU-level CRP contract information to the land transaction at the time of sale and the ability to examine rental rate and years remaining on contract. By comparison, Taylor et al. (2021) relied on a more limited dataset, indicating only whether a contract was present or not. Enrollment treated as presence/absence provides limited policy relevance because such treatment definitions cannot provide marginal valuations as enrolled acreages change. Taff and Weisberg (2007) and Schmitz and Shultz (2008) also utilize transaction-level data in a hedonic setting using data from Minnesota and North Dakota, respectively. The data in Taff and Weisberg (2007) only indicate the presence/absence of a CRP contract, while Schmitz and Shultz (2008) predict CRP acreage enrollment using a geospatial land classification. Other studies include the impact of per-acre CRP payments on farmer-perceived land value (Goodwin et al. 2003), the impact of CRP payments on county-level cash rents in Iowa (Lence and Mishra 2003), and the impact of CRP enrollment on land values using county-level land value data and farm-level contract information (Wu and Lin 2010).

At the policy level, there is a growing need to ensure that CRP is not only environmentally effective but also economically attractive to landowners. While Wu & Lin (2010) find an average 1-2% premium associated with CRP enrollment using data from 1997, Taylor et al. (2021) find the opposite, indicating that land use restrictions may reduce farmland value on the land market. Whether CRP participation results in a premium, a discount, or no significant change likely depends on contract attributes such as the proportion of the parcel enrolled, time remaining under contract, rental rate, and location. Our study uncovers these nuanced effects so policymakers can better tailor enrollment incentives to land market conditions and help producers understand how conservation enrollment may affect their land assets.

2. Background

Soil conservation in the U.S. began well before the CRP, with the establishment of the Soil Conservation Service in 1935 to combat land degradation. The CRP was later introduced as a key policy tool to further soil conservation goals (Wachenheim et al. 2014). The CRP, established under the 1985 Food Security Act and reauthorized in all subsequent bills, is the largest voluntary land conservation program in the U.S., offering annual rental payments and cost-sharing to encourage landowners to convert highly erodible or environmentally sensitive land from agricultural production to conservation practices (Barnes et al. 2020).

CRP contracts are typically 10 or 15 years in length, allowing time for environmental benefits to accrue. Early termination is possible but comes with significant penalties (Hellerstein and Malcolm 2011).[1] The annual payment, determined through a USDA formula and competitive bidding, depends on local cash rental rates and the area's agricultural productivity (Taff and Weisberg 2007). Payments are finalized through the competitive bidding process, where landowners submit land cover practices and annual rental offers that are accepted or rejected based on their net environmental and economic benefits (Schmitz and Shultz 2008; Stubbs 2014).[2] Enrollment was initially capped at 25% of a county's cropland to protect local farm-dependent economies from reduced agricultural activity and declining demand for related goods and services (Adjei et al. 2024; Riley et al.

[1] Penalties include paying back previous rental payments with interest and liquidated damages. The liquidated damages are assessed proportional to the acres enrolled and rental rate.
[2] Rental rates are capped at maximum amounts which are set at the county-level.

2019; Sullivan et al. 2004), but USDA regulations allow the cap to be waived under specific conditions when exceeding the limit does not adversely affect the local agricultural economy (USDA 2025). While praised for its environmental benefits (Schilling and Spooner 2006; Marton et al. 2014; Johnson et al. 2016; Riley et al. 2019; Yin et al. 2021) and income-stabilizing rental payments (Barnes et al. 2019; Bucholtz et al. 2004; Johnson et al. 2016), the program can also produce unintended consequences. For example, Fleming (2014) and Wu (2000) show that slippage effects can undermine any environmental gains.

CRP enrollment in Kansas expanded rapidly after the 1985 Food Security Act (Fig. 1). Between 1990 and 2010, total land enrolled in CRP in Kansas ranged from about 2.5 million acres to 3 million acres. Average rental rates across Kansas dropped sharply with the 1998 signup period, which introduced the environmental benefits index (EBI). The EBI ranks offers based on factors such as wildlife habitat, water quality, and reduced erosion. The introduction of the EBI disadvantaged plains states such as Kansas and Oklahoma but advantaged corn belt states such as Illinois and Iowa in terms of average rental rates. Enrollment began to decline post-2010, coincidental with food commodity price booms and reductions in CRP enrollment caps under the 2014 Farm Bill.

Government policies significantly influence farmland valuation by shaping the expected returns to land, most notably through direct payment programs (Bigelow et al. 2016; Goodwin et al. 2003; Kirwan 2009; Lence and Mishra 2003; Roberts et al. 2003) and agri-energy production mandates (Gardner and Sampson 2022; Kropp and Peckham 2015; Towe and Tra 2013). In addition, program design features and policy mechanisms (Hellerstein, 2017; Miao et al., 2016), as well as **changes to the rental rate formula** (Cornish et al. 2022)**,** affect participation in CRP.

3. Data

We obtain data from a variety of sources to estimate the hedonic price model of CRP enrollment. A summary of the data used in the empirical analysis is presented in Table 1 for land transactions with and without CRP enrollment at the time of sale. We detail each data source below.

3.1 Land Transactions

Data on every agricultural land transaction that is at least 40 acres in size are obtained from the Property Valuation Division (PVD) of the Kansas Department of Revenue for the years 2010 to 2024 (~95,000 observations). The PVD data includes information on the type of transaction (referred to as validity codes), estimated value of improvements to the land from county assessors, and acreage by land type (e.g., pasture or cropland). We restrict the analysis to transactions that are deemed arms-length in the validity codes, which leaves approximately 49,000 transactions. We then aggregate parcel-specific values and characteristics up to the transaction level (i.e., for multi-parcel transactions). Transaction values are converted to 2024 values using the consumer price index (CPI).

We drop observations where the PVD data presents a validity code for a multi-parcel transaction, but for which only a single parcel is observed. We also drop transactions that are greater than 5,000 acres in size or have improvements on the land (e.g., sheds, barns) valued at more than $100,000. We follow Edwards et al. (2025) in defining outlier transactions by examining the distribution of the log of transaction values. We first estimate a regression that controls for agricultural district-specific differences in transaction values for irrigated cropland, non-irrigated cropland, and grassland and the district-specific changes over time. We then predict the residuals, which reflect the deviation of the observed transaction value for a particular land cover in a particular agricultural district from what would be the average predicted value in that year. As in Edwards et al. (2025), we define outliers as transactions that are above the 75th quartile plus three times the interquartile range and below the 25th quartile minus three times the interquartile range. After this cleaning of the data, we are left with approximately 30,800 transactions.

3.2 Parcel Boundaries

The PVD land transaction data does not include geospatial information. Sometimes a point coordinate is provided with the transaction data. However, upon inspection, the association of the coordinate with features of the parcel is not always consistent. For example, in some instances the coordinate appears to identify the parcel centroid whereas in other instances the coordinate appears to identify the mailbox location or intersection of the parcel access road with the nearest county-maintained road. In the case of multi-parcel sales, the point coordinate presents particular difficulty in merging spatially delineated information with each of the associated parcel features. To further confound matters, CRP enrollment can range from a small portion of the farm acreage to the entirety of farm acreage (Chang and Boisvert 2009), as illustrated in Figure 2. We therefore rely on parcel boundary geodata to match CRP enrollment information to land transactions with high degrees of accuracy. Parcel boundary data is purchased from Regrid.[3]

The parcel boundary geodata contains an identification code that is specific to parcels within each county. We format the parcel identification code such that it is consistent across counties. We format the parcel identification codes in the PVD transaction data likewise. We are unable to obtain matches between the PVD and parcel boundary data for Wyandotte County, which is a suburb of Kansas City. We therefore drop

[3] https://regrid.com

transactions in Wyandotte County from the data. Figure 2 provides an example of parcel boundary data in two locations in Kansas in relation to the CRP geodata.

3.3 CRP Data

CRP geodata for the state of Kansas was obtained from the USDA Farm Service Agency (FSA). The geodata provides CRP enrollment information for the period 2010-2024. In particular, the data begins with parcels that enroll in CRP in 2010 and ends with parcels that have an active contract in 2024. The CRP geodata is delineated at the CLU, which refers to the smallest unit of land having a common land cover and owner. CLUs are nested within tracts (i.e., fields), which are nested within farms. Figure 2 provides an example of merging the CLUs to parcel boundaries in two locations in Kansas. The CRP data provides information on contract start and end dates, the signup name, rental rate, whether the contract was a re-enrollment, and conservation practice number(s) along with their acreage. Rental rates are converted to 2024 dollars using the CPI.

We use spatial intersection features in QGIS to find common areas where a CRP CLU polygon and a parcel boundary polygon overlap. A parcel will sometimes intersect with multiple CRP polygons because CLUs are nested within tracts. For each parcel boundary polygon, we compute the areal overlap of the parcel by CRP CLU polygons, which provides the proportion of the parcel acreage that is enrolled in CRP. Where multiple CRP contracts exist on a parcel or within a land transaction (i.e., multiple intersections of a parcel boundary and CRP CLUs), we compute a summary measure of contract attributes (e.g., rental rate) by taking the average across the transaction. We drop 28 transactions where there only appears to be an incidental overlap between a CRP polygon and the parcel boundary (i.e., overlap greater than zero but less than 0.01% by area).

Figure 3 shows the distribution of acreage enrollments for transactions having at least one CRP contract. Figure 4 shows the distribution of CRP rental rates and the years remaining under contract at the time of the transaction. Figure A1 shows the county-level distribution of enrolled acres for 2010-2024 along with an outline of the agricultural districts.

3.4 Climate

Grid-cell weather data for Kansas are obtained from PRISM. We construct four climate variables as 5-year rolling averages: growing season precipitation, growing season reference evapotranspiration, the number of degree days between 10C and 34C during the growing season, and the number of degree days greater than 34C during the growing season. We define the growing season as April 1st to September 30th. We also compute a water deficit variable, which is defined as the cumulative difference between reference evapotranspiration and precipitation across the growing season as outlined in Sampson et al. (2021). Together, this information controls for the effects of climate on the returns to agriculture (Mendelsohn et al. 1994). To link PRISM data to the location of land transactions, we match the centroid of the parcel boundary to the centroid of the nearest PRISM grid cell. The rolling average leads up the year of the land transaction. For example, the average growing season weather for 2006-2010 is used for a parcel that sells in the year 2011.

3.5 Soils

Soil characteristics related to agricultural productivity are obtained from the SSURGO soil survey. The PVD data include acres by SSURGO soil type. We link soil types to the SSURGO data and aggregate soil characteristics up to the transaction-level. In our empirical analysis, we include information on slope, sand content, silt content, clay content, and soil organic carbon to control for soil productivity and erodibility.[4]

3.6 Commodity Prices

County-year price data for corn are obtained from DTN.[5] The corn price data is collected weekly from elevators and ethanol plants that report to DTN. The price information is then averaged across all plants/elevators in a county up to the year. Corn prices are converted to 2024 dollars using the CPI.

4. Methods

The empirical objective of this paper is to estimate the treatment effect of having some portion of the land enrolled in CRP at the time of sale, whilst controlling for key attributes of the CRP contract and other determinants of land value. We first present descriptive statistics of our data before presenting the hedonic price model.

4.1 Descriptive Statistics

Table 1 presents summary statistics across transactions with and without a CRP contract at the time of the transaction. Mean values for transaction characteristics are compared by regressing CRP status (i.e., with or without an active CRP contract) on the characteristic, including agricultural district-year and township controls. We observe that transactions having an active CRP contract on any portion of the land tend to have a lower market price, lower proportions of native and tame grass, higher proportions of non-irrigated cropland, more heat exposure, lower clay content of the soil, and a greater number of parcels in the land transaction.

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[4] We do not include factor or index variables from SSURGO because these are sometimes derived from soil texture, which we already include in every regression. We did explore specifications including soil erodibility and wind erodibility. Including or excluding this information does not meaningfully affect estimates of our focal variables.
[5] https://www.dtn.com/agriculture/agribusiness/grain-portal/

4.2 Empirical Approach

We model land prices in a hedonic price framework, which conceptualizes the market value of farmland as being determined by the observable bundle of land characteristics (Rosen 1974). Agricultural parcels having characteristics attractive to consumers will be bid up in a competitive land market. The particular emphasis of this paper is to quantify the capitalized premium or discount of parcel enrollment in CRP at the time of sale.

As outlined in Taylor et al. (2021), there are numerous ways in which CRP enrollment may positively or negatively affect farmland values. If the fixed CRP rental payment exceeds the expected net benefits from crop production (e.g., during periods of low food commodity prices), then the presence of CRP contracts may increase farmland values (Shoemaker 1989). For instance, Kirwan et al. (2005) found that CRP bids exceed the willingness to accept to enroll land into CRP, and Wu and Lin (2010) found that CRP enrollment increased farmland values. Additionally, non-agricultural factors such as recreational opportunities tied to the land through CRP practices may contribute to the market value (Borchers et al. 2014). For instance, demand for hunting opportunities may create non-agricultural income sources in the form of hunting lease payments that offset foregone agricultural income (Borchers et al. 2014; Henderson and Moore 2006).

Conversely, periods of high food commodity prices might increase the returns to farming relative to the returns from CRP enrollment. Combined with the aforementioned financial penalties associated with early termination of a CRP contract, this would likely lead to land market discounts for farmland enrolled in CRP. There may also be adjustment costs to return the land to farming (e.g., need for additional weed control) and periods of reduced crop yields upon returning the ground to crop production (Keene et al. 2021). Adjustment costs and yield drag would be expected to generate a land value discount. Lastly, the new owners would be required to continue all original terms of the CRP contract, including the maintenance of all conservation treatments agreed upon in the contract. Maintaining conservation treatments that the new owners did not themselves tailor could be viewed as burdensome and thus be bid down on the market.

We specify the commonly used semilog functional form when estimating the impact of CRP enrollment on farmland value. Land transactions are strictly positive and can differ widely, making the semilog an appropriate specification. We estimate the real price per acre for farmland transaction i in year t as:

$$\ln\frac{price}{acre}_{it} = \beta_1 CRP_{it} + CRP_{it} \times \Omega' C_{it} + \Gamma' LTYPE_{it} + \theta' \mathrm{SALE_i} + \Phi' z_{it} + \eta_l + \lambda_{dt} + \epsilon_{it}. \qquad (1)$$

In equation (1), CRP_{it} can either measure the proportion of transaction i that is enrolled in CRP contract(s) at the time of sale in year t or whether or not there is an active CRP contract at the time of sale, C_{it} is a vector of CRP contract characteristics (e.g., rental rate, years remaining), $LTYPE_{it}$ is a vector of land use types defined as a proportion (e.g., irrigated or dry cropland) for transaction i at the time of sale in year t, $SALE_i$ is a vector of temporally stable characteristics of the land transaction (e.g., soil information, total farm acreage), z_{it} is a vector of all other time-varying characteristics (e.g., climate, corn prices). Characteristics of the CRP contract thus only enter the regression if the transaction is enrolled in CRP at the time of sale. If CRP_{it} is measured as a continuous proportion of the transaction acreage, the coefficient β_1 provides the average land market premium or discount for a parcel fully enrolled in CRP. If CRP_{it} is instead measured as a presence/absence binary variable, then β_1 provides the average land market effect of having at least one active CRP contract, regardless of the acreage enrolled. Included in the vector $LTYPE_{it}$ is the proportion of the transaction represented by irrigated cropland, non-irrigated cropland, and tame grass (e.g., bromegrass for hay or grazing). Native grass pasture is the omitted category of land use type. The coefficients in the vector Ω provide the capitalized value of CRP contract characteristics such as rental rate and time remaining under contract.

Annual rental rates that may be requested under the CRP program are capped based on the county-level average cash rental rates for non-irrigated cropland in that county, scaled by the parcel's relative soil quality. Parcel-level soil quality is controlled for using soil composition and slope information from SSURGO. The county-level average cash rental rates are reflective of agricultural productivity, which we do not precisely and directly observe. Instead, spatial dummies at the scale of PLSS townships (6 miles x 6 miles) are used to account for unobserved regional heterogeneity in factors affecting farmland values (e.g., regional differences in productivity) that are temporally stable. Deviations away from base-level agricultural productivity are addressed through the inclusion of parcel-level climate variables and the spatio-temporal dummies. Note that the appropriate level of spatial controls involves a tradeoff between leaving adequate "within" variation for precise estimation of independent variables and controlling for correlated omitted variables that potentially vary over fine spatial scales.[6] We document the sensitivity of parameter estimates to our choice of scale of spatial controls by including county-level controls in Table A2 of the appendix.

Lastly, agricultural district-year dummies are used to account for unobserved factors that might vary over time and space (e.g., farm input prices, interest rates). There are nine agricultural districts in Kansas that roughly split the state into nine equal portions (Fig. A1). With township and agricultural district-year controls included, the identifying variation in CRP enrollment derives from cross-sectional and time series variation within a

[6] A related tradeoff concerns the spatial scale of the nonmarket good that is being valued in the hedonic price model against the spatial scale of correlated omitted variables (Abbott and Klaiber 2011). In our context it is reasonable to expect that any premium or discount associated with CRP enrollment would confer at the transaction-level.

township that is not common across townships within an agricultural district. The model is completed by clustering standard errors at the agricultural district-year to account for spatial correlation of the errors within agricultural districts.

We estimate equation (1) using a generalized linear model (GLM) with a log link function and Poisson family. The primary advantage in using GLM as opposed to ordinary least squares is estimating marginal effects in levels terms without the need to back-transform the dependent variable.

5. Results

The results of estimating equation (1) are presented in Table 2 for the variables of most interest. Every column of Table 2 includes township and agricultural district-year effects. Columns 2 and 3 include additional levels of control on the CRP contract characteristics. Column 2 adds information on rental rates, years remaining on contract, and the number of CRP contracts present. Column 3 adds information on continuous or grassland CRP signup (as opposed to general signup).[7] The first row of Table 2 presents the exponentiated coefficient on the proportion of the transaction acres enrolled in CRP at the time of the transaction. The remaining rows present marginal effects measured in dollars per acre. The full regression output is presented in Table A1 of the appendix (all coefficients have been exponentiated).[8] Note that the CRP rental rate, number of CRP contracts included in the transaction, and number of years remaining under contract are centered on their means. Thus, the effect of CRP enrollment is interpreted as the land value impact for a transaction having average CRP contract characteristics.

We find that CRP enrollment has a large, negative, and statistically significant effect on the market value of farmland. Looking across columns 1-3 of Table 2, we observe that enrolling 100% of a transaction's acreage into CRP reduces the market value by about 27%. This amounts to a land market discount of about \$881/acre on average. The average proportion of acreage enrolled in CRP for a transaction having at least one active CRP contract at the time of sale is 25%. Using column 3 of Table 2, we predict an approximate 7% (i.e., 0.25×0.271) land market discount for a transaction having 25% of its acreage enrolled in CRP (i.e., ~\$221/acre).

One might reason that the effect of CRP enrolled acreage on farmland value need not be linear on a per-acre value basis. For instance, enrolling small portions of acreage that are not easily farmed into CRP might not be as

[7] The general signup enrolled more than half of all CRP acreage from 2010 to 2020 (Rosenberg and Pratt 2024). There are fewer than 40 grassland CRP transactions. Column 4 of Table A1 drops these grassland CRP observations.

[8] Table A2 presents regression output using county-level dummies to control for unobserved spatial heterogeneity instead of township-level. The effects of CRP and the CRP contract characteristics are similar using either township-level or county-level controls.

heavily bid down on the land market as enrolling all the farm acreage.[9] Field corners in center pivot irrigation or drainages/waterways within a field are examples. Figure 5 explores potentially nonlinear impacts of CRP enrollment on land values using a restricted cubic spline with three knots placed at the 10th, 50th, and 90th (top) and 25th, 50th, and 75th (bottom) percentiles of the acreage distribution of CRP enrollment for observed transactions. The coefficients on the spline knots in Table A3 in the appendix are not easily interpreted, so we plot in Figure 5 the predicted values of the estimated nonlinear relationship between land value and proportion of the transaction enrolled in CRP along with the histogram of enrollment proportions. Looking at Figure 5, we observe a relationship between predicted market value and proportion of the transaction enrolled in CRP that is approximately linear and decreasing—providing evidence in support of our model specification in equation (1). Transactions with zero CRP enrollment have a predicted market value of about $2,800/acre on average. A transaction whose acreage is 50% enrolled in CRP has a predicted market value of about $2,400/acre on average. A transaction that is 100% enrolled in CRP has a predicted market value of about $2,100 on average. We do not detect any overt difference in the shape of the effect of proportion of the transaction enrolled in CRP when we vary the knot placement (i.e., top vs. bottom of Figure 5).

One potential concern with the heretofore approach is that the hedonic covariates could plausibly confer fundamentally different implicit valuations to CRP and non-CRP transactions. Additionally, the spatial and spatio-temporal controls average across CRP and non-CRP transactions in equation (1). To probe these implications, we estimate equation (1) using only transactions having at least one active CRP contract at the time of sale. We report the estimates in Table A4 using county-level and township-level spatial controls and agricultural district-year spatio-temporal controls. In short, the estimated effect for proportion of the transaction enrolled in CRP is similar to what we report in Table 2.

Table 3 provides regression results when CRP enrollment is treated using a binary presence/absence measurement. Obtaining information on the acreage enrolled in CRP for farmland transaction data is generally only feasible if the researcher can match detailed contract-specific geodata (e.g., confidential CLU-level CRP enrollment) to parcel boundaries. That information must then be merged with the land transaction. Thus, the prior literature largely defines CRP enrollment treatments using coarser-level binary measures of CRP enrollment that is more widely available to researchers in the context of hedonic price models (Schmitz and

[9] Chang & Boisvert (2009) find that potential enrollees are more sensitive to CRP rental rates when enrolling a portion of their acreage as compared to all of their acreage.

Shultz 2008; Taylor et al. 2021).[10] Looking across columns of Table 3, we observe that having at least one active CRP contract on the land at the time of the transaction confers a land market discount ranging from about 7.5% to 9.2%. This amounts to approximately $210/acre to $257/acre in level terms and is consistent with the estimates of Taylor et al. (2021). Table A5 of the appendix presents the full regression output.[11]

Table A6 of the appendix presents separate model estimates examining a binary treatment definition for partial-farm and whole-farm CRP enrollment. Farms having a portion of their acreage enrolled in CRP still derive income from commodity sales. Thus, partial-farm CRP enrollment and whole-farm CRP enrollment may differentially capitalize land attributes (e.g., Chang and Boisvert 2009). We define partial-farm enrollment as having less than 95% CRP by transaction acreage. We define whole-farm enrollment as having greater than 95% CRP by transaction acreage. We find that transactions where a portion of the acreage is enrolled in CRP confers a 6.4% land value discount (~$180/acre). Conversely, transactions where the predominance of acreage is enrolled in CRP confers a 26% land market discount (~$729/acre). The whole-farm estimates are similar to the continuous measure provided in Table 2.

A binary definition of the treatment effect of CRP enrollment is likely to overestimate (underestimate) the true effect of CRP enrollment for parcels enrolling a small (large) proportion of their acreage. Chang and Boisvert (2009) find that 44% of farms participating in CRP in the U.S. enroll a portion of their acreage. Looking at Figures 2, 3, and 5, it is common in Kansas that a parcel enrolls a relatively small portion of their acreage in CRP, such as drainages or corners in fields serviced by center pivots. We illustrate the significance of defining CRP enrollment on an acreage basis versus defining CRP enrollment as a presence/absence treatment. To do this, we predict land values for all observed transactions between 2010 and 2024 with the observed level of CRP enrollment and with CRP enrollment set to zero using the models in column 3 of Tables 2 and 3. We then obtain a predicted difference in the market values for each transaction. We plot the distributions of the predicted market value difference in Figure 6 for the continuous definition of CRP treatment and binary definition of CRP treatment. The continuous definition of CRP treatment produces outcomes where many values cluster in the -$200/acre and less range. There is also a more pronounced tail on the distribution of outcomes using the continuous definition. The right side of Figure 6 plots the difference between predicted outcomes obtained from the binary definition and the continuous definition. As expected, the binary definition of CRP treatment tends to overestimate the

[10] For instance, the PVD data includes a binary variable for whether a transaction includes a conservation easement, but not the proportion of the transaction's acreage that is enrolled in the easement.
[11] Column 4 of Table A5 drops grassland CRP observations.

land value impact when the proportion of CRP enrollment is low (i.e., the difference is negative) and underestimates the land value impact when the proportion of CRP enrollment is high (i.e., the difference is positive).

To further illustrate the implications of using the more detailed definition of CRP treatment, we compare the aggregate land market capitalization effect from all transactions occurring between 2010 and 2024 across the different models (i.e., column 3 of Tables 2 and 3). To do this, we first obtain the predicted CRP treatment effect on land value by predicting price per acre at the observed CRP enrollment and with CRP enrollment set to zero. We then multiply the predicted CRP treatment effect for each transaction by the total number of acres in the transaction to obtain the transaction-level CRP treatment effect. We then sum all transaction-level CRP treatment effects across all years. Using the continuous definition of CRP treatment, we predict that land values for parcels that transacted between 2010 and 2024 were $45.0 million lower due to CRP contract enrollment (95% confidence interval $43.3-$46.2 million). This amounts to an approximate discount of $34,500 per transaction, on average. Using the binary definition of CRP treatment, we predict that land values for parcels that transacted between 2010 and 2024 were $61.4 million lower due to CRP contract enrollment (95% confidence interval $59.9-$62.8 million). This amounts to an approximate discount of $46,500 per transaction, on average. The binary definition of CRP treatment thus produces an estimated capitalization effect that is 35% greater than the continuous definition.

The second and third columns of Table 2 include information on the land market effect of the CRP rental rate and time remaining under contract. We compute the marginal effects at the mean proportion of acreage enrolled in CRP for transactions having at least one CRP contract (i.e., 25%). We find that one more dollar in CRP rental rate is capitalized into the value of farmland at approximately $2.12 to $2.18 per acre. An extra year under contract at the time of the transaction imparts a land value discount amounting to approximately $14/acre. Thus, for a fixed proportion of the parcel enrolled into CRP, additional payments under the rental rate and fewer years remaining under contract lower the capitalized CRP discount.

5.1 Spatial Heterogeneity

Table 4 presents agricultural district-specific estimates of the impact of CRP enrollment on agricultural land values. We specify year-level dummies and county-level dummies due to a smaller number of transactions and concern with leaving too little identifying variation net of spatio-temporal effects. Kansas is characterized by a total precipitation gradient that generally increases from west to east. Dryland corn and soybean yields are generally consistent with the precipitation gradient—yields are highest in the northeast portion of the state and decrease toward the west. Populations across Kansas are also highly concentrated in the eastern portion of the state, namely around the Kansas City metro area and Wichita. Only seven counties had a population density greater than 100 persons per square mile in 2024 (Inst. Policy Soc. Res. 2025). Six of these counties are clustered in the eastern third of the state (i.e., northeast and east central agricultural districts). Thus, the eastern portion of the state is characterized by higher land productivity but also higher population densities.

The CRP rental rate, number of CRP contracts included in the transaction, and number of years remaining under contract are demeaned within the agricultural district. Thus, the effect of CRP reported in Table 4 is for a transaction having average contract characteristics within that agricultural district. Looking at Table 4, we observe a land market discount associated with CRP enrollment in the western third of the state that ranges from 28% (northwest district) to 33% (west central district). In level terms, the discount ranges from about $666/acre to $786/acre. In the central third of the state, the land value discount ranges from 21% (northcentral district) to 32% (central district). In level terms, the discount ranges from $698/acre to $1077/acre. The land market thus capitalizes a generally consistent discount to land enrolled in CRP, ranging from 20% to 33% across the central and western portions of Kansas. Looking at the eastern third of the state, we observe a large but statistically insignificant discount in the northeast agricultural district. The effect is generally consistent with agricultural land in the northeast portion of the state being more productive. However, there are a small number of CRP transactions, and the estimate suffers from a lack of precision. The coefficients in the east central and southeast districts are also statistically insignificant, despite there being over 100 CRP transactions in the east central agricultural district. Table A7 in the appendix presents full model estimates for each agricultural district.

5.2 Other effects

Table A1 in the appendix presents model estimates for all explanatory variables. We find that water deficit, slope, and the total number of acres in the transaction reduce the transaction value per acre. The proportion of sand and silt content in the soil (as opposed to clay) and the number of parcels exchanged in the transaction increase the transaction value per acre.

We also explore potential heterogeneity of the CRP effects across different explanatory variables. To do so, we employ the causal forest algorithm of generalized random forests approach by Athey et al. (2019), which succeeds Wager and Athey (2018). While the details of the algorithm are in Athey et al. (2019), the basic idea is to use a random forest to predict heterogeneous treatment effects conditional on the explanatory variables. We define the CRP treatment using the binary specification (with and without any CRP acreage) and include 13 explanatory variables in the model (as appear in Table A1). The forest is tuned and fitted based on 80/20 cross-validation.

We find that among the 13 variables, average water deficit, soil organic carbon and average degree days 10-34C are the variables with most predictive power in explaining the heterogeneous treatment effects, followed by soil quality variables (silt and sand soil percentages) and share of dryland. Appendix Figure A2 illustrates how the predicted treatment effects differ across key explanatory variables (top 6 variables in their predictive power). A noticeable finding is that the CRP penalty is lower with high productivity land (displayed by the correlation between the predicted treatment effects and average water deficit, soil organic carbon, average degree days 10-34C) with some mixed findings with silt and sand contents in soil.

6. Soil Carbon Regenerative Effects

Among the environmental benefits of CRP are soil regenerative effects, including soil carbon storage (Gelfand et al. 2011; Johnson et al. 2016). In this section we provide a first-order approximation of the soil regenerative effects of CRP, measured through soil carbon sequestration. Early research established that converting cropland to perennial grass cover can create carbon sinks capable of sequestering substantial quantities of atmospheric carbon (Gebhart et al. 1994).

To quantify these effects, we use the USDA COMET-Planner (Swan et al. 2022), which links on-the-ground conservation practices to estimates of greenhouse gas emission reductions, including soil carbon sequestration. The COMET-Planner provides county-specific predictions of greenhouse gas emission reductions for different Natural Resource Conservation Service (NRCS) practice standards. While CRP conservation practices do not map directly one-to-one onto NRCS practice standards, the FSA provides guidance linking CRP practices to corresponding NRCS standards (USDA FSA 2003).

For each CRP conservation practice observed in our data, we assign the most closely corresponding NRCS practice standard available in the COMET-Planner. Because COMET-Planner estimates vary by county and irrigation status, we incorporate both dimensions in the matching process. Specifically, for each land transaction that includes a CRP contract, we compute the acreage enrolled in each practice and the duration of enrollment, yielding a practice-specific measure of acre-years.[12] We then match these acre-year measures to COMET-Planner estimates of mean total greenhouse gas emissions reductions based on the transaction's county, irrigation status, and the assigned NRCS practice standard.

[12] We assume the terms of all contracts (i.e., practices and duration) remain unbroken.

Across the period of analysis, we observe approximately 91,000 acres of CRP land that transacted on the land market. Based on COMET-Planner estimates, we predict that these acres sequestered approximately 684,566 metric tons of CO_2 equivalent over the life of their CRP contracts. Combining this estimated total sequestration with the aggregate land market capitalization effect attributable to CRP ($45.0 million), we calculate an implied average land market cost of $66.2 per metric ton of CO_2 equivalent. This estimate is below many prevailing estimates of the value of carbon sequestration (e.g., Rennert et al. 2022).

7. Conclusion

Farm real estate accounts for more than 80% of total farm sector assets, and an increasing share of farm debt is secured by land. As a result, changes in farmland values directly affect producers' balance sheets, borrowing capacity, and lenders' exposure to agricultural risk. Understanding how major federal conservation programs influence farmland values is therefore critical not only for landowners, but also for agricultural lenders and policymakers concerned with the financial stability of the farm sector (Burns et al. 2018; DeLay et al. 2023; Ifft et al. 2015).

This paper provides new evidence on how CRP enrollment is capitalized into agricultural land values, using transaction-level farm sales data combined with CLU-level CRP enrollment and contract information. Across a range of model specifications and robustness checks, we find that CRP enrollment is associated with a large, negative, and statistically significant discount in agricultural land values. On average, enrolling 100% of a transaction's acreage in CRP reduces land values by approximately 27%, corresponding to a discount of roughly $881 per acre. For the more typical case in which only a portion of a parcel is enrolled—about 25% of acreage among CRP transactions—the implied land value discount is closer to 7%, or approximately $220 per acre.

Beyond the extent of enrollment, land markets also capitalize key contract attributes. Higher CRP rental rates are positively capitalized into land values, with each additional dollar of rental payment increasing land values by roughly $2 per acre. In contrast, additional years remaining under contract at the time of sale increase the land value discount ($14/acre-year), consistent with delayed reentry into agricultural production. This pattern parallels the findings of Edwards et al. (2025), who show that farmland values capitalize specific attributes of state-defined resource rights. Taken together, our results indicate that farmland markets respond not only to whether land is enrolled in CRP, but also to the incentives and obligations embedded in the CRP contract. More broadly, these findings contribute to a growing hedonic literature that values policy-driven land use constraints such as conservation easements, land retirement programs, and regulated resource rights (e.g., Borchers et al. 2014; Brent 2017; Buck et al. 2014; Lynch et al. 2007; Nickerson and Lynch 2001).

We further explore the environmental implications by combining our land market estimates with county- and practice-specific soil carbon sequestration predictions from the USDA COMET-Planner. For the 91,000 CRP acres that transacted during the study period, we estimate total sequestration of approximately 685,000 metric tons of CO_2 equivalent over the life of the contracts. When paired with the estimated aggregate land value discount attributable to CRP enrollment ($45.0 million), this implies an average land market cost of roughly $66 per metric ton of CO_2 equivalent—below recent estimates of the value of carbon sequestration (e.g., Rennert et al. 2022). While this calculation is necessarily a first-order approximation and does not capture the full suite of CRP environmental benefits (e.g., wildlife, water quality), it suggests that soil carbon sequestration alone may justify a substantial share of the observed capitalization effects.

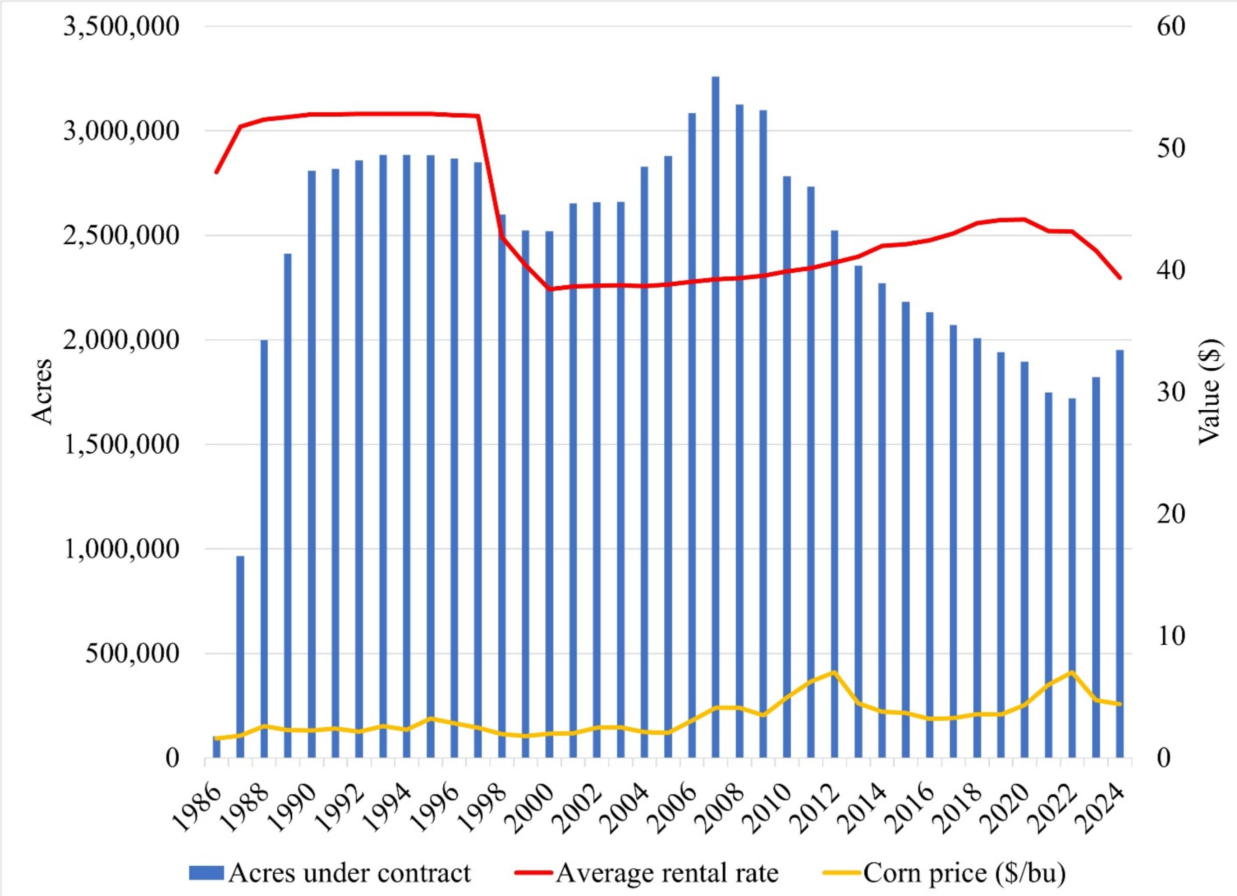

Figure 1. Acres under CRP contract, state-level average rental rate, and state-level annual cash corn price over time for Kansas.

Note: Annual enrollment and rental rate data are from USDA FSA. Corn price data are from USDA NASS. Renta rates and corn prices are nominal.

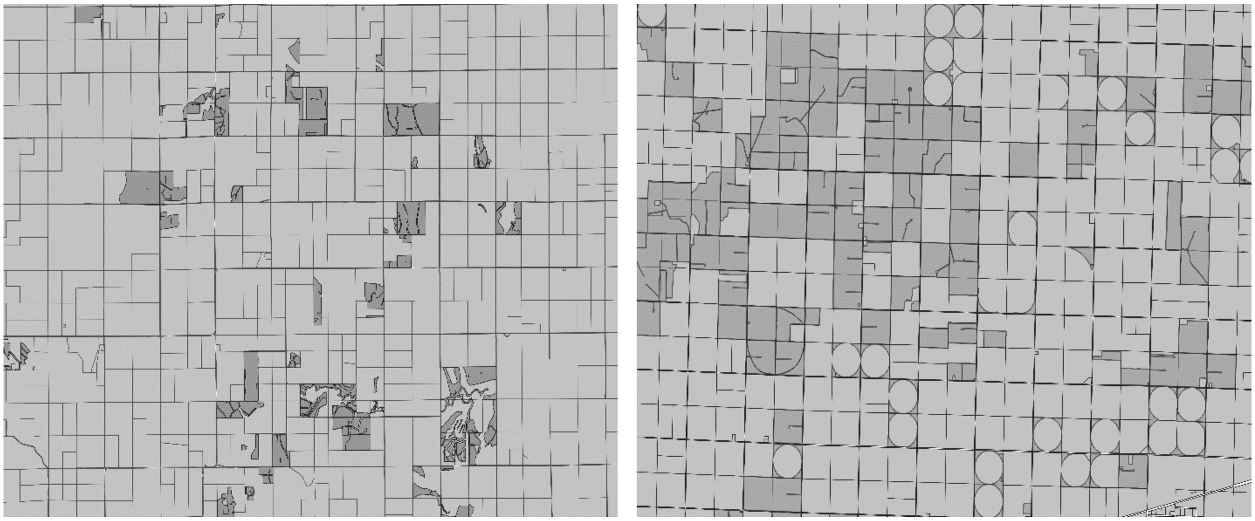

Figure 2. Example merging of CRP common land units (darker) and parcel boundaries (lighter) for two locations in Kansas. Darker shapes correspond to land enrolled into CRP.

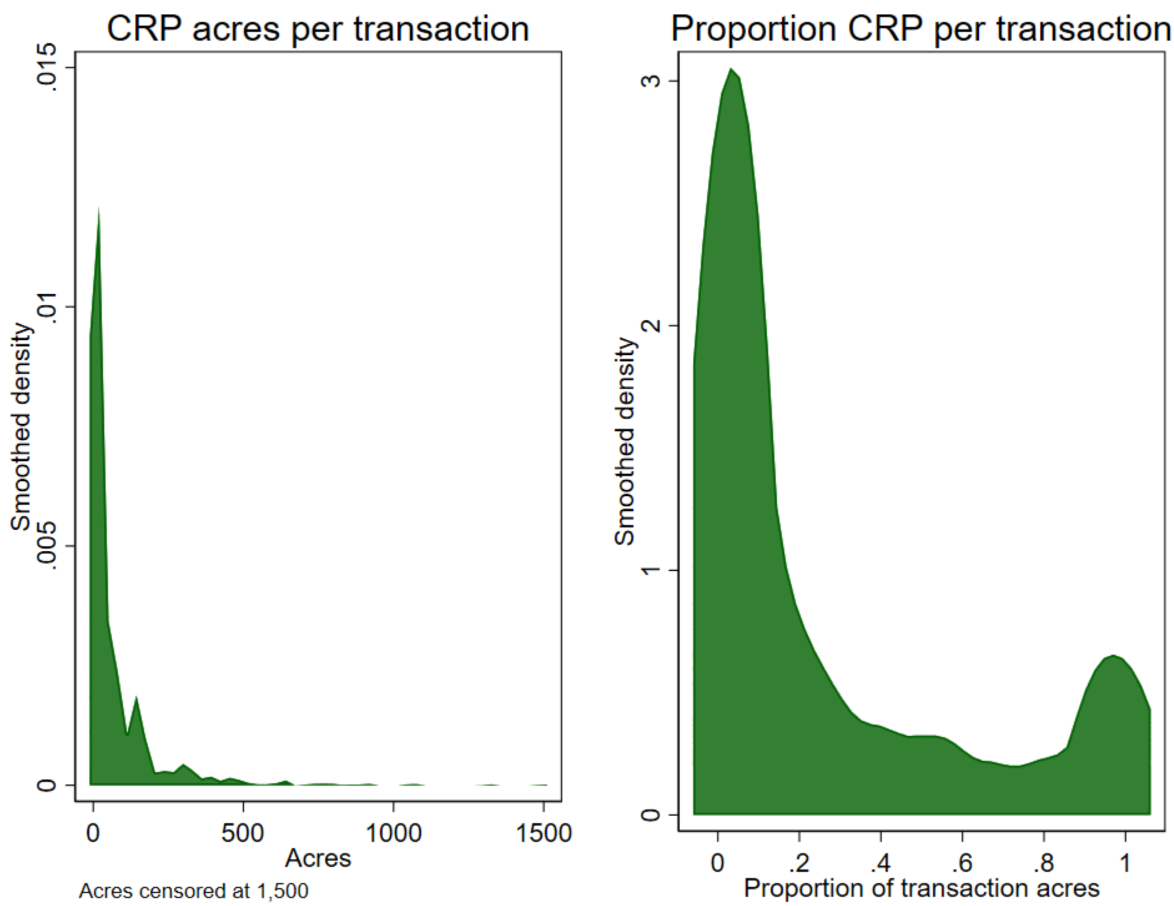

Figure 3. Smooth density plot of number of CRP acres per transaction (left) and proportion of CRP acres by transaction acreage (right).

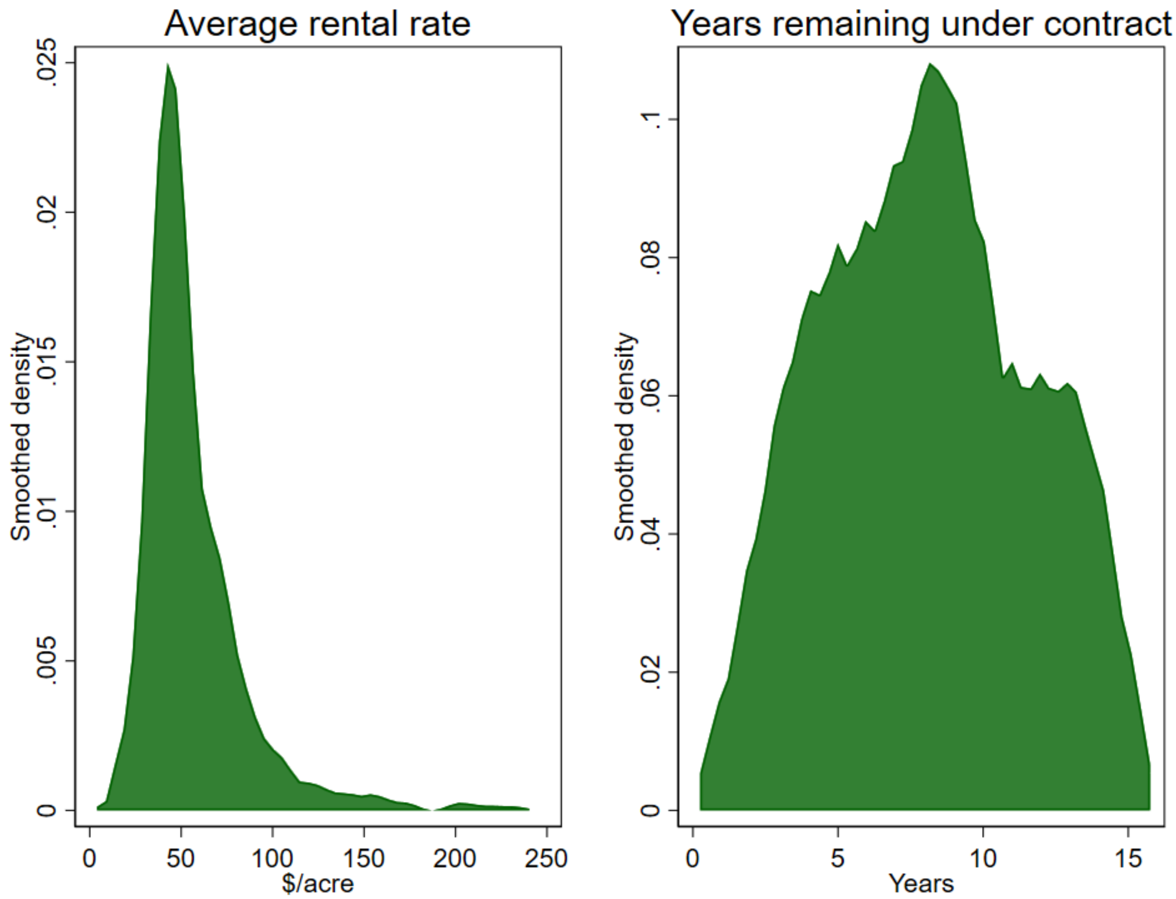

Figure 4. Smooth density plot of average CRP rental rate (left) and years remaining under contract at time of sale (right) for transactions.

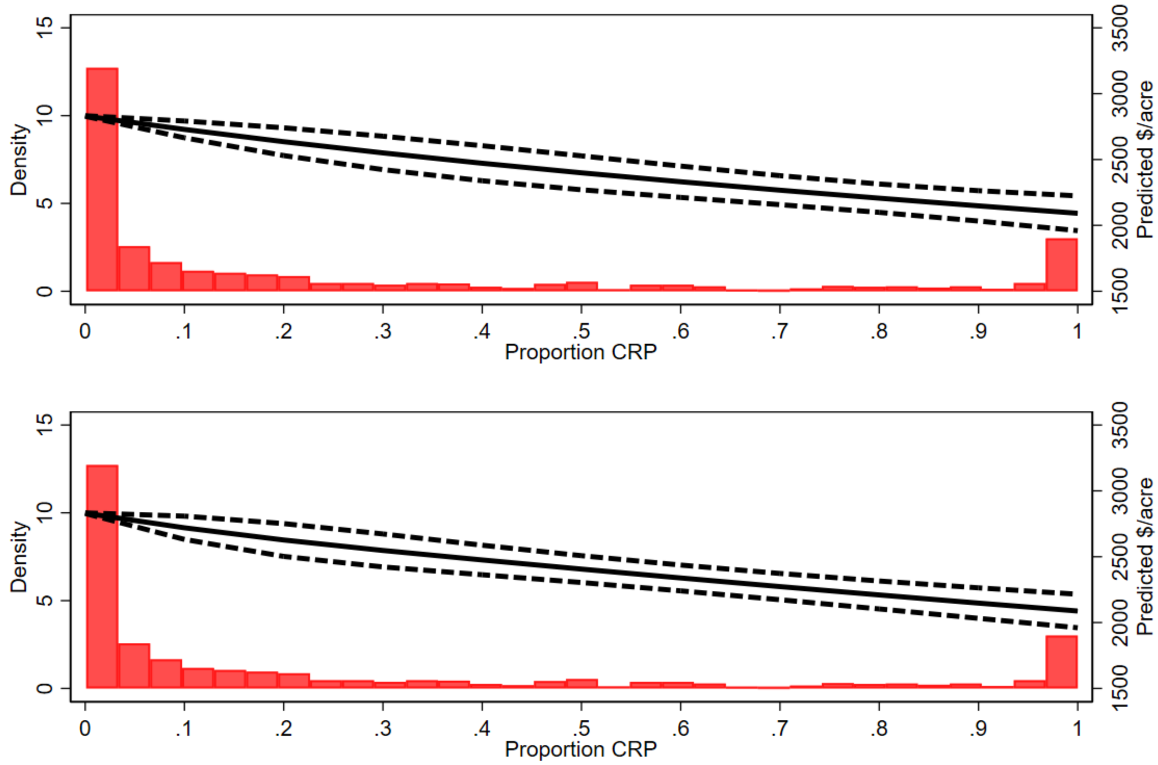

Figure 5. Predicted farmland values for different CRP enrollment proportions. Spline with three knots at the 10th, 50th, and 90th percentiles (top) and 25th, 50th, and 75th percentiles (bottom) of observed transactions.

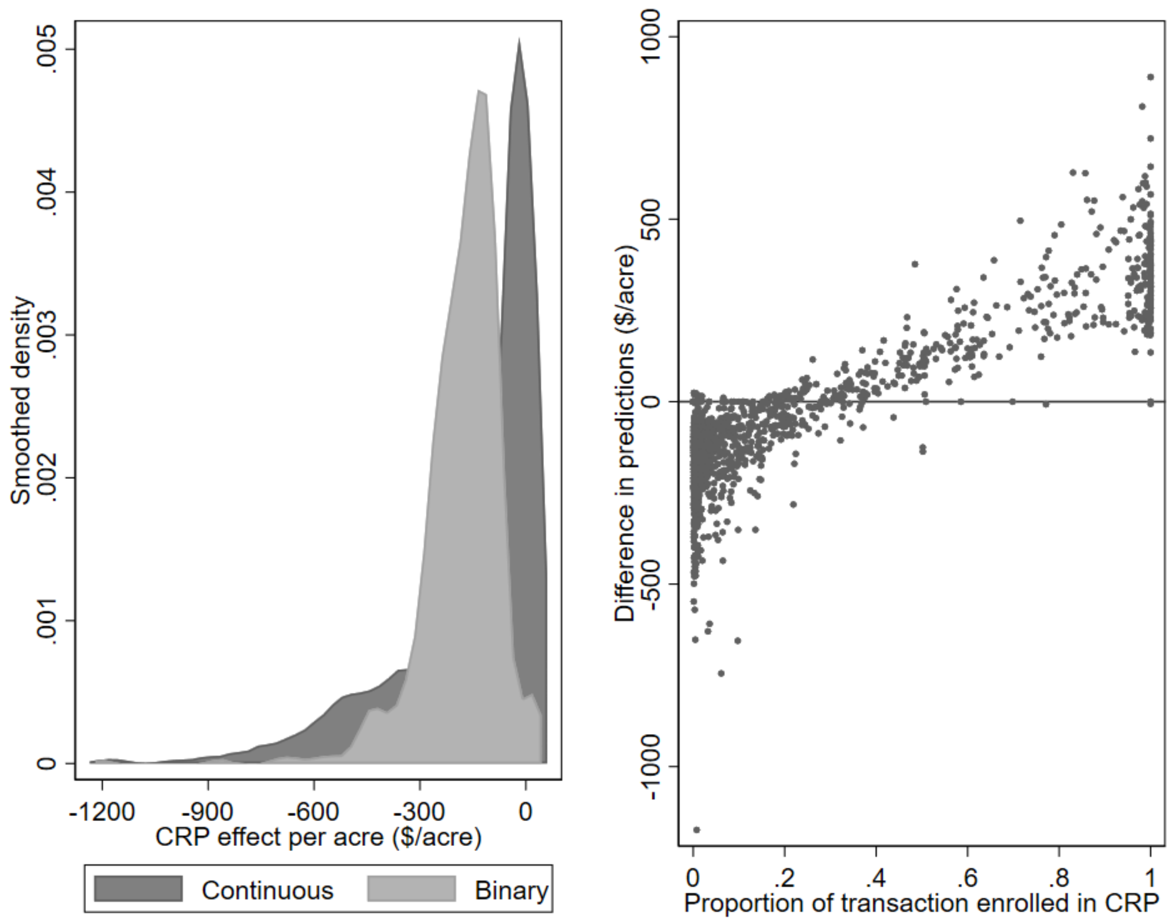

Figure 6. Distribution of predicted land value impacts of CRP enrollment using a continuous definition (proportion of acreage) and binary definition (presence/absence) of CRP treatment (left) and difference in predicted outcomes between continuous definition and binary definition (right).

Note: distribution censored at -$1200/acre and $25/acre.

Table 1. Summary statistics for transactions with CRP and transactions without CRP.

	Non-CRP sale			CRP sale			
	n	mean	sd	n	mean	sd	Diff
Price per acre	29,002	2,890.457	1,821.782	1,324	2,213.608	1,532.766	-196.651***
Proportion native grass	29,002	0.388	0.388	1,324	0.275	0.321	-0.053***
Proportion tame grass	29,002	0.068	0.190	1,324	0.012	0.060	-0.011***
Proportion dry cropland	29,002	0.503	0.401	1,324	0.641	0.346	0.067***
Proportion irrigated cropland	29,002	0.042	0.171	1,324	0.073	0.220	-0.004
Average corn cash price ($/bu)	29,002	6.160	1.932	1,324	5.952	1.661	-0.002
Average water deficit (inches)	29,002	14.488	9.482	1,324	22.098	8.807	0.051
Average degree days > 34C	29,002	14.358	9.365	1,324	15.503	7.914	0.207***
Average degree days 10-34C	29,002	2,296.932	149.261	1,324	2,291.131	125.833	0.126*
Slope (%)	29,002	3.850	2.976	1,324	3.519	2.515	0.097
Sand soil (%)	29,002	20.383	18.952	1,324	26.364	21.415	0.334
Silt soil (%)	29,002	49.129	13.340	1,324	47.525	15.813	-0.116
Clay soil(%)	29,002	30.488	9.203	1,324	26.111	8.077	-0.218*
Soil organic carbon (kg/m^2)	29,002	9.348	3.141	1,324	7.741	2.880	-0.075
Number of parcels in transaction	29,002	1.452	1.793	1,324	1.717	1.855	0.207***

Note: The Diff columns is the coefficient of a regression of CRP status on the variable, with agricultural district-year and township controls and clustered standard errors at the agricultural district-year level.

*** p<0.01

** p<0.05

* p<0.10

Table 2. Regression results for continuous measure of CRP in the transaction.

Proportion of CRP	-0.279***	-0.277***	-0.271***
	(0.035)	(0.032)	(0.036)
Marginal Effects:			
CRP average effect	-915.70***	-904.94***	-881.28***
	(97.86)	(90.17)	(100.03)
CRP rental rate (@ 25% CRP)		2.18***	2.12**
		(0.82)	(0.88)
Years remaining on contract (@ 25% CRP)		-14.25***	-14.09***
		(4.79)	(4.83)
Rental rate?	No	Yes	Yes
Time remaining?	No	Yes	Yes
Number of contracts?	No	Yes	Yes
Signup?	No	No	Yes
Observations	27,574	27,574	27,574

Standard errors clustered at agricultural district-year
Also controls for: land cover, county-year cash corn price, weather, parcel-level soil characteristics, and township and agricultural district-year effects
*** p<0.01, ** p<0.05, * p<0.10

Table 3. Regression results for binary (presence/absence) measure of CRP in the transaction.

Enrolled in CRP	-0.075***	-0.083***	-0.092***
	(0.014)	(0.014)	(0.017)
Marginal Effects:			
CRP average effect	-210.39***	-232.65***	-257.04***
	(40.01)	(40.11)	(48.07)
CRP rental rate		1.73	1.12
		(0.86)	(0.94)
Years remaining on contract		-13.20**	-11.06*
		(6.25)	(6.54)
Rental rate?	No	Yes	Yes
Time remaining?	No	Yes	Yes
Number of contracts?	No	Yes	Yes
Signup?	No	No	Yes
Observations	27,574	27,574	27,574

Standard errors clustered at agricultural district-year
Also controls for: land cover, county-year cash corn price, weather, parcel-level soil characteristics, and township and agricultural district-year effects
*** p<0.01, ** p<0.05, * p<0.10

Table 4. Agricultural district-specific regression results using a continuous measure of CRP in the transaction.

	Proportional effect	Level effect	Obs.	CRP sales
NW District	-0.278***	-752.80***	2,221	125
WC District	-0.331***	-786.06***	1,885	199
SW District	-0.301***	-665.80***	3,230	421
NC District	-0.205***	-697.77***	3,357	95
C District	-0.324***	-1076.60***	3,503	153
SC District	-0.317***	-1030.27***	4,123	137
NE District	-0.363	-2201.43	2,842	42
EC District	0.032	109.67	3,960	128
SE District	-0.146	-404.68	5,096	29
Spatial Controls		County		
Temporal Controls		Year		
Rental rate?		Yes		
Time remaining?		Yes		
Number of contracts?		Yes		
Signup?		Yes		

Standard errors clustered at year
Also controls for: land cover, county-year cash corn price, weather, parcel-level soil characteristics, and county and year effects
*** p<0.01, ** p<0.05, * p<0.10

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Reviewer Appendix

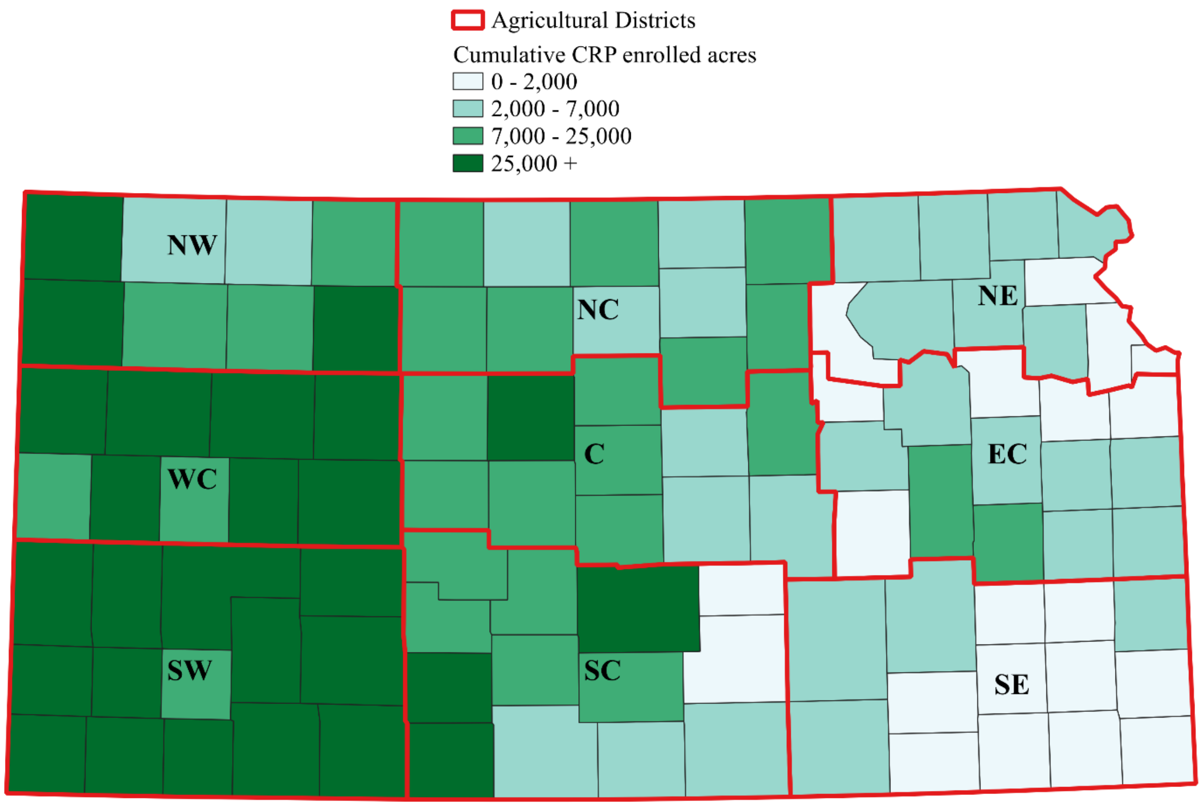

Figure A1. Cumulative CRP enrolled acres by county and agricultural district 2010-2024.

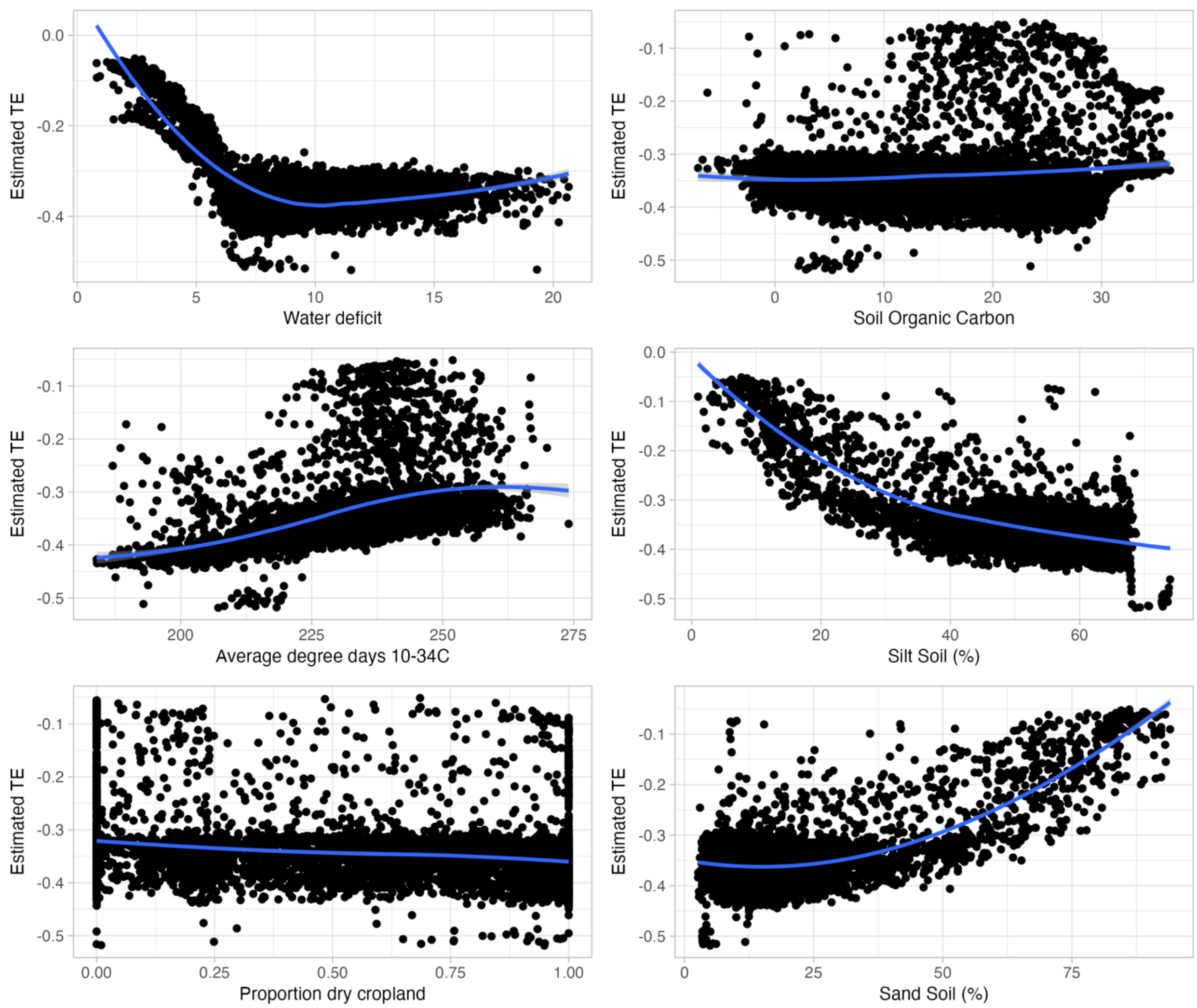

Figure A2. Heterogeneous treatment effects across key explanatory variables.

Table A1. Full regression results for continuous measure of CRP in the transaction.

Proportion of CRP	-0.279***	-0.277***	-0.271***	-0.271***
	(0.035)	(0.032)	(0.036)	(0.036)
Proportion tame grass	0.087***	0.087***	0.087***	0.087***
	(0.019)	(0.019)	(0.019)	(0.019)
Proportion dry cropland	0.258***	0.257***	0.257***	0.257***
	(0.019)	(0.019)	(0.019)	(0.019)
Proportion irrigated cropland	1.879***	1.877***	1.877***	1.873***
	(0.026)	(0.026)	(0.026)	(0.026)
Average corn cash price	0.000	-0.000	-0.000	0.001
	(0.018)	(0.018)	(0.018)	(0.018)
Average water deficit	-0.007**	-0.007**	-0.007**	-0.007**
	(0.002)	(0.002)	(0.002)	(0.002)
Average degree days > 34C	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Average degree days 10-34C	-0.000	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Slope	-0.018***	-0.018***	-0.018***	-0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
Sand soil	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Silt soil	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Soil organic carbon	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Number of parcels in transaction	0.007*	0.007*	0.007*	0.007*
	(0.004)	(0.004)	(0.004)	(0.004)
Total farm acres	-0.020***	-0.020***	-0.020***	-0.020***
	(0.003)	(0.003)	(0.003)	(0.003)
Variables interacted with CRP parcels				
Average rental rate		0.003**	0.003*	0.003*
		(0.001)	(0.001)	(0.001)
Number of CRP contracts		-0.002	-0.001	-0.011
		(0.019)	(0.020)	(0.021)
Years remaining on contract		-0.022**	-0.021**	-0.020**
		(0.007)	(0.007)	(0.008)
Grassland signup			-0.165	
			(0.169)	
Continuous signup			-0.023	-0.021
			(0.070)	(0.070)

Marginal Effects:				
CRP average effect	-915.70***	-904.94***	-881.28***	-882.29***
	(97.86)	(90.17)	(100.03)	(100.41)
Observations	27,574	27,574	27,574	27,537

Standard errors clustered at agricultural district-year

Also controls for township and agricultural district-year effects

*** p<0.01, ** p<0.05, * p<0.10

Table A2. Full regression results for continuous measure of CRP in the transaction (using county-level controls).

Proportion of CRP	-0.318***	-0.312***	-0.317***
	(0.031)	(0.030)	(0.032)
Proportion tame grass	0.108***	0.108***	0.108***
	(0.019)	(0.019)	(0.019)
Proportion dry cropland	0.323***	0.323***	0.323***
	(0.020)	(0.020)	(0.020)
Proportion irrigated cropland	2.134***	2.132***	2.132***
	(0.025)	(0.025)	(0.025)
Average corn cash price	0.004	0.004	0.004
	(0.018)	(0.018)	(0.018)
Average water deficit	-0.012***	-0.012***	-0.012***
	(0.003)	(0.003)	(0.003)
Average degree days > 34C	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)
Average degree days 10-34C	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Slope	-0.016***	-0.016***	-0.016***
	(0.002)	(0.002)	(0.002)
Sand soil	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)
Silt soil	0.010***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)
Soil organic carbon	0.005*	0.005*	0.005*
	(0.002)	(0.002)	(0.002)
Number of parcels in transaction	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)
Total farm acres	-0.023***	-0.023***	-0.023***
	(0.003)	(0.003)	(0.003)
<u>Variables interacted with CRP parcels</u>			
Average rental rate		0.004***	0.004**
		(0.001)	(0.001)
Number of CRP contracts		0.009	0.008
		(0.018)	(0.018)
Years remaining on contract		-0.014*	-0.014*
		(0.006)	(0.006)
Grassland signup			0.038
			(0.172)
Continuous signup			0.027

			(0.062)
Marginal Effects:			
CRP average effect	-1076.06***	-1048.66***	-1066.47***
	(87.33)	(84.74)	(89.47)
CRP rental rate (@ 25% CRP)		2.35***	2.28***
		(0.71)	(0.83)
Years remaining on contract (@ 25% CRP)		-9.14**	-9.11**
		(3.96)	(4.05)
Observations	30,217	30,217	30,217

Standard errors clustered at agricultural district-year

Also controls for county and agricultural district-year effects

*** p<0.01, ** p<0.05, * p<0.10

Table A3. Full regression results for restricted cubic spline measure of CRP in the transaction.

Proportion of CRP (1st spline)	-0.340**	-0.382**
	(0.131)	(0.184)
Proportion of CRP (2nd spline)	1.335	0.573
	(0.958)	(0.460)
Proportion tame grass	0.087***	0.087***
	(0.019)	(0.019)
Proportion dry cropland	0.257***	0.257***
	(0.019)	(0.019)
Proportion irrigated cropland	1.878***	1.879***
	(0.026)	(0.026)
Average corn cash price	-0.000	-0.000
	(0.018)	(0.018)
Average water deficit	-0.007**	-0.007**
	(0.002)	(0.002)
Average degree days > 34C	0.000	0.000
	(0.002)	(0.002)
Average degree days 10-34C	-0.000	-0.000
	(0.002)	(0.002)
Slope	-0.018***	-0.018***
	(0.003)	(0.003)
Sand soil	0.005***	0.005***
	(0.001)	(0.001)
Silt soil	0.009***	0.009***
	(0.001)	(0.001)
Soil organic carbon	0.000	0.000
	(0.002)	(0.002)
Number of parcels in transaction	0.007*	0.007*
	(0.004)	(0.004)
Total farm acres	-0.020***	-0.020***
	(0.003)	(0.003)
Variables interacted with CRP parcels		
Average rental rate	0.003**	0.003**
	(0.001)	(0.001)
Number of CRP contracts	-0.001	-0.001
	(0.020)	(0.020)
Years remaining on contract	-0.021**	-0.021**
	(0.007)	(0.007)
Grassland signup	-0.157	-0.160
	(0.170)	(0.170)

Continuous signup	-0.021	-0.017
	(0.070)	(0.071)
Marginal Effects:		
CRP average effect	-1153.75***	-1334.63***
	(360.16)	(506.96)
CRP rental rate (@ 25% CRP)	2.22***	2.19***
	(0.81)	(0.82)
Years remaining on contract (@ 25% CRP)	-13.73***	-13.62***
	(4.72)	(4.68)
Observations	27,528	27,528

Standard errors clustered at agricultural district-year

Also controls for township and agricultural district-year effects

*** p<0.01, ** p<0.05, * p<0.10

Table A4. Full regression results using only transactions with CRP.

Proportion of CRP	-0.205***	-0.231***
	(0.032)	(0.042)
Average rental rate	0.001	0.003*
	(0.001)	(0.001)
Number of CRP contracts	0.005	-0.006
	(0.014)	(0.015)
Years remaining on contract	-0.003	-0.009
	(0.003)	(0.007)
Grassland signup	0.001	-0.060
	(0.137)	(0.159)
Continuous signup	-0.046	-0.110*
	(0.030)	(0.047)
Proportion tame grass	-0.230	-0.127
	(0.228)	(0.155)
Proportion dry cropland	0.146*	-0.004
	(0.061)	(0.053)
Proportion irrigated cropland	2.426***	1.909***
	(0.099)	(0.076)
Average corn cash price	0.125	0.102
	(0.080)	(0.081)
Average water deficit	0.002	-0.020
	(0.008)	(0.015)
Average degree days > 34C	0.009	0.013
	(0.008)	(0.013)
Average degree days 10-34C	-0.000	-0.024*
	(0.004)	(0.012)
Slope	-0.043***	-0.044***
	(0.009)	(0.011)
Sand soil	0.011*	0.019**
	(0.005)	(0.006)
Silt soil	0.014*	0.025**
	(0.006)	(0.008)
Soil organic carbon	0.014	0.002
	(0.009)	(0.016)
Number of parcels in transaction	0.016	0.047**
	(0.013)	(0.017)
Total farm acres	-0.016*	-0.022*
	(0.008)	(0.010)
Marginal Effects:		

CRP average effect	-526.38***	-673.64***
	(81.34)	(115.85)
Spatial controls	County	Township
Observations	1,329	1,311

Standard errors clustered at agricultural district-year
Also controls for agricultural district-year effects
*** p<0.01, ** p<0.05, * p<0.10

Table A5. Full regression results for binary measure of CRP in the transaction.

Enrolled in CRP	-0.075***	-0.083***	-0.092***	-0.093***
	(0.014)	(0.014)	(0.017)	(0.019)
Proportion tame grass	0.085***	0.086***	0.086***	0.086***
	(0.019)	(0.019)	(0.019)	(0.019)
Proportion dry cropland	0.254***	0.254***	0.254***	0.254***
	(0.019)	(0.019)	(0.019)	(0.019)
Proportion irrigated cropland	1.888***	1.887***	1.884***	1.880***
	(0.026)	(0.026)	(0.026)	(0.026)
Average corn cash price	-0.000	-0.000	-0.000	0.000
	(0.018)	(0.018)	(0.018)	(0.018)
Average water deficit	-0.007**	-0.007**	-0.007**	-0.007**
	(0.002)	(0.002)	(0.002)	(0.002)
Average degree days > 34C	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Average degree days 10-34C	-0.000	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Slope	-0.018***	-0.018***	-0.018***	-0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
Sand soil	0.006***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Silt soil	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Soil organic carbon	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Number of parcels in transaction	0.007*	0.007*	0.007*	0.007*
	(0.004)	(0.004)	(0.004)	(0.004)
Total farm acres	-0.020***	-0.020***	-0.020***	-0.020***
	(0.003)	(0.003)	(0.003)	(0.003)
Variables interacted with CRP parcels				
Average rental rate		0.001*	0.001	0.001
		(0.000)	(0.000)	(0.000)
Number of CRP contracts		0.003	0.003	0.000
		(0.012)	(0.012)	(0.013)
Years remaining on contract		-0.006*	-0.005	-0.005
		(0.003)	(0.003)	(0.003)
Grassland signup			-0.159	
			(0.125)	
Continuous signup			0.036	0.037
			(0.026)	(0.027)

Marginal Effects:				
CRP average effect	-210.39***	-232.65***	-257.04***	-259.81***
	(40.01)	(40.11)	(48.07)	(48.75)
Observations	27,574	27,574	27,574	27,537

Standard errors clustered at agricultural district-year

Also controls for township and agricultural district-year effects

*** p<0.01, ** p<0.05, * p<0.10

Table A6. Full regression results for binary measure of CRP for partial-farm and whole-farm enrollment.

Enrolled in CRP	-0.064***	-0.259***
	(0.014)	(0.030)
Proportion tame grass	0.087***	0.091***
	(0.019)	(0.019)
Proportion dry cropland	0.256***	0.260***
	(0.019)	(0.019)
Proportion irrigated cropland	1.881***	1.860***
	(0.026)	(0.027)
Average corn cash price	-0.001	-0.001
	(0.018)	(0.019)
Average water deficit	-0.007**	-0.007**
	(0.002)	(0.002)
Average degree days > 34C	0.000	0.000
	(0.002)	(0.002)
Average degree days 10-34C	-0.001	-0.000
	(0.002)	(0.002)
Slope	-0.018***	-0.017***
	(0.003)	(0.003)
Sand soil	0.006***	0.005***
	(0.001)	(0.001)
Silt soil	0.009***	0.009***
	(0.001)	(0.001)
Soil organic carbon	0.001	-0.001
	(0.002)	(0.002)
Number of parcels in transaction	0.007*	0.007
	(0.004)	(0.004)
Total farm acres	-0.020***	-0.020***
	(0.003)	(0.003)
Variables interacted with CRP parcels		
Average rental rate	0.001	0.005***
	(0.000)	(0.001)
Number of CRP contracts	0.013	-0.034
	(0.013)	(0.029)
Years remaining on contract	-0.006*	-0.015
	(0.003)	(0.008)
Marginal Effects:		
CRP average effect	-179.94***	-729.04***
	(39.33)	(83.25)

Average rental rate	0.99	6.52***
	(0.86)	(1.10)
Years remaining on contract	-14.11**	-18.85*
	(6.86)	(10.61)
Observations	27,431	26,411

Column 1: partial-farm enrollment. Column 2: whole-farm enrollment.
Standard errors clustered at agricultural district-year
Also controls for township and agricultural district-year effects
*** p<0.01, ** p<0.05, * p<0.10

Table A7. Full regression results for agricultural district-specific regressions using continuous measure of CRP in the transaction.

	District								
	NW	WC	SW	NC	C	SC	NE	EC	SE
Proportion of CRP	-0.278***	-0.331***	-0.301***	-0.205***	-0.324***	-0.317***	-0.363	0.032	-0.146
	(0.069)	(0.052)	(0.055)	(0.051)	(0.082)	(0.069)	(0.436)	(0.154)	(0.142)
Proportion tame grass				-0.077	0.018	0.024	0.054*	0.143***	0.120***
				(0.155)	(0.097)	(0.076)	(0.024)	(0.026)	(0.029)
Proportion dry cropland	0.641***	0.290***	0.323***	0.518***	0.223***	-0.004	0.440***	0.246***	0.253***
	(0.048)	(0.057)	(0.045)	(0.059)	(0.027)	(0.047)	(0.036)	(0.046)	(0.033)
Proportion irrigated cropland	2.562***	1.657***	2.296***	1.941***	1.312***	1.834***	1.103***	1.876***	0.313
	(0.040)	(0.088)	(0.039)	(0.091)	(0.052)	(0.062)	(0.123)	(0.104)	(0.306)
Average corn cash price	-0.008	-0.035	0.002	0.218**	-0.101*	-0.084	0.034	0.012	-0.002
	(0.031)	(0.024)	(0.031)	(0.070)	(0.051)	(0.045)	(0.076)	(0.038)	(0.018)
Average water deficit	-0.016*	-0.016*	-0.001	-0.011*	-0.033***	-0.034***	-0.003	-0.005	-0.002
	(0.007)	(0.008)	(0.011)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)	(0.005)
Average degree days > 34C	0.014*	0.009	-0.015*	-0.008	0.004	-0.000	-0.027	0.002	0.013**
	(0.006)	(0.007)	(0.007)	(0.004)	(0.003)	(0.004)	(0.014)	(0.008)	(0.005)
Average degree days 10-34C	-0.011*	-0.016***	0.005	0.004	0.017***	0.000	-0.007*	-0.008**	0.005*
	(0.005)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)
Slope	-0.030***	-0.070***	-0.023***	-0.030***	-0.040***	-0.013**	-0.019***	0.002	0.007*
	(0.004)	(0.012)	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.006)	(0.003)
Sand soil	0.020***	0.003	-0.008	0.009***	0.004**	0.003*	0.005*	0.011***	0.012***
	(0.004)	(0.005)	(0.004)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)
Silt soil	0.022***	-0.001	-0.009	0.011**	0.003*	0.002	0.012***	0.019***	0.014***
	(0.005)	(0.005)	(0.006)	(0.003)	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)
Soil organic carbon	0.022***	0.035***	0.002	0.011**	0.018***	0.028***	-0.013**	0.006	0.010***
	(0.003)	(0.006)	(0.006)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.002)
Number of parcels in transaction	0.010	0.009	0.017	-0.021	0.015	0.005***	0.019*	-0.007	0.003
	(0.012)	(0.014)	(0.010)	(0.016)	(0.014)	(0.001)	(0.008)	(0.006)	(0.005)

Total farm acres	-0.017*	-0.006	-0.008	-0.040***	-0.037***	-0.019**	-0.088***	-0.034***	-0.018***
	(0.007)	(0.007)	(0.006)	(0.008)	(0.008)	(0.006)	(0.012)	(0.005)	(0.004)
Variables interacted with CRP									
Average rental rate	0.002	0.005	0.004***	0.005	0.000	-0.000	0.002	0.003	0.079
	(0.007)	(0.005)	(0.001)	(0.003)	(0.003)	(0.004)	(0.007)	(0.004)	(0.050)
Number of CRP contracts	0.041	-0.038	-0.042	-0.123	0.128*	0.038	-0.195	0.032	0.128
	(0.039)	(0.047)	(0.029)	(0.102)	(0.058)	(0.032)	(0.197)	(0.102)	(0.456)
Years remaining on contract	-0.026	-0.042***	0.012	0.085***	-0.015	-0.026**	-0.158*	0.006	-0.245
	(0.013)	(0.010)	(0.011)	(0.021)	(0.013)	(0.008)	(0.083)	(0.033)	(0.160)
Grassland signup		0.934**	-0.034			1.618***		-0.922***	
		(0.245)	(0.274)			(0.113)		(0.572)	
Continuous signup	-0.182	-0.098	0.026	-0.163	0.121	0.592**	-0.529	0.188	-0.433
	(0.302)	(0.065)	(0.061)	(0.359)	(0.172)	(0.157)	(0.851)	(0.206)	(0.867)
Marginal Effects:									
CRP average effect	-752.80***	-786.06***	-665.80***	-697.77***	-1076.60***	-1030.27***	-2201.43	109.67	-404.68
	(162.11)	(96.89)	(104.35)	(150.84)	(224.74)	(188.73)	(2057.20)	(498.87)	(392.84)
Observations	2,221	1,885	3,230	3,357	3,503	4,123	2,842	3,960	5,096

Standard errors clustered at year

Also controls for county and year effects

*** p<0.01, ** p<0.05, * p<0.10