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Increased Usage Of Cash Rent: Factors Influencing Illinois Farmland Leases Over The Past Two Decades

Jacob Styan
Illinois State University, jacobstyan13@gmail.com

INCREASED USAGE OF CASH RENT: FACTORS INFLUENCING ILLINOIS FARMLAND LEASES OVER THE PAST TWO DECADES

JACOB STYAN

50 Pages

In recent decades, cash rent leases have become increasingly popular amongst farm landowners in Illinois. Since 1995, a 44 percent rise has been seen in cash rent lease usage in Northern Illinois, a 105 percent increase in Southern Illinois, and a 117 percent increase in Central Illinois for acres enrolled in the Illinois Farm Business Farm Management Association. The rise in cash rent lease usage has been attributed to many factors such as crop yields, commodity prices, commodity payments, and crop insurance. This study aims to examine the potential factors driving the shift in use of cash rent leases in Illinois. Using data from the USDA National Agricultural Statistics Service (USDA-NASS), the Environmental Working Group (EWG), and University of Illinois farmdoc, factors influencing cash rent leases in Illinois were examined. Data was collected from all 102 counties in Illinois over a 21-year period. Comparisons were made across three regions in Illinois (Northern, Central, and Southern) using a fixed effects regression model. Results indicate that crop insurance payments ($p < 0.001$), corn price ($p < 0.05$), soybean price ($p < 0.05$), corn revenue ($p < 0.05$), soybean revenue ($p < 0.05$), and commodity payments ($p < 0.05$) have all influenced the increasing use of cash rent leases in Illinois. Corn and soybean yield were found to have no influence on increasing cash rent usage in Illinois. While only 5,500 Illinois farms were examined in this study, the findings can be viewed as a starting point for why the usage of cash rent leases are increasing in Illinois. With

agriculture consistently changing, any variations that occur to the variables examined in this study could potentially have major ramifications on the leasing market in the years to come.

KEYWORDS: Cash Rent Usage; Farmland Leasing; Fixed Effects Model

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JACOB STYAN

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JACOB STYAN

COMMITTEE MEMBERS:

Maria A. Boerngen, Chair

Michael J. Barrowclough

Justin W. Rickard

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CHAPTER I: GENERAL INTRODUCTION

This research study aims to better understand why cash rent leases have been increasingly used in recent years in Illinois. From 1995 to 2015, cash rent usage saw an increase from 41 to 59 percent (a 44 percent rise) in Northern Illinois, 20 to 41 percent (a 105 percent rise) in Southern Illinois, and 18 to 39 percent (a 117 percent rise) in Central Illinois, among farms enrolled in the Illinois Farm Business Farm Management Association (FBFM) (Lattz, 2016; Lattz and Zwilling, 2020; Schnitkey, 2002; Zwilling, Krapf, and Raab, 2013). Following trends toward more cash rent lease usage, cash rent prices have also been increasing. In Illinois, from 1987 to 2014, cash rent prices increased, on average, 3.6 percent annually. Since 2006, cash rent prices have increased annually by 7.4 percent (Schnitkey, 2017a).

A high proportion of Illinois farmland falls under rental agreements. According to the 2017 Census of Agriculture, just over 58 percent of farmland in Illinois was leased, while nearly 42 percent was owner-operated. Nationally, it was found that 39 percent of all farmland acres in the U.S. were rented, with the remaining 61 percent being owner operated (USDA-NASS, 2017). Bigelow, Borchers, and Hubbs (2016) found that of the 911 million acres of farmland currently being used in the contiguous 48 states, nearly thirty-nine percent of that farmland was being rented. Twenty percent of the rented land, or 70 million acres, was found to be rented by "operator landlords" (Bigelow, Borchers, and Hubbs, 2016, p. iii). These are landowners who currently farm but also rent out a portion of their land. The other eighty percent of rented land, or 283 million acres, came from landowners who do not participate in farming. Bigelow, Borchers, and Hubbs (2016) found that over seventy percent of the rented acres in the survey used a fixed-cash rent agreement.

Absentee landowners play a large role in cash rent lease usage. For the purposes of this study, absentee landowners are defined as landowners who do not permanently live on the property that they own (Petrzelka, 2012; Petrzelka and Armstrong, 2015). Absentee landownership has been increasing in recent years, and it has been observed that absentee landowners are more likely to try use cash rent leases to provide stable returns (Barry et al., 2000). Using cash rent leases to provide consistent returns is a way to mitigate risk in contract selection. Share rent contracts have a greater income risk for landowners, due to possible changes in crop yields and the potential of negative returns, which is different from cash rent contracts (Harwood et al., 1999). Cash rent contracts guarantee a set income per acre, making them inherently less risky for landowners.

The purpose of this study is to better understand the factors that potentially affect usage of cash rent leases in Illinois in recent decades. Because of the challenges these trends can present to farm operators, it is important to understand why cash rent usage has increased at the same time that per-acre cash rent prices have also increased. Seeing a significant rise in cash rent lease usage becomes a problem especially when coupled with lowering farm incomes because farmers may not be able to afford to pay such high prices for land rental. When cash rent prices increase, it becomes even more challenging for farmers to earn positive returns on cash rented land. With farmland being a finite resource, trending towards more cash rent lease usage becomes an issue, especially when farmers who cash rent their land earn negative returns on those acres. Cash rent returns have been trending downward since 2011, with negative returns being experienced in 2014, 2015, and 2017. Slightly positive returns were seen in 2016 due to higher yields and high Agricultural Risk Coverage (ARC) payments (Schnitkey, 2017a; Schnitkey, 2017b). Determining which factors make the biggest impact on leases will also help

with identifying why cash rent leases are growing in popularity, helping both farmers and landowners understand these changes. This study identifies factors that may influence the shift towards cash rent leases and what can be done to help landowners and operators select contracts that will be mutually beneficial to both parties involved going forward.

Thesis Organization

This thesis is an alternate format. It includes a general introduction, a manuscript formatted according to the Journal of the American Society of Farm Managers and Rural Appraisers, and a review of the literature.

CHAPTER II: MANUSCRIPT

Abstract

In recent years, cash rent leases have become increasingly popular amongst farm landowners in Illinois. Since 1995, cash rent usage has increased 44%, 105%, and 117% in Northern, Southern, and Central Illinois, respectively for acres enrolled in FBFM. Using data from USDA-NASS, EWG, FBFM, and University of Illinois farmdoc, information on several variables was collected from all 102 counties in Illinois over a 21-year period to examine their impact on the leasing market. Results indicate crop insurance payments, corn price, soybean price, corn revenue, soybean revenue, and commodity payments have influenced the increasing use of cash rent leases in Illinois.

Introduction and Background

Over the last two decades, Illinois has experienced a dramatic increase in the use of cash rent leases. From 1995 to 2015, cash rent usage saw an increase from 41 to 59 percent (a 44 percent rise) in Northern Illinois, 20 to 41 percent (a 105 percent rise) in Southern Illinois, and 18 to 39 percent (a 117 percent rise) in Central Illinois, among farms enrolled in FBFM (Lattz, 2016; Lattz and Zwilling, 2020; Schnitkey, 2002; Zwilling, Krapf, and Raab, 2013). These three regions are illustrated in Figure 1, with their respective changes shown in Figures 2-4. Following the trend towards more cash rent lease usage, cash rent prices have also been increasing. In Illinois, from 1987 to 2014, cash rent prices increased, on average, 3.6 percent annually. Since 2006, cash rent prices have increased by 7.4 percent annually (Schnitkey, 2017a).

Based upon the 2017 Census of Agriculture, it was found that just over 58 percent of farmland in Illinois is leased, while nearly 42 percent is owner-operated. Nationally, it was found

that 39 percent of all farmland acres in the U.S. are rented, with the remaining 61 percent being owner operated (USDA-NASS, 2017). When you couple more rented acres than the national average with increasing cash rent usage and increasing cash rent prices, it brings to light an interesting question of why these changes are occurring. This study aims to identify the factors that may influence the shift towards cash rent leases being used in Illinois.

Literature Review

This study primarily focuses on cash rent leases while examining share rent leases as well. Typically, a cash rent lease payment will see the operator pay the landowner a set fee per acre. The operator will then furnish the cost of all inputs on their own. After the growing season concludes, the operator then receives all the crop produced on that rented land. On the other hand, share rent leases involve the landowner and operator splitting most of the input costs and the crop that is produced on the land. Input costs typically include things such as seed, fertilizer, and chemical costs. A 50/50 split is the most common crop share agreement in Illinois and selling the crop that is produced on the land is how both parties receive payment. (Lattz, 2017a; Lattz, n.d.) The date when farmland leases normally begin in Illinois is March 1st. Typically, any leases would then end on the last day of February of the following year. The generally accepted deadline to terminate or make changes to a lease is four months prior to the ending date of the lease. Most leases will automatically renew if nothing is done, so missing the deadline will allow the lease to remain the same for another year (Troendle, 2019).

While limited research has been conducted on the increasing usage of cash rent leases in Illinois, there has been research done in related areas, mainly focused on land values and cash rent values. Previous studies have identified several factors that have been known to affect land

and cash rent values. These factors include corn and soybean prices, corn and soybean yields, government payments, and crop insurance payments amongst others.

Understanding these factors and how they influence cash rent usage becomes especially relevant to agriculture in Illinois when you consider that the majority of farmland acres in the state are leased. According to the 2017 Census of Agriculture, just over 58 percent of farmland in Illinois is leased, and nearly 42 percent is owner-operated. Nationally, it was found that 39 percent of all farmland acres in the U.S. are rented, with the remaining 61 percent being owner operated (USDA-NASS, 2017).

To understand why lease trends are changing so much, we must understand what factors affect the land market. Helmers, Shaik, and Johnson (2005) found that cash crop receipts and government payments were consistent with income generated from professionally managed farmland, meaning that recent cash crop receipts and government payments were strongly considered when looking into anticipated level of return off of the rented land. However, cash receipts are generally uncertain due to changing markets and they only account for gross revenue and not the net revenue. Government payments also have uncertainty due to the nature of changes being made to farm programs. Recent returns from crop receipts and government payments that farmers have received play a major role in their expectations for the income they expect to earn in upcoming years and help them make their decisions going forward (Helmers, Shaik, and Johnson, 2005).

Choosing between different types of leasing contracts also has an effect on changes in income levels received in Illinois. With a crop share lease there is a level of protection against revenue loss, but when using a cash rent lease, the loss risk is higher because it cannot be covered entirely by crop insurance (Paulson, Schnitkey, and Sherrick, 2010). It was also noted

that when utilizing a cash rent lease, as the price per acre of the lease increases, the greater the risk of lost income is for the operator. When farms use more cash rent lease at higher prices, they become much more likely to experience losses in income (Paulson, 2012).

Sotomayor, Ellinger, and Barry (2000) conducted a survey of Illinois grain farmers that resulted in details on 1,224 leases. Using a probit estimation and a least squares regression, they identified factors affecting the cash rent versus crop share contract choice and the expected level of cash rent prices. It was observed that changes in revenue, soil productivity, tract size, non-farm income, length of business relationship between landowner and operator, debt-to-asset ratio, net worth, and number of landowners on one farm were all significant in choosing between a cash rent and crop share contract. The variables that were found to affect cash rent prices include soil productivity, tract size, and net worth.

There is also a possible connection between cash rent values and actual land values. Ibendahl and Griffin (2013) looked at whether cash rent prices or land prices were the determining factor in setting the market prices for both. They found that cash rent prices will follow land prices pretty steadily until land prices start to drop, in which case cash rent prices do not drop at the same rate. Some thoughts as to why this occurs are tenants have a large impact on changes in cash rent prices. Tenants can affect cash rent prices by both helping slow down increases and helping drops in price occur faster. It was also noted that other pressures being placed on land values have an effect on the changes that occur between land and cash rent prices (Ibendahl and Griffin, 2013).

Zhang, Zhang, and Hart (2018) examined how industry professionals' thoughts on future commodity prices affects their predictions of future farmland values. The study surveyed farm managers, real estate brokers, rural appraisers and others attending the Soil Management and

Land Valuation (SMLV) conference at Iowa State University to capture their perspectives on future land and commodity prices. They concluded that crop price changes and expected land value changes correlate with each other. The correlation was the strongest in the medium-term land forecast. They found that a one percent increase in corn prices would result in a 0.2 percent increase in land prices in the short term (2016-2017), while a 0.4 percent increase could be expected in medium-to-long-term land forecasts. It was also found that the correlation was stronger between soybean price changes and land price changes than between changes in corn prices and changes in land prices. This could be attributed to the increase in soybean acres during the time of the study (Zhang, Zhang, and Hart, 2018).

Du, Hennessy, and Edwards (2007) found that for every dollar increase in corn price, cash rents in Iowa were expected to go up by seventy-nine dollars per acre in the short run, and between $109-$114 per acre in the long run. The long run change in price was found to take around four years. This study was conducted using data from 1987 to 2005.

How much money is received through government payments and which programs the money comes from can also affect cash rent rates. Roberts, Kirwan, and Hopkins (2003) used data from the 1992 and 1997 Census of Agriculture to find that for every dollar of government payment, land rental prices increased by 34 to 41 cents in nine regions across the country, including the Northern Great Plains and Heartland, which contains Illinois. Lence and Mishra (2003) found that for each dollar of market assistance and production flexibility contracts that was paid out in Iowa from 1996 to 2000, cash rent prices would increase by 86 cents per acre. Goodwin, Mishra, and Ortalo-Magné (2004) used data from the National Agricultural Statistics Service Agricultural Resource Management Survey to gather payment data from different farm programs across the country from 1998 to 2001. The study discovered that for every dollar of

loan deficiency payments (LDP), a 57-cent rise in cash rent prices would occur. Lambert and Griffin (2004) examined the changes that LDPs had on cash rent prices in Illinois from 1996-2001. The study found that no changes in cash rent prices were due to LDPs.

Policy changes have implications on both the owner and the operator, as well as on payment types. While the operator may benefit directly from government payments by receiving the money, it also allows for landowners to increase the price of cash rents. Land prices were found to be higher when payments were issued than if no government assistance was given to farmers (USDA-ERS, 2001). For every dollar of marginal subsidies that are paid out, a 20 to 25 cent increase in rental rates can be expected (Kirwan, 2009). Since government payments contribute to income, they help boost farmland value in situations where the land has government payments that are associated with it. Placing land into conservation programs to receive payments can draw land out of production, which can lead to increased rental prices on land still in production (Ryan et al., 2001).

However, different types of leases can lead to different ways that government payments are received by both the landowner and the operator. Much of this has to do with who is "actively engaged in farming." Being actively engaged in farming requires an individual to provide "significant contributions to the farming operation" (USDA FSA, 2015, p. 1). These contributions include things like farmland, labor, management or equipment (USDA FSA, 2015). When a cash rent lease is used, the operator will receive all of the government payments for that piece of land (Lattz, 2017a). When using a crop share lease, the landowner and the operator will split the government payments that are received (Leibold, 2018).

Data

This study used sources including USDA National Agricultural Statistics Service (NASS), Illinois Farm Business Farm Management Association (FBFM), University of Illinois farmdoc, and the Environmental Working Group (EWG) to collect secondary data on the potential factors affecting cash rent usage in Illinois. Land tenure data, which includes percent usage of cash rent leases, share rent leases, and owner-operated acres, was collected from farmdoc (University of Illinois) utilizing FBFM data. This data is representative of farms enrolled in FBFM, which currently includes more than 5,500 Illinois farms (Lattz and Zwilling, 2020). FBFM provides "a cooperative educational-service program designed to assist farmers with management decision-making" (Illinois FBFM, n.d.). All farms used in this data set are 260 acres or more and receive most of their income from grain farming. While this does not include all Illinois farms, it does provide a good framework for land tenure in the state (Lattz and Zwilling, 2020). Cash rent usage percentage was collected from 1995-2015 and categorized by region. The regions include the Northern, Central, and Southern portions of the state, based upon the standard regions that farmdoc uses in reporting their data (Figure 1). The explanatory factors that were used in this study include commodity prices and crop yields for both corn and soybeans (USDA-NASS) (Table 1), government payments in the form of commodity subsidies (Table 2), and crop insurance subsidies (EWG) (Table 3). With the exception of commodity prices, all factors were collected from each county in Illinois from 1995-2015. Commodity prices were collected from University of Illinois farmdoc and reflect the yearly average price that was received throughout Illinois for each individual year observed in the study.

After gathering the crop yield data on corn from USDA-NASS, each individual county was placed into the corresponding region that aligned with how the land tenure data was

organized. There are twenty-two counties in the Northern region, forty-four in the Central region, and thirty-six in the Southern region. Subsequently, an average yield was found for every year in each region (1995-2015) to give one corn yield in each region for every year. Identical steps were followed to amass and average the data for soybean yields, commodity subsidies, and crop insurance subsidies. Tables 1 through 4 provide a summary of the data used throughout the study.

Analysis

To find the relationship between each factor and increasing cash rent usage, a fixed effect regression analysis was conducted. For the purpose of this study, the dependent variable is the percent of cash rent usage. The explanatory variables are commodity prices, crop yields, commodity payments, and crop insurance payments. The data set includes two types of variation, between-region and within-region variation. Between-region variation comes from comparing the percent of cash rent usage across the three regions in a given year. Within-region variation is generated by the effect of the explanatory variables on cash rent usage within each region over time (Greene, 2003). Because unobservable factors not captured in the data could impact both the dependent and independent variables, meaning that any variables not used in the study could affect the data, there may be omitted variable bias present if a simple linear regression were run on the data (Greene, 2003). Dummy variables were made for each of the regions. Utilizing dummy variables allows for the Northern and Central regions to be compared to the Southern region, which is designated as the base region, and helps eliminate the effects of multicollinearity (Greene, 2003). Then, the differences that occur between the base region and the other regions can be observed without issue (Kennedy, 2003). One region must be used as the base region to

avoid the “dummy variable trap,” which states that if every region has a dummy variable, perfect multicollinearity would exist and the test would fail (Greene, 2003. p. 118)

The analysis was conducted with IBM SPSS Version 24, using the GLM (generate linear model) function with the univariate option to run the fixed effects regression model. There were four different ways that the model was run based upon work done by Lambert and Griffin (2004). The first model (Equation 1) used all the original variables that were stated above. The second model (Equation 2) utilized revenue for both corn and soybeans, instead of yields and prices separately. This was done to see the combined effect that prices and yields had on cash rent usage. Each crop’s revenue was found by multiplying its yield by its price for each year. The third model (Equation 3) used all the original variables, but the explanatory variables were lagged behind by one year. This was done because of potential timing issues that can occur with the explanatory variables, specifically regarding when they are received. For example, if commodity payments are received for something that occurred in 1995, the revenue from those payments may not be received until the following year. Similar situations can occur with the other variables as well, so lagging the payments allows for their effects to be felt in the correct year. Instead of starting with 1995, that cash rent usage percentage started with 1996 and continued until 2015. This allowed for 2015 to be removed from the explanatory variables, as it was no longer necessary because of the lag. Finally, the fourth rendition of the model (Equation 4) utilized revenues instead of yield and price again and all of the variables were still lagged in the same way as model three. For each of the models, the Southern region is used as the base, meaning that the Northern and Central regions will be compared to the Southern region throughout the models.

Models

In each model, the dependent variable $r_{i,t}$ represents the cash rent percentage in region *i* in year *t* where:

i = 1, 2, 3 (1 = northern, 2 = central, and 3 = southern)

t = 1, … 21 (1 = 1995…21 = 2015)

Model 1:

$$r_{i,t} = \beta_{CornYield} CornYield_{i,t} + \beta_{SoybeanYield} SoybeanYield_{i,t} + \beta_{CornPrice} CornPrice_{i,t} + \beta_{SoybeanPrice} SoybeanPrice_{i,t} + \beta_{CommodityPayments} CommodityPayments_{i,t} + \beta_{CropInsurance} CropInsurance_{i,t} + \beta_{Northern} Northern + \beta_{Central} Central + c_i + U_{it} \quad (1)$$

CornYield and *SoybeanYield* represent the average corn and soybean yields, respectively, measured in bushels per acre for region *i* in year *t*. *CornPrice* and *SoybeanPrice* are the average per-bushel price for each crop in year *t*. *CommodityPayment*s and *CropInsurance* represent the average amount of commodity payments and crop insurance subsidies received per county in region *i* in year *t*. *Northern* and *Central* denoted the dummy variables that were created. In addition, c_i measures the unobservable factors that are not measured in the study; and u_{it} represents the error that could occur across regions or time (Lambert and Griffin, 2004).

Model 2:

$$r_{i,t} = \beta_{cornrevenue} CornRevenue_{i,t} + \beta_{SoybeanRevenue} SoybeanRevenue_{i,t} + \beta_{CommodityPayments} CommodityPayments_{i,t} + \beta_{CropInsurance} CropInsurance_{i,t} + \beta_{Northern} Northern + \beta_{Central} Central + c_i + U_{it} \quad (2)$$

Model 2 possesses the same variables as the Model 1, except *CornRevenue* and *SoybeanRevenue* were created by combining the price and yield variables of each crop. This was done by multiplying the price and yield of each crop together in each year (*CornPrice*CornYield* and *SoybeanPrice*SoybeanYield*). The newly created revenue variables reflect the average revenue received for each crop in region *i* in year *t.*

Model 3:

$$r_{i,t} = \beta_{CornYield} CornYield_{i,t\text{-}1} + \beta_{SoybeanYield} SoybeanYield_{i,t\text{-}1} + \beta_{CornPrice} CornPrice_{i,t\text{-}1} + \beta_{SoybeanPrice} SoybeanPrice_{i,t\text{-}1} + \beta_{CommodityPayments} CommodityPayments_{i,t\text{-}1} + \beta_{CropInsurance} CropInsurance_{i,t\text{-}1} + \beta_{Northern} Northern + \beta_{Central} Central + c_i + U_{it} \quad (3)$$

For Model 3, the variables remained the same as in Model 1. However, Model 3 utilized a one-year lag for each of the explanatory variables. Simply put, this means that the explanatory variables will always be one year behind cash rent usage, the dependent variable. For example, the 1995 variables were measured against 1996 cash rent usage and so on until 2015. This is denoted by the superscript *t-1* with each of the explanatory variables.

Model 4:

$$r_{i,t} = \beta_{cornrevenue} CornRevenue_{i,t\text{-}1} + \beta_{SoybeanRevenue} SoybeanRevenue_{i,t\text{-}1} + \beta_{CommodityPayments} CommodityPayments_{i,t\text{-}1} + \beta_{CropInsurance} CropInsurance_{i,t\text{-}1} + \beta_{Northern} Northern + \beta_{Central} Central + c_i + U_{it} \quad (4)$$

This model, similar to Model 3, utilizes lagged explanatory variables and includes the *CornRevenue* and *SoybeanRevenue* instead of price and yield separately.

Results

Tables 5 through 8 provide descriptive statistics of the data. Each table includes the minimum, maximum, mean, and standard deviation of both the explanatory variables and the cash rent usage percentage. Table 5 shows the statistics for all of Illinois, while the following tables show the Northern (Table 6), Central (Table 7), and Southern (Table 8) regions separately. It is noted that the Central region had the highest averages for each of the explanatory variables, while the Northern region averaged the highest percentage of cash rent usage. Tables 9 through 12 depict the results for each of the individual models. A more in-depth discussion of the model results is included below.

Model 1

Model 1 produced an R^2 of 0.942, meaning that ninety-four percent of the variation in cash rent usage is explained by the variation of the explanatory factors used in the model. It was noted that crop insurance payments ($p < 0.001$), corn price ($p < 0.05$), and soybean price ($p < 0.05$) were all significant predictors of the use of cash rent leases. The results of the model suggest that a $10,000 increase in crop insurance payments will lead to a 0.042 percent increase in cash rent usage. To put this into better context, for every $250,000 increase in per-county crop insurance payments within a region, it can be expected that a one percent increase in cash rent usage will occur in that region. Since the average annual per-county crop insurance payment was $2,180,966.16, seeing swings of $250,000 or more could happen frequently. Therefore, it is

reasonable to expect that crop insurance payments could have a large effect on the increased usage of cash rent lease in Illinois.

The results show that a negative relationship exists between the corn price and cash rent usage. It was found that a one dollar increase in price will result in a drop in cash rent usage of just over three percent. Since smaller price changes occur more frequently with both corn and soybean prices, it is more reasonable to examine the impact of these small price changes. For every $0.25 increase in corn price, a decrease in cash rent usage of 0.78 percent can be expected. Soybean prices were also found to be significant ($p < 0.05$). The results show that a positive relationship exists between soybean price and cash rent usage, with a one dollar increase in soybean prices resulting in a 1.29 percent increase in cash rent usage. Subsequently, a $0.25 increase in soybean prices will lead to a 0.32 percent increase in cash rent usage. Commodity payments ($p > 0.05$), corn yield ($p > 0.05$) and soybean yield ($p > 0.05$) were found to be insignificant. It was also noted that the Northern region saw just over 16 percent more cash rent usage ($\beta = 16.07$) when compared to the Southern region. The Central region ($\beta = -6.641$) saw around 7 percent less cash rent usage compared to the Southern region. The complete results of Model 1 can be found in Table 9.

Model 2

This model produced an R^2 of 0.934, meaning that 93 percent of the variation in cash rent usage is explained by the variation of the explanatory factors used in the model. Both corn and soybean revenues were found to be significant at a five percent level. Corn revenue ($p < 0.05$) was found to have a negative relationship, meaning a one dollar increase in corn revenue will lead to a 0.012 percent drop in cash rent usage. However, soybean revenue ($p < 0.05$) was found

to have a positive relationship, as a one dollar increase in soybean revenue will lead to a 0.017 percent increase in cash rent usage. Crop insurance ($p < 0.001$) was significant at a five percent level, with the model suggesting that a $10,000 increase in crop insurance payments will lead to an increase in cash rent usage of 0.043 percent. Additionally, for every $250,000 increase of per-county crop insurance payments, an increase of cash rent usage of just over 1 percent can be expected. Commodity payments were found to be insignificant ($p > 0.05$) in this model. The Northern region saw slightly under 17 percent more cash rent usage ($\beta = 16.65$) than the Southern region, while the Northern region was observed to have just over 6 percent less cash rent usage ($\beta = -6.063$). The complete results of Model 2 can be found in Table 6.

Model 3

This model produced an R^2 of 0.934, meaning that 93 percent of the variation in cash rent usage is explained by the variation of the explanatory factors used in the model. It was found that corn price, soybean price and crop insurance were all significant. However, corn yield ($p > 0.05$) soybean yield ($p > 0.05$) and commodity payments ($p > 0.05$) were not significant at a five percent level ($\alpha = 0.05$).

Crop insurance payments were found to be highly significant ($p < 0.001$). For every $10,000 increase in crop insurance payments, a 0.039 percent rise in cash rent lease use will occur. This also means that for every $250,000 that are paid out, cash rent usage will increase by one percent. Since the average amount of per-county crop insurance payments paid out per year is $2,180,966.16, seeing changes of over $250,000 could occur frequently.

Corn price was found to be significant at a five percent level ($p < 0.05$) as well. However, it was found that the relationship between corn price and cash rent usage was negative. This

suggests that for every dollar increase in corn price, a drop of just over three percent in cash rent usage can be expected. With smaller price changes seen in both corn and soybean prices, it is reasonable to expect to see changes of around $0.25. In corn, if a price increase of $0.25 were to occur, a subsequent decrease of cash rent usage by 0.77 percent could be expected. Soybean prices ($p < 0.05$) had a positive relationship with cash rent usage, meaning that for every dollar increase in soybean price, a 1.3 percent rise in cash rent usage will occur in Illinois. If a $0.25 increase in soybean price was to happen, a rise in cash rent usage of 0.34 percent can be expected. The Northern region was found to have around fifteen percent more cash rented land ($\beta = 15.23$) when compared to the Southern region, while the Central region has just over seven percent ($\beta = -7.34$) less cash rent usage. Table 11 shows the complete results of Model 3.

Model 4

This model produced an R^2 of 0.917, meaning that 92 percent of the variation in cash rent usage is explained by the variation of the explanatory factors used in the model. The results indicate that both commodity payments and ($p < 0.05$) crop insurance payments ($p < 0.001$) were significant. However, both corn ($p > 0.05$) and soybean revenue ($p > 0.05$) were insignificant at the five percent level. Crop insurance payments were found to have a positive relationship with cash rent usage. For every $10,000 increase in crop insurance payments, an increase in cash rent usage of 0.039 percent can be expected. Additionally, a $250,000 increase in per-county crop insurance payments will lead to an increase in cash rent usage of 1 percent.

The positive relationship seen with commodity payments shows that a $10,000 increase in payments will lead to a 0.002 percent increase in cash rent lease usage. For every $500,000 of commodity payments paid out, a 1 percent rise is cash rent usage is expected to occur. This

becomes very plausible when you consider that there are major swings that occur every year in payment levels and that the average value of per-county government payments during this period was $7,155,047.62. The Northern region was found to have seen just under 16 percent (β = *15.93*) more cash rent usage when being compared to the Southern region, while the Central region had over 6 percent less (β = *-6.60*) cash rent usage. Table 12 shows the complete results of Model 4.

Implications/Conclusions

In recent decades, a major shift in land rental practices has been taking place throughout Illinois. Since 1995, cash rent lease usage has risen dramatically, with a 44 percent increase being seen in Northern Illinois, a 105 percent increase taking place in Southern Illinois, and a 117 percent increase occurring in Central Illinois among farms enrolled in FBFM (Lattz, 2016; Lattz and Zwilling, 2020; Schnitkey, 2002; Zwilling, Krapf, and Raab, 2013). During that same period, cash rent prices have also been rising, by about 3.6 percent per year since 1987 (Schnitkey, 2017a). The majority of farmland in the state falls under some variety of rental agreement, with 58 percent of the total farmland in the state being rented. Nationally, it was found that 39 percent of farmland acres were rented, which is much less than what is seen in Illinois (USDA-NASS, 2017). When you combine more rented acres than the national average, increasing cash rent usage, a lower amount of risk for a landowner when using a cash rent lease, increasing cash rent prices, and lower farm incomes, it brings to light an interesting question of why the use of cash rent lease are rising in popularity, and what exactly is driving this change.

The results of this study found that crop insurance payments, corn price, soybean price, corn revenue, soybean revenue and commodity payments all influence cash rent lease usage in

Illinois. With prices, yields and payments levels continually changing, the effects of these changes are constantly being reflected in cash rent usage. Specifically, with crop insurance and commodity payments, seeing changes in payment structure or types could have a major effect on cash rent usage. In the case of the recently implemented Market Facilitation Program (MFP), changes in payment structure that lead to increases of over $250,000 per county could potentially lead to major increases in the use of cash rent leases. Similarly, changes in the structure or type of crop insurance payments could possibly lead to large increase in cash rent usage as well. Although there were only 5,500 Illinois farms examined in this study, the findings can be viewed as a starting point for why the usage of cash rent leases are increasing in Illinois. With agriculture consistently changing, any variations that occur to the variables examined in this study could potentially have major ramifications on the leasing market in the years to come.

Tables and Figures

Table 1: Average Crop Yield and Commodity Prices Per Year

	Northern		Central		Southern		Commodity Prices	
	Corn Yield (bu/acre)	Soybean Yield (bu/acre)	Corn Yield (bu/acre)	Soybean Yield (bu/acre)	Corn Yield (bu/acre)	Soybean Yield (bu/acre)	Corn ($/bu)	Soybeans ($/bu)
1995	114.59	43.75	116.30	40.95	92.03	31.15	2.61	5.96
1996	131.23	38.82	143.48	43.23	106.39	34.13	3.71	7.41
1997	132.23	45.89	134.27	44.76	100.33	35.40	2.70	7.55
1998	153.86	50.48	142.02	46.06	109.97	34.51	2.30	6.05
1999	142.09	46.00	145.36	44.80	105.56	30.31	1.97	4.68
2000	141.68	41.00	157.52	46.18	135.00	38.92	1.90	4.81
2001	144.36	44.45	156.75	46.86	139.97	39.81	1.94	4.53
2002	136.00	43.00	143.75	48.18	83.61	29.36	2.19	5.05
2003	160.50	32.09	174.59	40.64	118.17	34.92	2.29	6.14
2004	175.00	48.41	186.00	52.34	158.72	44.58	2.51	7.51
2005	129.73	44.00	147.68	48.30	129.39	41.69	2.04	6.02
2006	171.00	50.45	163.89	50.14	131.97	41.39	2.36	5.75
2007	179.86	49.64	182.91	47.80	131.39	30.06	3.41	7.97
2008	178.70	45.35	182.02	49.05	153.32	42.88	4.78	11.66
2009	164.41	45.70	178.57	49.70	153.91	39.56	3.70	10.29
2010	170.09	53.96	153.40	54.20	140.36	42.25	3.85	10.14
2011	173.22	57.35	156.49	50.25	129.09	37.54	6.12	12.79
2012	128.57	47.36	112.10	46.56	42.83	32.71	6.72	14.25
2013	180.05	53.66	180.24	52.80	162.53	42.75	6.12	14.24
2014	188.47	57.19	209.43	57.82	179.48	48.92	4.17	12.53
2015	184.55	57.40	177.90	58.57	155.20	48.16	3.73	9.67

Data was collected from USDA-NASS and University of Illinois farmdoc.

Table 1 reflects the average yield per county within each region for both corn and soybeans from 1995-2015. It also includes the average corn and soybean prices received in Illinois during those years.

Table 2: Average Commodity Payments Received Per Year			
	Northern	Central	Southern
	Commodity Payments		
1995	$ 6,011,443.82	$ 6,166,412.57	$ 1,829,446.11
1996	$ 3,610,585.27	$ 3,871,933.95	$ 1,972,995.28
1997	$ 5,750,028.41	$ 6,233,663.64	$ 2,426,716.31
1998	$ 9,938,077.36	$ 11,377,271.00	$ 4,336,447.58
1999	$ 18,465,664.86	$ 22,197,921.16	$ 8,921,031.03
2000	$ 20,054,078.09	$ 23,965,623.64	$ 9,842,327.72
2001	$ 17,714,202.68	$ 21,253,791.09	$ 9,956,937.67
2002	$ 5,622,155.91	$ 5,911,454.11	$ 2,603,504.75
2003	$ 7,358,021.68	$ 8,747,253.07	$ 3,764,654.39
2004	$ 10,910,561.00	$ 13,848,120.32	$ 5,214,745.14
2005	$ 17,898,106.95	$ 20,956,733.57	$ 7,552,432.92
2006	$ 9,773,142.50	$ 11,743,233.52	$ 4,637,266.64
2007	$ 4,921,645.77	$ 5,818,968.07	$ 2,486,970.11
2008	$ 4,876,773.86	$ 5,963,409.57	$ 2,477,621.14
2009	$ 4,758,401.09	$ 5,288,587.50	$ 2,546,993.33
2010	$ 5,232,067.23	$ 6,408,153.80	$ 2,550,673.92
2011	$ 4,482,862.23	$ 5,306,824.11	$ 2,330,751.83
2012	$ 4,533,159.77	$ 5,129,042.20	$ 2,371,085.58
2013	$ 4,183,739.73	$ 4,942,867.91	$ 2,176,907.89
2014	$ 27,923.64	$ 37,367.86	$ 10,700.28
2015	$ 8,341,605.23	$ 1,013,190.89	$ 111,720.06

Data was collected from the Environmental Working Group (EWG).

Table 2 reflects the average amount of commodity payments that were received per county within each region in Illinois from 1995-2015.

Table 3: Average Crop Insurance Payments Received Per Year			
	Northern	Central	Southern
	Crop Insurance Payments		
1995	$ 403,167.36	$ 485,911.05	$ 389,793.56
1996	$ 462,855.27	$ 557,130.64	$ 420,034.69
1997	$ 381,481.64	$ 448,610.61	$ 352,261.06
1998	$ 419,919.45	$ 473,851.23	$ 335,485.31
1999	$ 373,331.18	$ 420,218.25	$ 333,054.92
2000	$ 360,385.59	$ 463,091.02	$ 335,214.64
2001	$ 878,376.77	$ 1,122,851.48	$ 699,291.94
2002	$ 898,564.86	$ 1,108,438.48	$ 671,102.36
2003	$ 1,076,588.45	$ 1,261,051.34	$ 879,789.14
2004	$ 1,515,742.50	$ 1,670,501.36	$ 1,149,787.69
2005	$ 1,634,211.23	$ 1,717,751.73	$ 1,052,471.22
2006	$ 2,651,378.14	$ 2,803,213.11	$ 1,205,926.44
2007	$ 3,949,811.68	$ 3,993,500.66	$ 1,849,648.14
2008	$ 4,979,596.41	$ 5,149,237.36	$ 2,927,755.00
2009	$ 4,027,188.77	$ 4,530,307.00	$ 2,709,485.75
2010	$ 3,221,181.23	$ 3,555,908.09	$ 2,427,942.61
2011	$ 5,283,211.68	$ 5,962,245.20	$ 3,892,647.25
2012	$ 4,194,567.55	$ 4,907,434.11	$ 3,653,891.42
2013	$ 3,778,708.77	$ 4,927,183.36	$ 4,148,958.97
2014	$ 3,179,291.77	$ 3,863,099.73	$ 3,738,628.22
2015	$ 3,179,709.41	$ 4,015,022.20	$ 3,941,869.75

Data was collected from the Environmental Working Group (EWG).

Table 3 shows the average amount of government expenses from crop insurance per county within each region for each year from 1995-2015.

Table 4: Farmland Tenure By Year

	Northern			Central			Southern		
	Cash Rent (Percentage)	Share Rent (Percentage)	Owner-Operated (Percentage)	Cash Rent (Percentage)	Share Rent (Percentage)	Owner-Operated (Percentage)	Cash Rent (Percentage)	Share Rent (Percentage)	Owner-Operated (Percentage)
1995	41	42	17	18	68	14	20	58	22
1996	37	41	22	17	68	15	20	53	27
1997	38	41	21	18	67	15	22	51	27
1998	40	39	21	18	67	16	20	54	26
1999	43	36	21	20	66	14	22	52	26
2000	43	36	21	21	65	14	22	53	25
2001	45	33	22	23	63	14	22	53	25
2002	45	33	22	24	62	14	24	51	24
2003	48	30	22	26	59	15	28	49	23
2004	49	29	22	29	56	15	27	50	22
2005	53	30	17	30	56	14	34	47	19
2006	53	28	18	32	55	13	34	47	20
2007	54	28	18	34	53	13	37	43	20
2008	54	28	18	35	52	13	36	44	20
2009	55	27	18	35	52	13	36	44	20
2010	57	26	18	33	53	14	38	42	20
2011	57	25	18	36	51	14	40	40	20
2012	58	23	19	37	49	14	38	41	21
2013	58	22	20	37	49	14	37	42	21
2014	58	21	21	39	47	14	39	37	24
2015	59	21	20	39	46	15	41	37	22

Data was collected from University of Illinois farmdoc.

Table 4 shows the percentage use of cash rent leases, share rent leases, and owner-operated acres on farmland acres in Illinois. The percentages are shown in the Northern, Central, and Southern regions of the state, and cover a timeline spanning from 1995 to 2015.

Table 5. Descriptive Statistics of Illinois for all Counties, 1995-2015

	Minimum	Maximum	Mean	Std. Deviation
Cash Rent Usage (%)	17.00	59.00	36.24	12.27
Corn Yield (bu/acre)	42.83	209.43	147.37	29.80
Soybean Yield (bu/acre)	29.36	58.57	44.70	7.31
Corn Price ($/bu)[a]	1.90	6.72	3.39	1.46
Soybean Price ($/bu)[a]	4.53	14.25	8.33	3.18
Corn Revenue ($/acre)	183.11	1103.07	503.54	251.04
Soybean Revenue ($/acre)	141.85	764.12	381.01	178.51
Commodity Payments (per $10,000)	1.07	2396.56	715.50	592.05
Crop Insurance (per $10,000)	33.31	596.22	218.10	170.15

a. Crop prices are average per-bushel prices statewide, 1995-2015.

Table 6. Descriptive Statistics of the Counties in the Northern Region, 1995-2015

	Minimum	Maximum	Mean	Std. Deviation
Cash Rent Usage (%)	37.00	59.00	49.76	7.39
Corn Yield (bu/acre)	114.59	188.47	156.20	22.34
Soybean Yield (bu/acre)	32.09	57.40	47.43	6.38
Corn Price ($/bu)[a]	1.90	6.72	3.39	1.48
Soybean Price ($/bu)[a]	4.53	14.25	8.33	3.23
Commodity Payments (per $10,000)	2.79	2005.41	830.78	563.44
Crop Insurance (per $10,000)	36.04	528.32	223.09	170.56
Corn Revenue ($/acre)	264.65	1101.84	539.51	267.03
Soybean Revenue ($/acre)	197.03	764.12	406.30	193.75

a. Crop prices are average per-bushel prices statewide, 1995-2015.

Table 7. Descriptive Statistics of the Counties in the Central Region, 1995-2015

	Minimum	Maximum	Mean	Std. Deviation
Cash Rent Usage (%)	17.00	39.00	28.62	7.81
Corn Yield (bu/acre)	112.10	209.43	159.27	24.07
Soybean Yield (bu/acre)	40.64	58.57	48.53	4.76
Corn Price ($/bu)[a]	1.90	6.72	3.39	1.48
Soybean Price ($/bu)[a]	4.53	14.25	8.33	3.23
Commodity Payments (per $10,000)	3.74	2396.56	934.20	709.26
Crop Insurance (per $10,000)	42.02	596.22	254.46	191.90
Corn Revenue ($/acre)	286.36	1103.07	541.92	251.35
Soybean Revenue ($/acre)	209.66	751.87	412.02	183.12

a. Crop prices are average per-bushel prices statewide, 1995-2015.

Table 8. Descriptive Statistics of the Counties in the Southern Region, 1995-2015

	Minimum	Maximum	Mean	Std. Deviation
Cash Rent Usage (%)	20.00	41.00	30.33	7.86
Corn Yield (bu/acre)	42.83	179.48	126.63	31.51
Soybean Yield (bu/acre)	29.36	48.92	38.14	5.82
Corn Price ($/bu)[a]	1.90	6.72	3.39	1.48
Soybean Price ($/bu)[a]	4.53	14.25	8.33	3.23
Commodity Payments (per $10,000)	1.07	995.69	381.53	291.25
Crop Insurance (per $10,000)	33.31	414.90	176.74	143.62
Corn Revenue ($/acre)	183.11	994.68	429.18	228.41
Soybean Revenue ($/acre)	141.85	612.97	324.70	150.67

a. Crop prices are average per-bushel prices statewide, 1995-2015.

Table 9. Fixed Effects Regression Model 1

					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	18.907	4.070	4.645	.000	10.747	27.067
Corn Yield (bu/acre)	-.008	.025	-.336	.738	-.058	.042
Soybean Yield (bu/acre)	.112	.109	1.025	.310	-.107	.330
Corn Price ($/bu)	-3.100	1.181	-2.625	.011	-5.468	-.732
Soybean Price ($/bu)	1.287	.565	2.279	.027	.155	2.419
Commodity Payments (per $10,000)	.001	.001	1.417	.162	-.001	.003
Crop Insurance (per $10,000)	.042	.005	7.722	.000	.031	.053
Northern Region	16.068	1.371	11.723	.000	13.320	18.816
Central Region	-6.641	1.457	-4.558	.000	-9.563	-3.720

Southern Region is absent because it is used as the base.

Table 10. Fixed Effect Regression Model 2

					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	21.689	1.541	14.076	.000	18.602	24.776
Commodity Payments (per $10,000)	.002	.001	1.577	.120	.000	.004
Crop Insurance (per $10,000)	.043	.005	7.991	.000	.032	.053
Corn Revenue ($/acre)	-.012	.005	-2.355	.022	-.022	-.002
Soybean Revenue ($/acre)	.017	.007	2.389	.020	.003	.032
Northern Region	16.649	1.210	13.763	.000	14.226	19.073
Central Region	-6.063	1.264	-4.796	.000	-8.596	-3.531

Southern Region is absent because it is used as the base.

Table 11. Fixed Effects Regression Model 3

					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	17.916	4.391	4.080	.000	9.100	26.732
Corn Yield (bu/acre)	.016	.027	.615	.541	-.037	.070
Soybean Yield (bu/acre)	.075	.126	.598	.553	-.177	.328
Corn Price ($/bu)	-3.076	1.256	-2.450	.018	-5.596	-.555
Soybean Price ($/bu)	1.345	.608	2.211	.032	.124	2.566
Commodity Payments (per $10,000)	.002	.001	1.824	.074	.000	.004
Crop Insurance (per $10,000)	.039	.006	6.553	.000	.027	.051
Northern Region	15.229	1.497	10.173	.000	12.224	18.235
Central Region	-7.337	1.605	-4.571	.000	-10.559	-4.114

Southern Region is absent because it is used as the base.

Table 12. Fixed Effects Regression Model 4

					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	22.165	1.741	12.731	.000	18.673	25.657
Commodity Payments (per $10,000)	.002	.001	2.081	.042	8.480E-5	.005
Crop Insurance (per $10,000)	.039	.006	6.498	.000	.027	.052
Corn Revenue ($/acre)	-.009	.006	-1.523	.134	-.020	.003
Soybean Revenue ($/acre)	.015	.008	1.895	.064	-.001	.032
Northern Region	15.934	1.373	11.607	.000	13.181	18.688
Central Region	-6.598	1.452	-4.546	.000	-9.510	-3.687

Southern Region is absent because it is used as the base.

Figure 1: Map of Illinois Regions

Figure 1 shows the Northern, Central, and Southern regions of Illinois used in this study. The standard farmdoc reporting regions were overlaid onto a county map of Illinois (Wikimedia Commons). The Northern region contains 22 counties, the Central region contains 44 counties, and the Southern region contains the remaining 36 counties.

Figure 2: Land Tenure in Northern Illinois

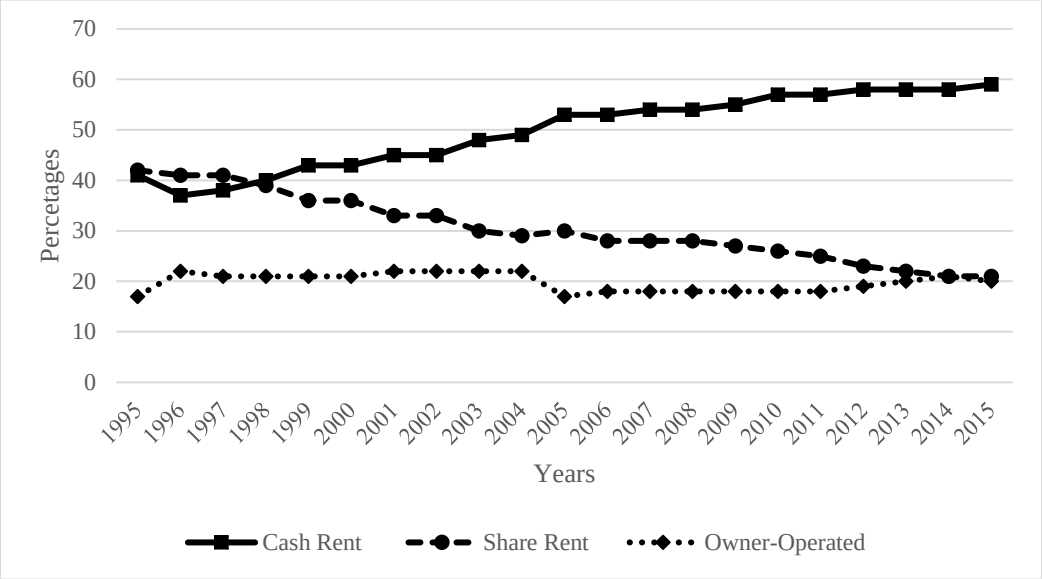


Figure 3: Land Tenure in Southern Illinois

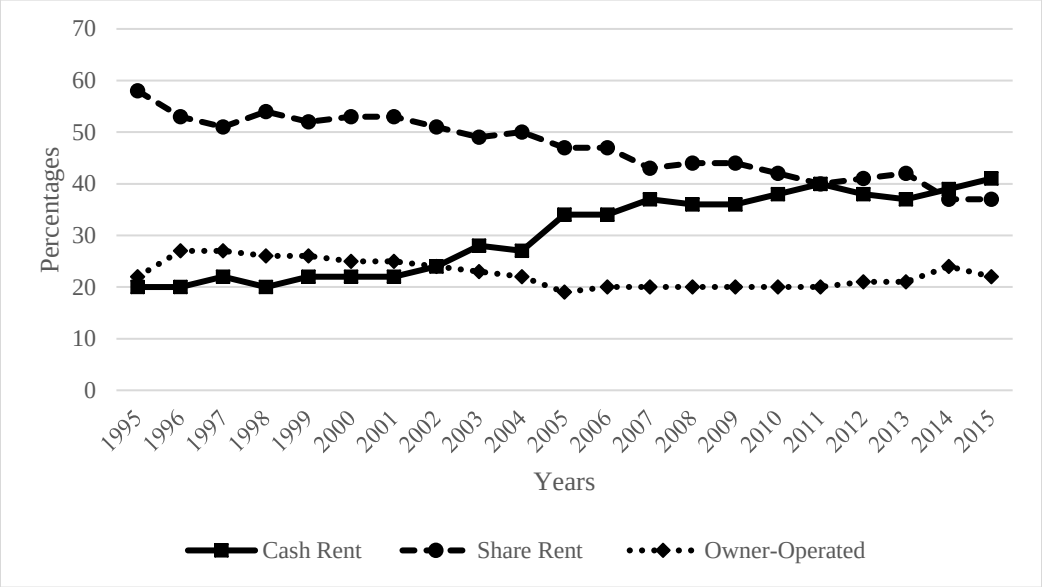
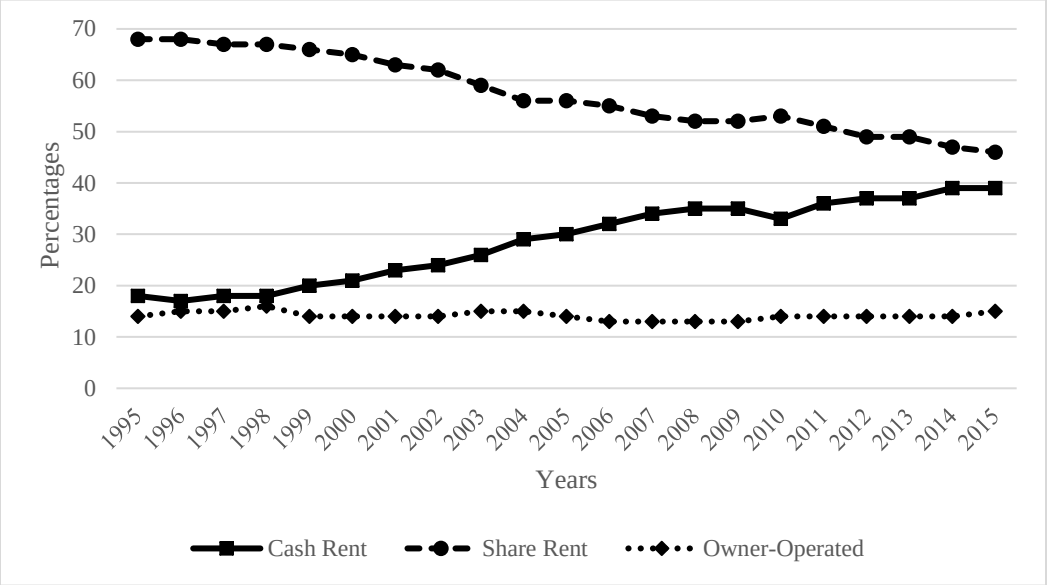


Figure 4: Land Tenure in Central Illinois



Figures 2 through 4 show how the percent usage of cash rent leases, share rent leases, and owner operated acres has changed over time throughout the Northern, Central, and Southern regions of Illinois in farms using FBFM. From 1995 to 2015, cash rent usage saw an increase from 41 to 59 percent (a 44 percent rise) in Northern Illinois, 20 to 41 percent (a 105 percent rise) in Southern Illinois, and 18 to 39 percent (a 117 percent rise) in Central Illinois. Subsequently, share rent usage has dropped from 42 to 21 percent in Northern Illinois, 58 to 37 percent in Southern Illinois, and 68 to 46 percent in Central Illinois. Owner-operated acres have remained relatively consistent throughout the same time period (Lattz, 2016; Lattz and Zwilling, 2020; Schnitkey, 2002; Zwilling, Krapf, and Raab, 2013).

CHAPTER III: REVIEW OF THE LITERATURE

Previous studies done by Helmers, Shaik, and Johnson (2005), Blank, Erickson, and Hallahan (2012), and Zhang, Zhang, and Hart (2018) have observed factors such as crop yields, farm income, and government payments as determinants of land values. Examining factors that have been found by previous studies to have effects on both land values and choosing between different leases will help develop a better understanding of what drives changes in cash rent usage.

To understand why lease trends are changing so much, we must understand what factors affect the land market. Helmers, Shaik, and Johnson (2005) found that cash crop receipts and government payments were consistent with income generated from professionally managed farmland, meaning that recent cash crop receipts and government payments were strongly considered when looking into anticipated level of return off of the rented land. However, cash receipts are generally uncertain due to changing markets and they only account for gross revenue and not the net revenue. Government payments also have uncertainty due to the nature of changes being made to farm programs. Recent returns from crop receipts and government payments that farmers have received play a major role in their expectations for the income they expect to earn in upcoming years and help them make their decisions going forward (Helmers, Shaik, and Johnson, 2005).

Government payments also have an effect on the value of farmland. Over the years, there have been many different Farm Bills that have utilized many different payment types. During the time span examined by this study, there were five different Farm Bills used, including the Food, Agriculture, Conservation, and Trade Act of 1990; the Federal Agriculture Improvement and Reform Act of 1996; the Farm Security and Rural Investment Act of 2002; the Food,

Conservation, and Energy Act of 2008; and the Agricultural Act of 2014 (National Agricultural Law Center, n.d.). The was also a wide variety of different commodity payments that were utilized throughout the years. Some of the major commodity payments used include deficiency payments in 1995; production flexibility contracts (1996-2002), loan deficiency payments (1998-2006), marketing loan gains (1998-2006), and marketing loss assistance (1998-2001) introduced in the 1996 Farm Bill; total direct payments (2002-2014) and counter cyclical payments (2003-2006) from the 2002 Farm Bill; average crop revenue election program (ACRE) (2009-2013) in the 2008 Farm Bill; and agricultural risk coverage (ARC) and price loss coverage (PLC) from the 2014 Farm Bill (EWG; National Agricultural Law Center, n.d.).

Policy changes have implications on both the owner and the operator. While the operator may benefit directly from government payments by receiving the money, it also allows for landowners to increase the price of cash rents. Land prices were found to be higher when payments were issued than they were if no government assistance was given to farmers (USDA-ERS, 2001). For every dollar of marginal subsidies that are paid out, a 20 to 25 cent increase in rental rates can be expected (Kirwan, 2009). Since government payments contribute to income, they help boost farmland value in situations where the land has government payments that are associated with it. The landowner receives more of the aforementioned value because, in most cases, the payment is attached to the land, and land that receives frequent payments is more valuable than land that does not (Ryan et al., 2001). When the land is rented using a cash rent lease the operator will receive all of the payments. However, the landowner receives value because the cash rent price can be increased since the operator is making more money (Kirwan, 2015; Lattz, 2017a). When using a crop share lease, the landowner and the operator will split the government payments that are received (Leibold, 2018). Placing land into conservation

programs to receive payments can draw land out of production, which can lead to increased rental prices on land still in production (Ryan et al., 2001).

However, different types of leases can lead to different ways that government payments are received by both the landowner and the operator. Much of this has to do with who is "actively engaged in farming". Being actively engaged in farming requires everyone involved to provide "significant contributions to the farming operation" (USDA FSA, 2015, p. 1). These contributions include things like farmland, labor, management or equipment (USDA FSA, 2015).

How much money is received through government payments and which programs the money comes from can also affect cash rent rates. Roberts, Kirwan, and Hopkins (2003) used data from the 1992 and 1997 Census of Agriculture to find that for every dollar of government payment, land rental prices increased by 34 to 41 cents in nine regions across the country, including the Northern Great Plains and Heartland. Lence and Mishra (2003) found that for each dollar of market assistance and production flexibility contracts that was paid out in Iowa from 1996 to 2000, cash rent prices would increase by 86 cents per acre. Goodwin, Mishra, and Ortalo-Magné (2004) used data from the National Agricultural Statistics Service Agricultural Resource Management Survey to gather payment data for different farm programs across the country from 1998 to 2001. The study discovered that for every dollar of loan deficiency payments (LDP), a 57-cent rise in cash rent prices would occur. Lambert and Griffin (2004) examined the changes that loan deficiency payments had on cash rent prices in Illinois from 1996-2001. The study found that no changes in cash rent prices were due to LDPs.

Another factor that could play a part in changing land values is farm income. In a study by Blank, Erickson, and Hallahan (2012) a regression analysis was done on 95,517 observations collected from farmers and random farmer samples from 1996-2010 in ten different regions

across the U.S. The analysis found that farm income was only significant in affecting farmland values in two of ten regions during that time. However, since this was a time of low farm income, the authors found it understandable that farm incomes were not driving farmland prices at the time. Their regression analysis concluded that farm incomes from production were not the main reason for land prices rising for that period. Instead they found that urban influence, such as growth of the outskirts of cities, was the most dominate factor (Blank, Erickson, and Hallahan, 2012).

Stephens and Schurle (2013) examined additional factors affecting land price swings. Specifically, they studied the effect that rainfall had on prices in Western Kansas. Their regression results came back with a ninety-five percent confidence level and found that every inch of rainfall was worth about $75.30 per acre. Other potential issues that could affect land prices are not all land being the same and potential randomness of sales. A prime example of this would be a neighbor paying more for farmland because they desperately desire it. They also conclude that regression analysis is a very valuable tool that can allow for appraisers to see the impacts of many different factors on land sale (Stephens and Schurle, 2013).

There is also a possible connection to be examined between cash rent values and actual land values. Ibendahl and Griffin (2013) looked at whether cash rent prices or land prices were the determining factor in setting the market prices for both. They found that cash rent prices will follow land prices pretty steadily until land prices start to drop, in which case cash rent prices do not drop at the same rate. Some thoughts as to why this occurs are tenants have a large impact on changes in cash rent prices. Tenants can affect cash rent prices by both helping slow down increases and helping drops in price occur faster. It was also noted that other pressures being

placed on land values have an effect on the changes that occur between land and cash rent prices (Ibendahl and Griffin, 2013).

With many other factors such as government payments and risk having been found to have effects on cash rent and land price, the effects of corn and soybean yields and prices on land prices should be inspected as well. Zhang, Zhang, and Hart (2018) examined how industry professionals' thoughts on future commodity prices affects their predictions of future farmland values. The study surveyed farm managers, real estate brokers, rural appraisers and others attending the Soil Management and Land Valuation (SMLV) conference at Iowa State University to capture their perspectives on future land and commodity prices. They concluded that crop price changes and expected land value changes correlate with each other. The correlation was the strongest in the medium-term land forecast. They found that a one percent increase in corn prices would result in a 0.2 percent increase in land prices in the short term (2016-2017), while a 0.4 percent increase could be expected in medium-to-long-term land forecasts. It was also found that the correlation was stronger between soybean price changes and land price changes, than between changes in corn prices and changes in land prices. This could be attributed to the increase in soybean acres during the time of the study (Zhang, Zhang, and Hart, 2018).

Du, Hennessy, and Edwards (2007) found that for every dollar increase in corn price, cash rents in Iowa were expected to go up by seventy-nine dollars per acre in the short run, and between $109-$114 per acre in the long run. The long run change in price was found to take around four years. This study was conducted using data from 1987 to 2005.

One reason that use of cash rent leases is increasing could be the risk associated with using other lease types. Cash rent lease payments see the operator pay the landowner a set fee per acre. The operator will then furnish the cost of all inputs on their own. After the growing season

concludes, the farmer then receives all the crop off that rented land and sells it to generate a return. Variable cash rent leases set a base amount paid per acre, with the potential of a bonus rent based upon the productivity of the farm. The determinants of productivity include commodity prices and crop yields. If the tenant experiences high yields and prices in the same year, then the bonus will kick in and more money will be paid to the landowner per acre. Share rent leases involve the landowner and tenant splitting most of the input costs and the crop that comes off the land. Input costs would typically include things such as seed, fertilizer, and chemical costs amongst others. Typically, a 50/50 split is the most common crop share agreement in Illinois. Selling the crop that comes of off the land is how both parties receive payment. (Lattz, 2017b; Lattz, n.d.). Using share rent leases causes a greater income risk for landowners, and cash rent lease do not share that same risk (Harwood et al., 1999). The taxation on share rent agreements is also different from cash rent agreement. Landowners must pay self-employment taxes when using share rent agreements (Fukunaga, 2006). Fukunaga and Huffman (2009) noted that using a fixed cash rent lease will guarantee the owner a set price per acre, which helps mitigate risk. It has also been observed that the older a landlord becomes, the more likely the use of a cash rent contract becomes in order to lower the amount of risk. This study also found that as a tenant's total assets increase without an increase in debt, the contract is more likely to be cash rent. Also, as the landowner's farm assets increase, without an increase in debt, the contract is more likely to be cash rent because the landowner is less risk averse. This study found that risk-sharing plays a major part in the contract that is selected (Fukunaga and Huffman, 2009).

Risk sharing also plays a pivotal role in explaining the rise in cash rent lease usage. In Illinois, cash rent prices are rising to levels that are very close to the expected return level that a

landowner would see from a share rent lease. By doing this, more of the risk is now being shifted to the farmer instead of the landowner. Using risk management instruments such as crop insurance and advanced marketing strategies are also thought to be some of the reasons for this movement towards higher cash rent prices. The authors also noted that crop revenues and low interest rates have an impact on changes in cash rent rates as well (Paulson and Schnitkey, 2014).

Choosing between different types of leasing contracts also has an effect on changes in income levels received in Illinois. With a crop share lease there is a level of protection against revenue loss, but when using a cash rent lease, the loss risk is higher because it cannot be covered entirely by crop insurance (Paulson, Schnitkey, and Sherrick, 2010). It was also noted that when utilizing a cash rent lease, as the price per acre of the lease increases, the greater the risk of lost income is for the operator. When farms use more cash rent lease at higher prices, they become much more likely to experience losses in income (Paulson, 2012).

Sotomayor, Ellinger, and Barry (2000) conducted a survey of Illinois grain farmers that resulted in details on 1,224 leases. Using a probit estimation and a least squares regression, the study found what factors were affecting the cash rent versus crop share contract choice and the expected level of cash rent prices. It was observed that changes in revenue, soil productivity, tract size, non-farm income, length of business relationship between landowner and operator, debt-to-asset ratio, net worth, and number and landowners on one farm were all significant in choosing between a cash rent and crop share contract. The variables that were found to affect cash rent prices include soil productivity, tract size, and net worth.

The effect of changes in corn and soybean yields must also be considered when examining what has increased the use of cash rent leases. Fukunaga and Huffman (2009) found that the larger the variation of crop yields on a field, the more likely it becomes that a crop share

contract is used to help share the risk. It was also noted that the type of crop that is planted does not have an effect on contract choice.

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