Essays on leasing Kansas agricultural land

by

Chelsea Jewel Arnold

B.S., Texas A&M University-Commerce, 2015
M.B.A, Texas A&M University-Commerce, 2017
M.S., Texas A&M University-Commerce, 2018

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics
College of Agriculture

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2021

Abstract

Nearly half of all the farmland in the United States is farmed by a producer that does not own the land. This is especially true in midwestern states such as Kansas. Leasing, versus owning, farmland requires producers to have significantly less capital upfront, thereby reducing overall financial risk exposure. When deciding to lease, or who to lease to/from, both landowners and tenants face several decisions in contract specifics that benefit both parties.

Contract choice in farmland leasing includes many factors outside of simply which contract is preferred as each contract choice brings its own set of costs and benefits for both the landowner and tenant. In Essay 1 of this dissertation, the role of risk in contract choice is studied. A unique dataset of landowners and tenants in Kansas is used to examine the role of risk in their contract choices. Results indicate that greater production risk and more risk-averse landowners lead to use of fixed cash rent contracts. As there can be potentially many relationship variables that affect contract choices, a penalized regression is used to examine whether the inclusion of relationship variables affect the finding and find that the results are robust. Understanding the role of risk in farmland contract choices is important to assess the welfare consequences of farm policies or environmental changes that affect production risk.

When deciding who to lease their land to, landowners can face several choices in tenants with a wide variety of attributes such as experience level, age, and relationship to the landowner. Experience level, or years of farming experience, is an important factor that landowners utilize in determining who to lease to and at what rate. This can leave young producers, who typically have lower experience levels, at a greater disadvantage when trying to find access to farmland. Using a dataset built from responses of surveys sent to landowners across the state of Kansas, Essay 2 focuses on landowners' willingness-to-lease to young producers under different

condition. A discrete choice model is used to find Kansas landowners' willingness-to-lease to tenants at three different experience levels and three different relationship levels with the landowner. Empirical results indicate that a young producer with no experience is less preferred than a tenant with more years of experience and may, therefore, need to offer the landowner a higher cash leasing amount before the landowner is willing to lease to them. For young producers with higher experience levels, landowners will accept a marginally discounted rate when compared to not leasing to anyone at all. Relationships such as family/friend and acquaintances between landowners and young producers are also given a discounted leasing rate when compared to the landowner leasing to a stranger. This study not only fills a literature gap of landowner-young producer relationships and willingness-to-pay, but it also lays the foundation for policies to be implemented. Young producers with no experience are at the greatest disadvantage with low access to capital and heavily reliant on access to leased farmland, yet Kansas landowners require a higher leasing rate to rent to young producers. The results of this essay are key in policy implications, but also in educating landowners that their stated belief and attitudes towards young producers do not hold when faced with a monetary-based decision.

This dissertation is comprised of two unique studies that focus on farmland leasing in Kansas and the relationships and factors that can affect them. Both studies present results that benefit Kansas landowners and producers by offering insight and education about how leasing contracts and arrangements can be made that benefit both landowner and producer.

Essays on Leasing Kansas Agricultural Land

by

Chelsea Jewel Arnold

B.S., Texas A&M University-Commerce, 2015
M.B.A, Texas A&M University-Commerce, 2017
M.S., Texas A&M University-Commerce, 2018

A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics
College of Agriculture

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2021

Approved by:

Major Professor
Mykel R. Taylor

Copyright

Abstract

Nearly half of all the farmland in the United States is farmed by a producer that does not own the land. This is especially true in midwestern states such as Kansas. Leasing, versus owning, farmland requires producers to have significantly less capital upfront, thereby reducing overall financial risk exposure. When deciding to lease, or who to lease to/from, both landowners and tenants face several decisions in contract specifics that benefit both parties.

Contract choice in farmland leasing includes many factors outside of simply which contract is preferred as each contract choice brings its own set of costs and benefits for both the landowner and tenant. In Essay 1 of this dissertation, the role of risk in contract choice is studied. A unique dataset of landowners and tenants in Kansas is used to examine the role of risk in their contract choices. Results indicate that greater production risk and more risk-averse landowners lead to use of fixed cash rent contracts. As there can be potentially many relationship variables that affect contract choices, a penalized regression is used to examine whether the inclusion of relationship variables affect the finding and find that the results are robust. Understanding the role of risk in farmland contract choices is important to assess the welfare consequences of farm policies or environmental changes that affect production risk.

When deciding who to lease their land to, landowners can face several choices in tenants with a wide variety of attributes such as experience level, age, and relationship to the landowner. Experience level, or years of farming experience, is an important factor that landowners utilize in determining who to lease to and at what rate. This can leave young producers, who typically have lower experience levels, at a greater disadvantage when trying to find access to farmland. Using a dataset built from responses of surveys sent to landowners across the state of Kansas, Essay 2 focuses on landowners' willingness-to-lease to young producers under different

condition. A discrete choice model is used to find Kansas landowners' willingness-to-lease to tenants at three different experience levels and three different relationship levels with the landowner. Empirical results indicate that a young producer with no experience is less preferred than a tenant with more years of experience and may, therefore, need to offer the landowner a higher cash leasing amount before the landowner is willing to lease to them. For young producers with higher experience levels, landowners will accept a marginally discounted rate when compared to not leasing to anyone at all. Relationships such as family/friend and acquaintances between landowners and young producers are also given a discounted leasing rate when compared to the landowner leasing to a stranger. This study not only fills a literature gap of landowner-young producer relationships and willingness-to-pay, but it also lays the foundation for policies to be implemented. Young producers with no experience are at the greatest disadvantage with low access to capital and heavily reliant on access to leased farmland, yet Kansas landowners require a higher leasing rate to rent to young producers. The results of this essay are key in policy implications, but also in educating landowners that their stated belief and attitudes towards young producers do not hold when faced with a monetary-based decision.

This dissertation is comprised of two unique studies that focus on farmland leasing in Kansas and the relationships and factors that can affect them. Both studies present results that benefit Kansas landowners and producers by offering insight and education about how leasing contracts and arrangements can be made that benefit both landowner and producer.

Table of Contents

List of Figures

List of Tables

Acknowledgements

I would like to thank and acknowledge all of those that have helped me throughout my entire education, but especially during my PhD program. Thank you to my committee members: Jisang Yu, Glynn Tonsor, and Matthew Sanderson with a special thank you to Mykel Taylor, my advisor who has constantly and consistently encouraged me. I would also like to thank the multitude of others that have offered advice, well wishes and advice, and most importantly, support. These include the numerous professors, mentors, and the friends that I have met during this program whose advice and support will stay with me throughout my life and into my career.

Dedication

This dissertation, the summation of my PhD program, is dedicated to each member of my family who over my entire educational career have never doubted me and have constantly supported and encouraged me. This dissertation is also dedicated to the person that, despite my initial opposition, consistently and persistently encouraged me to pursue higher education, far beyond what I thought was personally possible, Dr. Robert “Bob” Williams.

Chapter 1 - Introduction

Leasing farmland for agricultural production has been an integral part of agriculture for centuries. In recent decades, American agriculture has seen an increase in the number of acres of farmland that are operated by producers that do not own the land. In fact, nearly 40 percent of the 911 million acres of production farmland in the contiguous United States is operated on leased land (Bigelow et al., 2016). According to the 2014 Tenure, Ownership, and Transition of Agricultural Land Survey, or TOTAL survey, approximately 2.1 million landowners rented out 353.8 million acres of the farmland in the United States (USDA NASS, 2015). This holds true for Kansas as well, with nearly half of all available farmland in Kansas being operated by someone other than the landowner (USDA ERS, 2020). Kansas was also listed as 9th in the top 10 states in farmland rent received, estimated at around 1.4 billion dollars (USDA NASS, 2015). This increasing popularity of leasing farmland can be attributed to multiple factors including the decrease of available farmland due to split inheritances, growing urban populations, and increasing prices of farmland. For instance, farmland values have consistently appreciated in value every year since 2000 nearly doubling nationwide. This is especially true for land in the Midwest, where the majority of agricultural production per available acre is found and has a faster appreciation rate of farmland value than any other region in the United States (Key & Burns, 2018).

Leasing, versus owning, farmland requires producers to have significantly less capital upfront, thereby reducing overall financial risk exposure. Agricultural leasing offers three contract (or leasing) options: cash, cropshare, and flex, each carrying their own associated risk and reward. Of the three options, fixed cash rent and cropshare are by far the most popular accounting for over 90% of the leasing markets in the Midwest. Fixed rent contracts are

straightforward in that the tenant pays a single payment for the use of the land during the growing season. Fixed rent contracts are seen as beneficial to landowners as their income from leasing is set and typically paid upfront and in full or split between spring and fall payments. Crop share contracts differ, however, in that the producer pays a certain previously agreed upon share of the harvest to the landowner at the end of the season as payment for use of the land. Landowners and tenants also share some of the input expenses in addition to sharing the harvested crop. Approximately 69% of farmland contracts in the Plains regions are fixed rent contracts and 21% use cropshare as their preferred contract. Kansas is slightly below the Plains region average with just under 60% of its contracts as fixed rent and slightly under 40% preferring cropshare (USDA ERS, 2020). Currently, there is a large amount of well-known literature associated with contract choice in terms of optimal contract choice, associated risk, and incentives under different contracts (Allen & Lueck 1992, 2004, 2008; Huffman & Just, 2004; Fukanaga & Huffman, 2008). When deciding to lease, contract choice plays a pivotal role in decision making for both farm and risk management decisions. As land continues to appreciate and the farmland leasing market becomes more competitive, producers, especially beginning farmers and young producers with smaller operations looking to expand their production, are evaluating their option to operate under a lease instead of taking on the commitment and expense of purchasing. No matter the size of production, each producer must consider all risks, rewards, and every financial option before making their final production and farm management decisions.

As you look ahead to the future of American agriculture and farmland leasing, the transition of land is a key focus in determining how leasing farmland may be impacted. The 2014 TOTAL survey delved into this subject by asking landowners about their future plans for transferring ownership of their farmland over the next five years. Non-operator landlords expect

to transfer around 16% of their land, and, in total, there are around 92 million acres of land expected to be transferred to new owners in the five years following the survey, with the Plains region expecting to transfer a larger share than other regions at 11%, or nearly 23 million acres to be transferred. Of this land being transferred, just under half of these acres are expected to be transferred into a trust, with selling the land to a non-relative following at 23% (USDA NASS, 2015). This large amount of land being transferred offers many uncertainties for Midwest and Plains region producers that rely on operating on leased land. If the land they currently lease is being transferred, whether it's being sold, inherited, moved to a trust, etc., there is the possibility that their lease contract, with its current conditions, could be changed, renegotiated, or not renewed entirely, with that land being leased to another producer.

This uncertainty is only one of numerous difficulties agricultural producers face today and is especially difficult for young producers who are trying to enter into the agricultural sector and achieve success by relying heavily on leasing to meet their production minimums and obtain economies of scale (Katchova & Ahearn, 2016). Young producers are often at a disadvantage to more experienced producers who have a better financial status, more experience, and access to more farmland. Landowners, who are largely retired or retiring producers, hold a growing portion of the available farmland in the United States. Landowners and experienced producers are aging, and soon, there will be a transition in the ownership of a large portion of the available farmland, and leasing, as previously mentioned, offers incentives to both the aging landowners and to producers. The aging producers transitioning in becoming landowners still have control over their land while producers are able to expand their production to cover more acres. This has led to a more competitive market for gaining access to lease farmland throughout the Midwest, especially so in Kansas. When in competition for access to land, leasing negotiations can often include factors

other than price. This competition can be a major disadvantage to young producers as they need access to farmland to help obtain economies of scale within the range of their limited capital. To be competitive, young producers need access to as much information as possible to give them the opportunity to compete against more established and experienced producers for leasing rights to land.

The purpose of this dissertation is to better understand Kansas farmland landowners, particularly their risk attitudes and preferences and their effect on contract choice and willingness-to-lease to certain tenants, such as young producers. The first essay focuses on the role of risk in contract choice. Using a dataset where landowner and tenants were matched, the role of production risk and the risk attitudes of producers and landowners interact with their contract choices is studied. Results indicate that greater production risk and more risk-averse landowners lead to use of fixed cash rent contracts. The second essay focuses on Kansas landowners' willingness-to-lease to young producers, particularly those that have little to no experience under different relationships the tenant has to the landowner. Essay 2 focuses on landowners' willingness-to-lease to young producers under different conditions. A discrete choice model is used to find Kansas landowners' willingness-to-lease to tenants at three different experience levels and three different relationship types with the landowner. Empirical results indicate that a young producer with no experience is less preferred than a tenant with more years of experience and may need to offer the landowner a higher cash leasing amount before the landowner is willing to lease to them. Additionally, relationships such as family/friend and acquaintances between landowners and young producers are also given a discounted leasing rate when compared to the landowner leasing to a stranger. This study not only fills a literature gap of landowner-young producer relationships and willingness-to-pay, but it also lays the foundation

for policies to be implemented. Those policies may help young producers with no experience to gain access to land by incentivizing landowners to lease to them.

This dissertation is comprised of two unique studies that focus on farmland leasing in Kansas and the relationships and factors that can affect them. Both studies present results that benefit Kansas landowners and producers by offering insight and education about how leasing contracts and arrangements can be made that benefit both landowner and producer.

Chapter 2 - The Role of Risk in Contract Choice[1]

Introduction

Since the mid-1950s, the national share of farmland that is owner-operated has remained relatively stable at approximately sixty percent of U.S. farmland. However, of the 911 million acres of farmland in the contiguous United States, almost 40% is under a land leasing contract (Bigelow, Borchers, and Hubbs, 2016). Producers and landowners have three leasing contract choices for agricultural production: fixed cash rent, crop-share, and flex. However, flex, a relatively modern combination of both cropshare and fixed cash contract characteristics, is rarely used only accounting for about 5% of all leasing contracts across the United States. Therefore, we focus on fixed cash rent and cropshare. Fixed rent contracts are straightforward in that the tenant pays a single payment for the use of the land during the growing season. Approximately 74% of farmland contracts in the Midwest regions are fixed rent contracts while crop share contracts make up another 15% of the contracts (USDA-NASS, 2014). With crop share contracts, the producer pays a certain share of the harvest to the landowner at the end of the season. Contracts dictate how risks are shared between landowners and tenants, therefore, contract choice is an integral part of risk management decisions. Understanding the contract choices between tenants and landowners is crucial to assessing how various farm policies or environmental changes that affect production and price risks affect managerial decisions, productivities, and their capitalizations into land values. Therefore, in this paper, we examine

[1] Authors for this essay are as follows: Chelsea Arnold, Jisang Yu, Mykel Taylor, Leah Palm-Forster, and Simanti Banjeree

how production risk and the risk attitudes of producers and landowners interact with their contract choices.

Understanding the role of risk in the contract choice is particularly important when the level of riskiness in farming changes. The degree of risk in farming can change due to various factors such as national or local farm policies, climate or environmental changes, or other market-level changes. Each new farm bill or legislation passed brings potential change for a producer and their production decisions as they must decide how the legislation will affect their operation. Both landowners and producers must consider the risk-return trade-offs of each contract choice under the new regulations as they can affect the riskiness of the farming. Therefore, understanding how the changes in risk affect contract choices is essential to the discussion of welfare consequences of various farm policies and the distributional effects of the policies across tenants and owners.

For example, in Kansas, producers face possible limitations on their irrigation practices due to recent local regulations of the Ogallala aquifer. In response to lowering aquifer levels, the Kansas Department of Agriculture (KDA) implemented groundwater management districts (GMDs). In 2012, K.S.A. 82a-1041 granted the GMDs the authority to recommend the approval of Local Enhanced Management Areas (LEMAs) per the recommendation of the chief engineer of the KDA. Conditions upon which a GMD could implement a LEMA include when: groundwater levels in the area are declining or have declined excessively, the rate of withdrawal of groundwater equals or exceeds the rate of recharge in the area of question, preventable waste of water is occurring, or may occur, and/or unreasonable deterioration of the quality of water is occurring or may occur within the area of question (KDA, 2018). Currently, approximately 18 counties in Kansas are in a GMD that has a LEMA being enforced or has a LEMA that has been

approved and will be enforced within a year. Limiting irrigation to producers increases the uncertainty and risk associated with yield and revenue, and, in turn, can affect the contract choice for a producer who leases the land they produce on.

In this study, we investigate how production risk affects contract choice using a unique dataset from a survey of tenants in Kansas and their landowners. This dataset, which has detailed information on the characteristics of tenants, landowners, and their leases, also matches tenants to their corresponding landowner which is not often seen in the literature as often, the literature focuses on specifically the landowner or tenant alone. By including this detailed information on the personal characteristics of both landowners and tenants, this study contributes to the literature by estimating the relationship among contract choices, the degree of risk in farming, and the risk attitudes of both tenant and landowners. We estimate the relationship among the contract choices, the degree of risk in farming, and the risk attitudes of the tenants and owners. Consistent with risk-sharing theory, we find that i) greater risk in farming leads to the selected contract being a fixed cash rent and ii) the more risk-averse the owner is the more likely a fixed cash rent contract is chosen. Our results are robust with respect to different samples and specifications.

Related Literature

Optimal contract choice under risk in agriculture has been extensively studied. The seminal work of Holmström (1979) investigates and establishes the role of imperfect information and moral hazard on optimal contract choices. In the context of the land rental contracts, the recent study of At and Thomas (2018) derives the optimal contracts between a monopoly landlord and tenant when the tenant's revenue is affected by both moral hazard and adverse selection. They conclude that the level of a tenant's protection and the outside option of the tenant are crucial in choosing an optimal contract (At and Thomas, 2018).

Similar to Holmström's approach, Huffman and Just (2004) develop a conceptual model to derive a set of comprehensive stylized facts on the contracts between landowners and tenants. Huffman and Just present a principal-agent model with risk-averse agents and explore how the optimal contract changes, given the risk aversion of landowners and tenants, tenants' characteristics, and landowners' holdings to risk. They highlight that the heterogeneity in landowner and tenant attributes such as riskiness of land, tenants' productivity, and risk attitudes of landowners and tenants are important to understand the patterns of contract choices.

There have also been attempts to empirically estimate the determinants of the land rental contract choices. By using data from over 3,000 contracts in the Midwest, Allen and Lueck (1992) find that there is no empirical evidence that contract choices are based on avoiding risk, and, in effect, risk sharing is not likely to be motivation for contract choice. In contrast, Fukanaga and Huffman (2009) and Qui, Goodwin, and Gervais (2011) present empirical evidence that shows risk and risk preferences matter. Using the 1999 Agricultural Economics and Land Ownership Survey (AELOS), Fukanaga and Huffman (2009) find that tenants' and landowners' behavior were consistently risk averse, with landowners appearing to be more risk averse than tenants. Their results support transaction cost and risk-sharing incentive motives in contracting much like the theoretical framework. Qui, Goodwin, and Gervais (2011) also show that risk does have a significant impact on contract choice, as it has a negative effect on a fixed cash contract being chosen.

Relationship variables related to landowners and tenants are also a crucial aspect of understanding optimal contract choice. While some studies such as Allen and Lueck (1992) include a singular relational variable describing the landowner and tenant, Bryan, Deaton, and Weersink (2015) place a heavy emphasis on including relational variables in their model. They

find that the relationship between the landowner and tenant can affect what type of contract is chosen. They also find that those with longstanding relationships are less likely to engage in a fixed cash contract (Bryan Deaton, and Weersink, 2015).

As the literature provides mixed evidence on the role of risk and risk preferences, we contribute to the literature by providing a new set of empirical results. We add to the empirical literature on classical risk-sharing approaches by using variables that measure production risk and also the direct measures of risk attitudes of both tenants and landlords. Our novel survey design generates matched data for tenants and landlords. This is important as it allows us to analyze how relative risk preferences affect leasing contract choices. Furthermore, we also utilize a penalized regression approach to examine whether a set of relational variables that are similar to those of as Bryan, Deaton, and Weersink (2015) influence the contract choices.

Conceptual Framework

To describe the relationships among the optimal rental contract choices, risk, and risk attitudes, we present a conceptual model and derive stylized facts. The stylized facts we derive further motivate our empirical framework. We assume that there exist two types of farmland rental contracts: a) fixed cash rent with a rate denoted by F, and b) crop share contract represented by a share to the owner, s. For simplicity, we further assume that contract choice is the only choice variable of each agent. More specifically, the tenant chooses whether they take fixed cash rent or crop share contracts for a given menu described by F or s. The owner chooses the specifics of fixed cash rent and crop share contracts by choosing F and s. Similar to Huffman and Just (2004), we assume that the two agents, the tenant and the owner, are represented by a simple-mean variance utility function:

$$U(\tilde{\pi}) = E\tilde{\pi} - 0.5kV(\tilde{\pi}) \quad (1)$$

where $\tilde{\pi}$ is the stochastic profit and *k* is the Arrow-Pratt constant risk aversion coefficient.

The tenant, denoted by subscript *T*, who rents field *i*, maximizes:

$$U_T = \max\{\mu_i - 0.5k_T\sigma_i^2 - F,\ (1-s)\mu_i - 0.5k_T(1-s)^2\sigma_i^2\} \quad (2)$$

where μ_i and σ_i^2 are the mean and the variance of the profit from crop production in field *i*. From this problem, the fixed cash rental rate that makes the tenant indifferent between the two contracts as a function of *s* can be derived:

$$F^*(s) = s\mu_i - 0.5k_T\sigma_i^2(2s - s^2) \quad (3)$$

for $s < 1$. Essentially, as long as there exists an alternative contract denoted by *s*, the tenant would not accept a fixed cash rent contract that has the rate greater than F^*.

The owner, denoted by subscript *O*, who rents out field *i*, maximizes:

$$U_O = \max\{F,\ s\mu_i - 0.5\sigma_i^2 k_O s^2\}. \quad (4)$$

From the tenant's problem, we know what the maximum fixed cash rent that the tenant will bid will be. Using this and the owner's problem, we arrive at:

$$U_O = \max\{s\mu_i - 0.5k_T\sigma_i^2(2s - s^2),\ s\mu_i - 0.5\sigma_i^2 k_O s^2\}. \quad (5)$$

From the above, we find the optimal *s* for each of the arguments of the owner's problem. For the first argument, $s\mu_i - 0.5k_T\sigma_i^2(2s - s^2)$, the solution is $s_1^* = 1 - \frac{\mu_i}{\sigma_i^2 k_T}$. For the second argument, $s\mu_i - 0.5\sigma_i^2 k_O s^2$, the optimal s_2 is $s_2^* = \frac{\mu_i}{\sigma_i^2 k_O}$. These lead to the final optimization problem:

$$U_O = \max\{s_1^*\mu_i - 0.5k_T\sigma_i^2(2s_1^* - s_1^{*2}),\ s_2^*\mu_i - 0.5\sigma_i^2 k_O s_2^{*2}\} \quad (5')$$

or simply:

$$U_O = \max\left\{0.5\left(\frac{(\sigma_i^2 k_T)^2 - {\mu_i}^2}{\sigma_i^2 k_T}\right),\ 0.5\frac{{\mu_i}^2}{\sigma_i^2 k_O}\right\} \quad (5'')$$

indicating that the optimal contract is the fixed cash rent agreement only if

$$\frac{(\sigma_i^2 k_T)^2 - {\mu_i}^2}{k_T} > \frac{{\mu_i}^2}{k_O} \qquad (6)$$

We obtain two stylized facts from this relatively simple conceptual framework. First, an increase in the profit variability would increase the likelihood of the optimal contract being the fixed cash rent contract, which we obtain from the fact that an increase in σ_i^2 makes condition (6) more likely to be true. Second, as the owner becomes more risk averse, the optimal contract is more likely to be the fixed cash rent contract. This is from the fact that an increase in k_O makes condition (6) more likely to be satisfied. The role of the tenant's risk preference is ambiguous.

Data Description

The data used for this survey were compiled from a mail survey sent during the summer of 2018. Using producers' information from the Kansas Farm Management Association (KFMA) database, a survey was sent to 2,000 producers in Kansas. Producers were asked to complete and return the survey in a postage paid return envelope. In addition to the producer questionnaire, each survey packet also contained a landowner questionnaire in a postage paid envelope. Producers were asked to send the landowner-specific survey questionnaire to the landowner from which they lease the largest amount of land. The landowner survey packet asked recipients to complete the survey and return it using the postage paid return envelope included in the packet. Both surveys included questions about their leasing arrangements, the land leased, and demographic characteristics. In addition, both tenants and landowners were asked to self-identify their level of willingness to take financial risks with respect to their farm operations, with 1 being completely unwilling to take risks and 10 being completely willing to take risks.[2]

[2] Note that previous studies have argued both for and against the use of a Likert scale of risk attitude with many studies finding consistency across their results in using a Likert scale of risk attitude (Uematsu and Mishra 2011; Dohmen, et al. 2005; Caliendo et al. 2009).

There was a total of 389 landowner surveys returned with 179 of those being matched tenant-landowner survey pairs. We limited the pairs with enough information on their lease and also whose main crops are corn, soybeans, wheat, or grain sorghum. The sample criterion on the main crops is used because other crops do not have enough yield and price information to measure the variabilities in their revenues. As a result, a final sample of 113 tenant-landowner pairs were identified and used. We distinguish our study from the literature by using information, especially the direct measures of risk attitudes, on both landowners and tenants from the matched pairs of landowners to tenants.

In addition, a coefficient of variation for each crop was found to measure the relative variability in crop yield using county-level yield data from the National Agricultural Statistics Service, USDA, for corn, soybeans, wheat, and grain sorghum for the years 2002-2017 (USDA NASS 2019). Crop price data for corn, soybeans, wheat, and grain sorghum for the years 2002-2019 were obtained from Kansas State University's Department of Agricultural Economics Grain Basis Database (Llewelyn, 2020). We compute the coefficient of variation for each crop using the means and the standard deviations over the years 2002-2017. Additionally, we also use weather variables such as growing degree days, degree days above 30°C, and precipitation as potential covariates. We extract these variables from the dataset of Schlenker and Roberts (2009), which is based on the gridded dataset of the PRSIM climate group.

Table 1 provides the summary statistics of the two samples we use for the analyses: i) a sample of the 113 matched tenant-landowner pairs, and ii) a sample of the 248 tenants, who report the relevant information and meet the sample criterion based on the main crops they grow. For the matched pair dataset, approximately 43% of producers and landowners currently operate under a fixed cash contract, whereas only 35% of producers operated under a fixed cash contract

in the tenants-only sample. The dataset used in this study, and its percentages of cropshare and fixed cash leases, does appear to be representative given previous studies and surveys completed in recent years (Li and Tsoodle, 2020). The variability the producers face, measured as the weighted average of the coefficient variations in revenue based on their crop rotation, is about 46% of the average revenue and is similar across the two samples.

Producers main crop was relatively consistent between the two samples. Soybeans were the most produced at 36 and 37% of producers' main crop with corn following at 32 and 33% of the matched pair and tenants-only sample, respectively. As previously mentioned, respondents were asked to assess their personal willingness to take financial risks on a scale from 1 to 10 with 1 being unwilling to take any financial risks and 10 being willing to take all risks. The average tenant in both the matched pair and tenants-only sample were slightly more risk-loving than the average landowner.

In addition to risk preferences, survey respondents were asked to state the relationship that they have with their landowner or tenant, along with demographic identifiers such as the number of years they have leased together and where the landowner lives in relation to their leased land. The relationship options between landowners and tenants include family, friend, neighbor, acquaintance, or business only. Approximately 48% of those in the matched pair data and 42% of those in the tenant-only data identified their landlords as family and 33% identified as friends with fewer respondents identifying as neighbors, acquaintances, and business only. For both datasets, the average number of years leased is approximately 18 years. In both datasets, over half reported that the majority of their household income was on-farm income.

Table 2.1 Summary Statistics of the Key Variables

	Matched Pair		Tenants Only	
	(1)	(2)	(3)	(4)
VARIABLES	Mean	SD	Mean	SD
Contract type (Fixed Cash=1)	0.43	0.50	0.35	0.48
Weighted avg. CV (Revenue)	0.45	0.044	0.46	0.042
Tenant's willingness to take risks	7.13	1.77	6.92	1.83
Owner's willingness to take risks	6.86	2.22	NA	NA
Corn share	0.32	0.23	0.33	0.21
Soybeans share	0.36	0.18	0.37	0.18
Wheat share	0.26	0.27	0.25	0.25
Family	0.48	0.50	0.42	0.49
Friend	0.33	0.47	0.33	0.47
Neighbor	0.15	0.36	0.20	0.39
Acquaintance	0.12	0.32	0.09	0.29
Business only	0.12	0.33	0.14	0.35
Years leased	18.54	12.30	17.94	12.81
Main income source is on-farm income	0.54	0.50	0.62	0.49
No. of Observations	113		248	

Empirical Framework

As illustrated in the conceptual framework section, our main hypotheses are i) greater profit variability of a field increases the likelihood of the field being contracted under fixed cash rent contract and ii) the fixed cash rent is less likely to occur when the landowner is more risk-loving.

Thus, our outcome variable is whether the contract is fixed cash rent or not. We are primarily interested in the following explanatory variables: the variability in the profits, which is measured by the weighted average of the coefficients of variation for the four crops, and the risk preferences of the tenants and the landowners.

To estimate the relationship among the contract choices, the variability in the profits, and the risk attitudes of tenants and landowners, we use both the Linear Probability Model (LPM) and the Logit regression model. The LPM model is specified as

$$\text{Prob}(\text{Fixed Cash Rent}_\text{i} = 1) = \beta_0 + \beta_1 CV_i + \beta_2 TR_i + \beta_3 OR_i + \boldsymbol{\Gamma X_i} + \varepsilon_\text{i} \qquad (7)$$

where CV_i is the weighted average of the coefficients of variations for the crops that tenant i is producing, TR_i is the risk attitude of tenant i and OR_i is the risk attitude of the owner of the land that tenant i is leasing from. Additionally, we include shares of corn, soybeans, and wheat in the crop rotation, and fixed effects specific to each Kansas Farm Management Association region, which are represented as a vector, $\boldsymbol{X_i}$. Similarly, we specify the Logit model as

$$\text{Prob}(\text{Fixed Cash Rent}_\text{i} = 1) = \frac{1}{1+\exp\left(-(\beta_0 + \beta_1 CV_i + \beta_2 TR_i + \beta_3 OR_i + \boldsymbol{\Gamma X_i} + \varepsilon_\text{i})\right)} \qquad (8).$$

We cluster standard errors by crop-reporting district to control for potential within-crop-reporting-district correlations since the crop prices we use are reported at the crop-reporting district level.

Based on the stylized facts derived from our conceptual framework, we expect that the variability of output is negatively correlated with the probability of fixed cash rent contract in place, holding the risk preferences constant. We also expect that the more that the tenant is willing to take risks, the fixed cash rent contract is more likely (positive sign), while the more the owner is willing to take risks, fixed cash rent is less likely (negative sign).

In addition to the main specification, as Bryan, Deaton, and Weersink (2015) document the importance of the relationship variables, we also examine the role of relational variables in explaining contract choices and whether the inclusion of the relational variables affect the estimated coefficients of our variables of interest. Ideally, one can include all possible relationship variables that are relevant to the outcome variable. Yet, if the number of these candidate control variables are relatively large compared to the sample size, including all of these candidate variables leads to poor prediction accuracy with non-zero coefficients for all of these variables (Tibshirani 1996). As an alternative, penalized regressions have been proposed (e.g. Tibshirani 1996; Zou 2006).

A common and reliable penalized regression one can utilize is the Adaptive Lasso approach developed by Zou (2006). An Adaptive Lasso model is specified as

$$\hat{B}, \hat{\Delta} = \arg\min \left\| Y - BD - \Gamma X - \sum_{j=1}^{p} \delta_j Z_j \right\|^2 + \lambda \sum_{j=1}^{p} \widehat{w_j} |\delta_j| \qquad (9)$$

where $B = \{\beta_1, \beta_2, \beta_3\}$, $D = \{CV, TR, OR\}$, and Z_j is the j-th variable among potential candidate variables over which we perform the variable selection estimation. Thus, $\hat{\Delta}$ is the vector of the estimated coefficients of the selected variables. Finally, λ and $\widehat{w_j}$ are the tuning parameters. Normally, λ is determined by a cross-validation procedure and $\widehat{w_j}$ is defined as $1/\left|\hat{\delta}_{j,OLS}\right|$ where $\hat{\delta}_{j,OLS}$ is the estimated coefficient from the Ordinary Least Squares estimation with all variables included. Zou (2006) shows that this Adaptive Lasso approach can consistently select the relevant variables. Also, note that we perform the variable selection over the additional candidate variables, Z_j, and are always keeping the initial key variables.

Therefore, we re-estimate equations (7) and (8) considering a set of candidate variables as potential covariates using the Adaptive Lasso approach. For Logit, one can simply replace the first term in (9) with the negative of log-likelihood function of the Logit model of (8) (see Zou

2006). The 22 candidate variables we consider here are relational variables that include if the tenant and owner are family, friend, neighbor, business-only, acquaintance, and no interaction, the number of years of lease between the owner and tenant, and variables describing how the land was obtained, such as if the land was inherited, purchased, or unknown. Locational variables include: if the land was in or out of the county of residence, in or out of Kansas, on farm, and local status. Finally, agronomic variables include: precipitation, growing degree days, growing degree days above 30°C, irrigation, productivity, and the sum of the share of crops in each rotation. Each of these variables offer a potential opportunity to help explain our model. Bryan, Deaton, and Weersink (2015) included similar relational variables for both landowners and tenants in their empirical model and were able to determine that the different relationships between tenants and landowners affect contract choice.

Results

Table 2.2 reports the estimation results of the matched pairs dataset for both the LPM and the logit models.[3] Columns 1 and 3 contain the coefficients of the LPM and logit models, respectively, that do not include the risk attitude variables whereas columns 2 and 4 include the coefficients of the models that do include the risk attitude variables. We focus on the weighted average coefficient of variation for revenue, and the risk attitudes of tenants and owners.

The weighted average coefficient of variation (CV) for revenue, which measures the riskiness of farming that field, is statistically significant and positive for all four models presented. This is consistent with our stylized facts. The estimated coefficients indicate that a one percentage point increase in the weighted average CV leads to about a 2.2 percentage point

[3] Note that two observations are dropped from the main sample of 113 pairs when estimating the Logit model since one of the association fixed effects that contains two observations perfectly predicts the outcome.

increase in the likelihood of that land being contracted under the fixed cash rent contract. Models that do not include the risk attitude variables, columns 1 and 3, had slightly higher coefficients than their counterparts. Both LPM and Logit models yield similar marginal effects.

The coefficient of the owner's willingness-to-take-risk variable is statistically significant and negative for both the LPM and the logit model. In other words, the more risk-loving the owner is, the less likely they are to have a fixed cash rent contract. Again, this is consistent with our stylized facts. The coefficient of the tenant's willingness-to-take-risk variable is a positive sign indicating that the less risk-averse tenants tend to be part of fixed cash rent contracts. As previously mentioned, our data, along with previous studies conducted in Kansas (Li and Tsoodle), see that in areas of non-irrigated land, fixed cash contract is higher supporting the idea that risk-averse landowners are more likely to choose fixed cash contracts on non-irrigated land. Note that our conceptual framework predicts ambiguous direction for the relationship between the likelihood of the optimal contract being fixed cash rent and the tenant's willingness to take risk. It does appear, though, that tenants' and landowners' risk preferences partly correspond to each other in the matched dataset (correlation coefficient of 0.63) and may suggest that some landowners and tenants are matching on risk preferences.

Table 2.2 Estimation Results: Matched Pairs

	LPM		Logit	
	(1)	(2)	(3)	(4)
VARIABLES	Prob(Fixed Cash Rent=1)			
	Marginal Effects			
Weighted avg. CV (Revenue)	2.27*	2.14*	2.39*	2.19**
	(1.19)	(1.01)	(1.23)	(1.04)
Tenant's willingness to take risks		0.059*		0.056**
		(0.029)		(0.026)
Owner's willingness to take risks		-0.055**		-0.054***
		(0.017)		(0.016)

Wheat share	0.37	0.35	0.32	0.28
.	(0.45)	(0.45)	(0.42)	(0.39)
Corn share	0.89*	0.84*	0.89**	0.80**
	(0.43)	(0.43)	(0.41)	(0.37)
Soybeans share	0.075	0.060	-0.020	-0.035
	(0.58)	(0.59)	(0.58)	(0.54)
Association FE	Yes	Yes	Yes	Yes
Observations	113	113	111	111

Note: Standard errors are clustered by the crop-reporting district level. Asterisks *, **, and *** denote the p-values less than 0.1, 0.05, and 0.01.

The estimation results of the LPM and logit models that include the results from the larger sample consisting of only tenants' information are reported in table 3. Included in Table 2.3 are the estimated coefficients for the weighted average CV of revenue variable, the tenant's risk attitude coefficient, and the crop share coefficients for both the LPM models and the logit models. We also estimate the model without the owner's risk attitude variable for the main sample of the 113 matched pairs to assess whether the potential differences in the estimation results between the two sets of samples are driven by omitting the owner's risk attitude variable.

Columns 1 and 2 represent coefficients for the LPM and Logit model of the matched pairs dataset, columns 3 and 4 represent the LPM of the tenants-only dataset, and finally, columns 5 and 6 report the estimated coefficients of the Logit models for the tenants-only dataset. Across all models, the estimated coefficient of the weighted average CV coefficient is positive and statistically significant, which supports the robustness of the results. Interestingly, the estimated coefficient is smaller in the tenants-only sample. The coefficient of the tenant's risk attitude is no longer statistically different from zero for all six specifications, which is different from the findings shown in Table 2.2. This indicates that omitting the owner's risk attitude variable causes a bias in estimating the coefficient of the tenant's risk attitude variable, implying that there is a correlation between the risk attitudes of the owners and tenants.

Given that the coefficient of the weighted average CV in columns 1 and 2 are similar to that of Table 2.2, the difference in the estimates is mainly from the difference in the samples rather than the fact that the owner's risk attitude variable is omitted. The primary difference between the matched pair sample with 113 observations and the sample with the tenant-only information (248 observations) is due to the nature of the survey procedure. That is, tenants were given the opportunity to fill out their survey and then were asked to pass along an extra survey to their landlord for them to fill out. The lack of a matched pair for 135 tenants (the difference between the 248 tenant surveys and the 113 matched pair surveys) suggests there may be a fundamental difference in the nature of the relationship between tenants and landowners for the non-reporting landowners. It could be driven by the unwillingness of the tenant to pass along the survey or the unwillingness of the landowner to fill it out.

In either case, we look to the summary statistics of the demographic variables to see if there are any possible explanations due to differences in relationship (Table 2.1). One difference to note is the contract type. In the matched sample (113 observations), there is a higher occurrence of fixed cash leases, whereas the larger sample of unmatched and matched tenants (248 observations) has a higher incidence of choosing crop share leases. This suggests a possible difference in the relative risk attitudes between the tenants and landowners in the two samples. It is also possible that the nature of the relationships between landowner and tenant differ between the two samples. Evidence for this comes from differences between the percent that are family versus neighbor or acquaintance. There are also differences between the number of years leased to the same tenant and the share of on-farm income. While it is impossible to pinpoint the exact driver of these differences, we do observe qualitatively robust estimates for the coefficient of the riskiness variable, i.e. the weighted average CV.

Table *2.3* Estimation Results: Comparison with the Tenants-only Sample

	Matched Pairs		Tenants Only			
	LPM	Logit	LPM		Logit	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Prob(Fixed Cash Rent=1)					
Weighted avg. CV (Revenue)	2.32*	2.46**	1.38*	1.41*	1.39**	1.41**
	(1.13)	(1.17)	(0.65)	(0.70)	(0.59)	(0.63)
Tenant's willingness to take risks	0.018	0.017		-0.0061		-0.0061
	(0.024)	(0.023)		(0.019)		(0.018)
Wheat share	0.40	0.35	0.28	0.28	0.28	0.28
	(0.45)	(0.41)	(0.29)	(0.29)	(0.30)	(0.30)
Corn share	0.93*	0.93**	0.51*	0.51*	0.51*	0.52*
	(0.42)	(0.39)	(0.27)	(0.27)	(0.30)	(0.29)
Soybeans share	0.090	0.0070	-0.088	-0.081	-0.091	-0.081
	(0.57)	(0.57)	(0.31)	(0.31)	(0.32)	(0.32)
Association FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	113	111	248	248	248	248

Note: Standard errors are clustered by the crop-reporting district level. Asterisks *, **, and *** denote the p-values less than 0.1, 0.05, and 0.01.

Finally, we perform a robustness check that focuses on the possibility of the omitted variable bias. Thus, we re-estimate equations (2) and (3) using the Adaptive Lasso approach of Zou (2006), which is specified as equation (4). We use 5-fold cross-validation to find the optimal λ. We repeat the model estimation procedure 100 times to consider model uncertainty. As a result, we find that the Adaptive Lasso for the LPM model never selects any additional control variables from the candidate pool and thus, yields the identical result as column (2) of Table 2. For the Logit model, the only additional variable selected via the Adaptive Lasso approach in some of the repetition is the indicator variable of whether the tenant knows how the landowner

obtained the land or not. Table 2.4 reports the estimation result with this additional variable included. The coefficients of the key independent variables remain robust.

Table 2.4 Estimation Results: Post-selection Estimation

VARIABLES	Logit Prob(Fixed Cash Rent=1)
	Marginal Effects
Weighted avg. CV (Revenue)	2.12**
	(1.01)
Tenant's willingness to take risks	0.056**
	(0.025)
Owner's willingness to take risks	-0.059***
	(0.015)
Wheat share	0.30
	(0.37)
Corn share	0.77**
	(0.34)
Soybeans share	-0.022
	(0.51)
Does not know how the landowner obtained the land	0.39*
	(0.21)
Association FE	Yes
Observations	111

Note: Standard errors are clustered by the crop-reporting district level. Asterisks *, **, and *** denote the p-values less than 0.1, 0.05, and 0.01.

An interesting finding of the variable selection exercise is that the none of the relational variables had enough statistical power to explain the contract choices. This is different from the work of Bryan, Deaton and Weersink (2015) who found that familial relationship had enough statistical power to explain contract choice, but not enough to explain contract amount.

Conclusion

In conclusion, this study's unique dataset that matched landowners to tenants provides an opportunity to estimate the relationship between contract choice, the degree of risk in farming, and risk attitudes of the tenants and landowners. It is this fairly unique attribute that is a

contribution to the related literature. Consistent with the risk-sharing theory presented in the previous literature, we confirm two stylized facts: i) greater risk leads to the optimal contract as fixed cash rent and ii) more risk-averse the owners make the fixed cash rent contract more likely. Using multiple samples and specifications, our results confirming the derived stylized facts remain robust.

The results from this study contribute to the empirical literature by confirming related findings, but with the unique attribute of matching landowners to tenants not previously seen in the literature. We can conclude that more risk-loving landowners are less likely to engage in a fixed cash rent contract, while tenants are more likely to choose a fixed cash rent contract when they are more risk loving. This knowledge benefits landowners and tenants by helping assess the potential effect of welfare consequences of farm policies, in addition to providing guidance on how risk-enhancing environmental changes affect managerial decisions. Specifically, in relation to irrigated land being leased. In areas of Kansas where irrigation is high, the percentage of cropshare being the most common lease is also higher. As previously mentioned, this can be due to the fact that irrigated land is typically less volatile, and more risk-averse landowners may choose cropshare over fixed cash when the land is irrigated. However, if irrigation practices are restricted and production variability increases, the greater risk exposure to tenants may alter negotiations of leasing arrangements between tenants and landowners.

Chapter 3 - Impacts of Tenant Experience and Social Capital on Leasing Decision by Landowners in Kansas

Introduction

In recent decades, American agriculture has seen an increase in the number of acres of farmland that are being leased. Land, especially high-quality farmland, is a non-renewable resource that producers must compete with other producers and other industries to acquire access to produce on the land. This is especially true in the Midwest and in Kansas. Leasing offers incentives for both the landowner and the tenant, especially so when the tenant is a young producer who typically has less access to available farmland. However, output from agricultural production can be volatile due to outside factors. Over time, a producer gains experience in how to best manage their production during years of volatility. Those with less experience may often make decisions that producers with more experience would not, leaving less experienced farmers with the potential of higher volatility in their production output. Due to these limitations, landowners may potentially value producers that have more experience when choosing a tenant as landowner revenue can be tied to producer output (cropshare).

Studies have been conducted that assess the struggles that young producers and beginning farmers face in agriculture as a whole and how leasing impacts a young producer's potential to succeed (Katchova & Ahearn, 2016). However, there is room to add to the literature by studying landowners' preferences in leasing to those with less experience, such as young producers, especially as a new generation of producers are expected to enter the market in the transition of land in the coming decades (USDA NASS, 2015). Additionally, studies on landowner-tenant relationships are often found in the literature and include studies that looked at social capital between a landowner and a tenant in leasing arrangements (Taylor & Featherstone, 2018). Social

capital is an important aspect of leasing as relationship type and communication level can impact multiple facets of leasing arrangements including optimal contract type, contract specifications, and, in some instances, leasing rates (Bryan, Deaton, and Weersink, 2015). However, literature that focuses on social capital between landowners and tenants who are young producers is limited, and, again, could be added upon to better understand the impact that social capital may have on leasing arrangements between landowners and young producers.

Landowners

There are around two million non-operator landowners renting out farmland across the United States according to the 2014 TOTAL survey (USDA NASS, 2015). Landowners across the United States, and particularly across the Midwest and Great Plains, have ownership of a large majority of the available farmland in production. Of the two million non-operator landowners, 70% were classified as "principal landowners," meaning that they were either an individual owner or the principal landowner in a partnership. These principal landowners are typically older than the average producer, have a college education, or at least some college experience, and slightly over half were not currently an active member of the paid workforce. Additionally, while many have experience on the farm, 45% of principal landowners did not have farming experience (USDA NASS, 2015). In relation to Kansas landowners and tenants, Taylor (2016) conducted a survey of members of the Kansas Farm Management Association (KFMA) and their leasing and relationship attributes and found that the average leasing relationship lasted for a cropshare was 22.3 years and 18.7 for fixed cash leases. Kansas landowners and tenants also heavily prefer an oral (versus written) contract agreement with 75% of those choosing cropshare operating under an oral agreement. While it is difficult to specifically say why oral contracts are preferred over written, it can be stated that there is a

certain level of trust that must be established to operate under an oral agreement. In addition, those operating under a cropshare contract may hold higher levels of trust between landowners and tenants as a cropshare contract requires more interaction between landowner and tenant than a fixed cash contract (Taylor, 2016). Understanding the role of the level of trust between landowners and tenants is crucial when attempting to study either party, but especially so when studying how their interaction and relationship affect their leasing arrangements and willingness to lease to one another.

Young Producers and Beginning Farmers

As producers retire, there is the expectation that younger producers will take their place. The USDA reported that as of the 2017 Agricultural Census, the average age of a U.S. producer was 57.5, up just over a year from 2012. This small upward trend has been seen each agricultural census since 1978, when the average age was 50.3 (USDA, 2020). A study conducted by the ERS (Economic Resource Service) found that the reason for the increasing average age over the past few decades is that the number of young producers entering agricultural production has declined, along with a decline in the number of older operators exiting production from 1978 through the early 21st century (Gale, 2003). While in more recent years there has been a slight increase in the number of young producers, this trend of an increasing age of the average producer gives insight that younger producers are not entering agricultural production as quickly and consistently as expected. As defined by the USDA, a young producer is one that is 35 years old or younger. Often in the literature, young producers and beginning farmers and ranchers are studied together; therefore, it is important to distinguish between the terminology. A beginning farmer may also be a young producer (under the age of 35) but beginning farmers can be any age. To qualify as a beginning farmer, a producer must be the principal operator with less than 10 years of farming

experience. However, beginning farm operators tend to be younger than principal operators of established farms. In 2017, 30% of beginning farm principal operators were 35 years old or younger. The 2017 agricultural census reported that young producers accounted for 9%, or over 300,000 of the country's 3.4 million producers with 80% of those young producers having started farming in the last ten years (USDA, 2020). Gale (2003) suggested that the declining entry of young producers and exit of older producers signifies certain demographic shifts in both the social and economic organization of the agricultural sector.

Young producers and beginning farmers in America face a handful of challenges when establishing their farms including limited access to land and financial hardships that arise with establishing a new farming enterprise. In fact, young producer groups often state that the hardest challenges in getting started is acquiring access to farmland, farm equipment, and obtaining financing for their agricultural enterprise (Ackoff et. al, 2017). Limited access to farmland is a challenge for a number of reasons. First, young producers do not typically inherit the land on which they produce (Katchova & Ahearn, 2015). Instead, they must decide to either purchase farmland, which includes a higher exposure to risk and uncertainty, or enter into a leasing arrangement to gain access to the land which involves less financial risk exposure. Since 2000, the price of agricultural land has continually appreciated, nearly doubling between 2000 and 2015 (Key & Burns, 2018) making purchasing land for farm use difficult for a young producer with minimal financial resources. To assist young producers with the high initial costs of beginning their operations, FSA offers higher assistance rates when applying for financial and technical assistance through the USDA's Environmental Quality Incentives Program (EQIP) for some conservation practices. In addition, the Risk Management Agency of the USDA offers benefits to those beginning farmers and ranchers that buy crop insurance by requiring less stringent yield and

production history requirements. While these policies aim to help young farmers acquire the capital for the land, young farmers still have, on average, lower household income and net worth than more established farm enterprises.

Beginning farmers often seek off-farm employment to assist in acquiring the capital needed to get started. In 2017, USDA reported that 67% of the principal operators of beginning farms worked off-farm jobs with 45% of those being employed full time off-farm and 22% being part-time employed off-farm. The spouses of beginning farms are also more likely to work off-farm than the spouse of an established farm operator. In addition, beginning farms have a higher debt-to-asset ratio. Nearly 56% reported having some level of debt in comparison to only 48% of established farms. As principal operators of beginning farms tend to be younger, have less net worth, and are generally smaller scale, they are more likely to borrow to finance their production expenses and capital investments with an average debt-to-asset ratio of almost 30% compared to 18% for established farms (Ahearn, 2017; Key & Lyons, 2019). In addition, beginning farms are less likely to receive payments from federal agricultural programs. This can be attributed to the fact that beginning farms are typically smaller, and smaller farms are less likely to receive payments (Key & Roberts, 2007); However, for those that do receive a payment, they financially rely more heavily on the payment than established farms that receive a payment.

Katchova and Ahearn (2016) studied both young producers and beginning farmers entrance into agriculture and their ability to accumulate the needed capital and grow in the early years of their operations. They categorize the data in their study by focusing on the entire distribution of farmer age and experience instead of comparing young and old farmers and beginning and experienced farmers. They find that a young producer who has successfully entered into the agricultural sector will attempt to obtain economies of scale by expanding their farm size more

rapidly through both owning and renting more land. Young producers have higher rates of leasing land earlier in their career, as they do not yet have the capital required to purchase land. Katchova and Ahearn (2016) also suggest that young producers may rely more heavily on leasing land because of the added financial risk of owning land and the high cash flow requirement of owning land. As they gain experience and capital, young producers lease less land and purchase more, but leasing is critical for young producers' early years when trying to expand their operations (Katchova & Ahearn, 2016). Young producers can be successful in both the short and long term, but there are many challenges that they will face. Leasing farmland greatly aids the younger producer and gives them a higher chance of success; therefore, it is important that, when possible, assistance and information is accessible so that they may become competitive in the farmland leasing market.

Transition of Farmland

Farmland has been increasingly held by the older generation of landowners and producers which can affect farmland value when land is being transferred down to younger generations (Duffy, 2011). As previously discussed, the average age of farmland owners has increased over recent decades. The increasing age brings the question of what will happen to the land upon transfer from the landowner as it affects the current producers of the land and its future productivity. The 2014 TOTAL survey asked respondents to identify their current plans for transferring their land ownership over the next five years. Landlords that were classified as non-operators (landowners who are not currently farmers or ranchers) expected to transfer around 14 percent of their leased land to other ownership. Similarly, operator landowners expect to transfer around 15 percent of their leased land. In total, nearly 10 percent of all land used for agricultural production was expected to be transferred in the five years after 2014 (USDA NASS, 2015).

When land that is historically leased is transferred, or is planning on being transferred, it disrupts the current leasing arrangement and brings uncertainty and risk to the producer. In instances of long-term leases and long withstanding relationships with landowners, a transition of landownership to a trust or family member could greatly impact the producer who has used that land to meet their production goals for many years. In some cases, the farmland in question may be listed for sale in its transition and the producer may be able to purchase some or all of the land, but, again, this is not always an option. This is especially true for younger producers. Access to the available farmland being transferred via leasing is crucial for young producers and beginning farmers who use leasing as an entry method into agricultural production and as an economically less risky way of obtaining economies of scale when their access to capital is low. Enabling these young producers market access to the land being transitioned in the coming years could prove greatly beneficial to young producers and their success.

Landowner and Tenant Relationships

Landowner and tenant relationships can vary widely from relationships that have lasted decades with high interaction to relationships that are straightforward and strictly business. Landowners overall have varying backgrounds, experience, attitudes, expectations, and preferences when leasing their land. Despite this, there are typically certain traits and characteristics that landowners tend to share. Landowners in the United States tend to lease their land to producers that have similar characteristics to the landowners themselves (Allen and Lueck, 2002). As landowners seek out tenants to work with, there are often numerous things to consider other than the financial aspect of the relationship. Bryan, Deaton, and Weersink conducted a study in 2015 of landowners in Canada who were mostly non-farmers to assess if the relationship of landowners and tenants affected both the contract choice and/or the monetary amount of rent. Their

study found mixed statistically significant results, but a key finding of their model is that, for contract choice, tenants and landowners that were classified as family were 16% less likely to choose cash rent as their contract choice. However, they also find that landowners that use a cash rent with family members do not do so under a cheaper rent, meaning that the stronger relationship (family member compared to stranger) did not necessarily result in a discounted rental price. In a similar situation, rental rates were also found to not be impacted by the number of years leased. In fact, none of the landowner characteristics, such as age, marital status, resident of a rural area, whether the landowner was a farmer previously, etc., had a statistically significant impact on the cash rental rate. Only land characteristics, such as yield and quality of the land, had large impacts on the cash rent value (Bryan et. al, 2015). Despite their mixed results, Bryan, Deaton, and Weersink emphasize the importance of social capital in landowner-tenant relationships and stress that both landowners and tenants consider similar factors when negotiating cash rent values. Interestingly, landowners may even disregard higher leasing rates and instead may rent to an existing tenant that has a reputation with the landowner and a higher level of social capital (Taylor & Featherstone, 2018).

Willingness-to-Pay (Lease)

If it can be concluded that monetary incentive is not always the main deciding factor when choosing a tenant to lease to, then what are the other contributing factors? When researching the available literature, a key focus of landowner and tenant relationships is the value of social capital and how it affects contract choice, land values, and rental rates (Tsoodle, Golden, & Featherstone, 2006; Taylor & Featherstone, 2018; Bryan, Deaton, & Weersink, 2015). Social capital can be defined as “a person or group’s sympathy or sense of obligation for another person or group” (Robinson, 1999). This concept of social capital introduces the possibility that the relationship

between landowner and tenant can affect the terms under which the leasing contract is negotiated. Landowners' preferences can be shaped by numerous outside factors, such as their past experience with tenants, their attitudes towards land stewardship, and their own financial standpoints. In the early studies that included social capital, an economist, Becker, attempted to show that the common, narrow assumptions of self-interest were not accurate. Instead, he believed that behavior is commonly driven by preferences and values that are much more intricate assuming that a person maximizes personal welfare "as they conceive it" and that individual behavior consistent over time and forward looking (Becker, 1996). This thought can be applied to landowners. When debating who has more bargaining power in a leasing negotiation, the landowner or the tenant, one might respond that the landowner holds the power as they hold the land. A landowner will maximize their own personal welfare "as they conceive it." This means that based on their own preferences and experiences, they will find a tenant and contract that maximizes their own welfare. However, how does this change when they consider leasing to a young producer? As previously mentioned, young producers need access to available farmland to lease for their production, but landowners, especially those in the Midwest and Kansas, have certain preferences expected in who they lease to. They typically have longer landowner-tenant relationships built upon years of experience, while a young producer may have neither the relationship established, nor the level of experience as opposed to other available tenants. When a landowner is faced with two tenants, one with years of experience and that they have a working relationship with and a second that is a young producer with minimal experience and has not worked with the landowner, the argument could be made that the landowner is likely to choose the first tenant as they offer potentially less risk and lower monitoring costs to the landowner. This amount they offer more of can be associated with lower monitoring costs to the landowner. Taylor and Featherstone offer a conceptual model of valuing

social capital that includes monitoring costs into the landowners' utility maximation where landowner-tenant relationships with higher social capital, the landowner have lower monitoring costs. Ultimately, the decision made by the landowner is made by examining the trade-offs in the monitoring costs and returns to their land (Taylor & Featherstone, 2018). Associating lower monitoring costs with higher social capital builds a theory that tenants that have a stronger relationship, or higher level of social capital, also have a higher level of trust, which as previously discussed can impact not only contract choice, but also leasing rates (i.e. willingness-to-pay).

Willingness-to-pay (WTP) models in agricultural economics are often found in research related to consumer demand and consumer preferences, but rarely in the literature is a landowner's willingness-to-pay studied. Literature related to landowners and tenants tends to focus heavily on landowner-tenant relationships and their contract choice, their leasing arrangements, the current rate of their lease, land productivity and conservation practices, and the impact on the value of the land. However, there are many instances in which landowners are the focus of the WTP model when the research is focused on landowners leasing in other countries, such as Ireland (Hynes and Hanley, 2009) which has leasing structures and agricultural policies far different than those common in the United States. Landowners' WTP for certain conservation practices and in the timber industry is also a focus area (Thunberg and Shabman, 1991; Lynch, Hardie, & Parker, 2002). Landowners' leasing decisions rely heavily on their relationship, experience, and social capital with their tenants, but as previously stated, landowners are aging, and there is a large amount of available farmland expected to be transitioned. Young producers are struggling to gain access to farmland to rent. Information gained from these types of studies can better prepare the next and incoming generation of producers to better navigate the farmland leasing market as farmland for lease becomes scarcer and competition with experienced producers increases.

Conceptual Framework

When deciding who to lease their land to, landowners can face several choices in tenants. Landowners have a set of individual preferences that can impact who they decide to rent to and under what conditions. With every possible tenant to choose, a landowner has a level of certainty (or uncertainty) that the tenant will follow the contract and pay the agreed upon amount or achieve a higher expected return to the land. These expectations by the landowner may be affected by the experience level of the potential tenant along with the relationship between tenant and landowner. These characteristics of tenants, and landowners' attitudes or preferences towards the characteristics, along with the relationship between tenant and landowner have often been studied and sometimes include a social capital variable (Bryan, Deaton, & Weersink, 2015; Taylor and Featherstone, 2018). A tenant that has a closer relationship, such as a family member, is typically regarded as having a higher level of trust (Bryan, Deaton, & Weersink, 2015). A tenant with a lower level of social capital may be perceived as having a higher chance of defaulting on their lease. It can also be argued that some tenants, such as younger producers, or those with less experience, may carry the uncertainty of defaulting on their lease in the event of a crisis as they may not have the capital or cash reserves to pay in the event of a loss. Therefore, the landowner's utility function can be modelled for two different events: no default of the lease or a default of the lease. The landowner's value for each event is shown below.

No Default on Lease:

$$\boldsymbol{V_t = Rent_t + \Delta\pi(experience, social\ capital)} \quad (1)$$

Default on Lease:

$$V_t = \Delta V(experience, social\ capital) \quad (2)$$

V_t is the landowner's value of the land for that length of the lease, subscript *t*. Note that this is not the landowners net present value of the land, but rather the value they are expected to potentially receive over the course of the lease. $\Delta\pi$ is the change in the future value of land. This is included as each time land is leased and produced on, soil quality can change depending on what production practices were used, what crop was grown on the field, etc. Experience level is a function of this as different experience levels will have different management practices that may affect the change in the future value of the land after the lease is complete. For this study, social capital is measured in ranked categories of family/friend, acquaintance, and stranger describing the nature of the relationship between tenant and landowner is a function of the future value of land under the contract year, V_t. As previously mentioned, both experience and social capital level of the tenant to a landowner can potentially impact the lease potentially defaulting or not. Consequently, the probability of defaulting on a lease can be written as:

$$Prob(Default)\ or\ \rho\ = f(exp, s) \quad (3)$$

Where the probability of defaulting, ρ, is a function of *exp*, or the tenant's experience level, and *s*, the level of social capital. From this probability function, we can describe the expected value as:

$$EV = \big(1 - \rho(exp, s)\big) * \big(rent + \Delta V(exp, s)\big) + \rho(exp, s) * \Delta V(exp, s) \quad (4)$$

The change in expected rent as a response to tenant's experience level can be explained by the derivative of the expected future value of land with respect to experience which is derived as:

$$\frac{\partial EV}{\partial exp} = \left[-\rho'_{exp} * (rent + \Delta) + (1 - \rho) * \Delta'_{exp}\right] + \left[\rho'_{exp} * \Delta + \rho * \Delta'_{exp}\right] \quad (5)$$

Which simplifies to:

$$\frac{\partial EV}{\partial exp} = -\rho'_{exp} * rent + \Delta'_{exp} \quad (6)$$

$$\frac{\partial EV}{\partial exp} = \underbrace{-\rho'_{exp} * rent}_{rent} + \underbrace{\Delta'_{exp}}_{land\ value} \quad (7)$$

We expect ρ'_{exp} , or the rent portion of the equation, to be <0 as a tenant with more experience has a lower probability of default. We also expect that Δ'_{exp} , or the land value portion of the equation, to be >0 as there is less depletion of the land expected from a more experienced tenant, meaning that

$$\frac{\partial EV}{\partial exp} > 0.$$

Another potential reason for greater expected value from a more experienced landowner would be under a crop share contract. In this situation, the tenant's higher level of experience may result in higher expected yields, and therefore returns, from the land. The landowner's utility increases as expected rent increases. Additionally

For social capital, the same steps and derivations can be used to find derivative of the expected future value of land with respect to social capital.

$$\frac{\partial EV}{\partial s} = \left[-\rho'_s * (rent + \Delta) + (1-\rho) * \Delta'_s\right] + \left[\rho'_s * \Delta + \rho * \Delta'_s\right] \quad (8)$$

Which, again, simplifies to:

$$\frac{\partial EV}{\partial s} = \underbrace{-\rho'_s * rent}_{rent} + \underbrace{\Delta'_s}_{land\ value}. \quad (9)$$

However, unlike $\frac{\partial EV}{\partial exp}$, the signage for $\frac{\partial EV}{\partial s}$ can be more ambiguous. Δ'_s can be signed either positively or negatively as one's social capital level may not affect the depletion (or value) of the current land. In addition, one's relationship to tenant may both help, or hinder, the probability of defaulting on the lease. For example, the argument could be made that a family member is less likely to default on their lease as they know the landowner closely, and a stranger is more likely to default on their lease as they have no working relationship, but there is little literature to support this claim; therefore, we do not assign a sign to the derivative.

Data Description

Kansas Landowner Survey

The objective of this study focuses on Kansas landowners and their attitudes and preferences towards young producers. A survey-based approach was found to be the optimal approach for identifying landowner preferences. Kansas has over 52 million acres of land with over 46 million of acres listed as agricultural land (NASS, 2020). Recall that almost half of this land is rented. In an effort to create a database for this study, an open records request was issued to the Kansas Department of Revenue's Property Valuation department. This request allowed access to the mailing address of any person, or entity, that currently owns 75 acres or more of land

in Kansas resulting in over 250,000 addresses. As it is economically infeasible to mail a survey to each landowner in Kansas, 18 counties in 9 of the NASS regions were randomly selected to be oversampled to represent their region. These may be seen in Table 3.1.

Table 3.1- Counties Randomly Selected

Region	County
Central	Marion
	McPherson
East Central	Coffey
	Anderson
North Central	Jewell
	Clay
Northeast	Atchison
	Brown
Northwest	Cheyenne
	Decatur
South Central	Kiowa
	Reno
Southeast	Cowley
	Crawford
Southwest	Finney
	Hamilton
West Central	Wallace
	Trego

Within each county selected, 200 landowners were randomly selected and mailed a landowner survey for a total of 3,600 landowner surveys being mailed. Below is a map of the 9 NASS regions in Kansas.

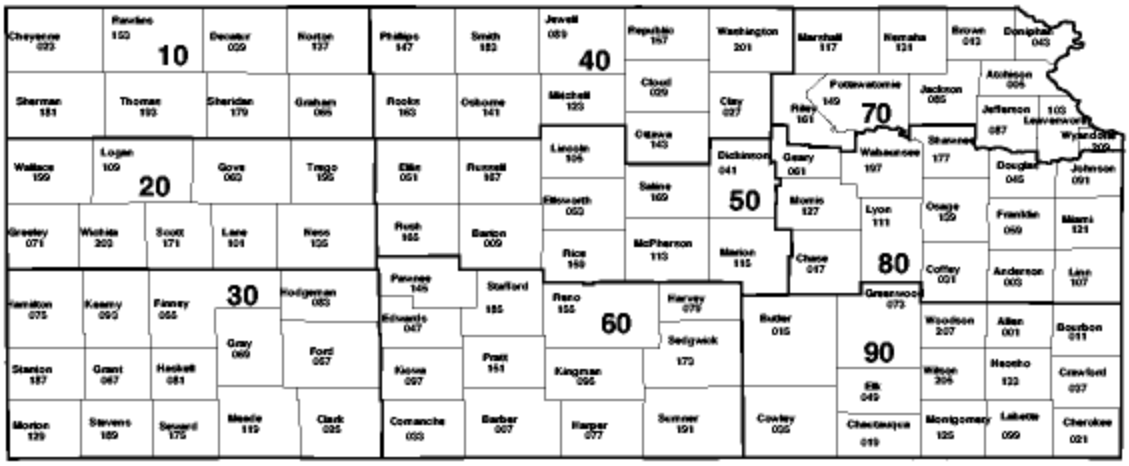

Figure 3.1 - Kansas NASS Regions

The landowner surveys sent had four sections that included questions pertaining to: demographics, landowner property, personal preferences, and leasing scenarios. A full copy of the survey may be found in the appendix, along with a copy of the letter sent to all participants.

Demographics and Personal Property

Section 1 included questions related to landowner demographics, such as: gender, age, generational farmer status, education, and annual gross income. Section 2 included questions to describe attributes of the farmland that landowners currently lease. The questions asked for respondents to describe how much farmland they own/lease, where the land is leased, where they live in relation to the land, and how much land if any is held by a trust. In addition, this section also asked respondents to identify their relationship that they have with their landowners/tenants, how often they meet to discuss the farmland and lease, and what type of contract each respondent prefers to use.

Personal Preferences

In an effort to access the risk preferences of landowners, Section 3 asked landowners to rank their preferences on groups of leasing options such as: lease type, relationship, and

experience. These questions were given in groups of three and asked each respondent to rank which of the three ventures they believed had the highest amount of risk at 1, and the lowest amount of risk involved at 3. Landowners were asked to answer questions that stated, “What is the most important aspect when deciding who to lease their land to when considering: financial returns, tenant’s age, tenant’s experience, tenant’s financial status, or tenant’s relationship with the landowner?” In addition, landowners were asked to agree or disagree with statements regarding common beliefs held by some landowners, such as: (1) Do written leases offer more protection than a verbal lease; (2) Should land be managed only under practices approved by the landowner; and (3) Is there more risk involved when rented to a young producer and should they, therefore, be charged a higher leasing rate?

Leasing Scenarios

The fourth and final section for both landowners asked each respondent to complete either 6 or 7 discrete choice leasing scenarios. A survey design of 3 fixed choices (Tenant A, B, & C) and the variable relationship attribute for each fixed choice gave a full factorial of 729 possible scenarios. To support identifying both base linear and possible two-way interaction effects, a full second-order model was identified using OPTEX. The OPTEX procedure is commonly used to search for optimal experimental design by specifying a set of candidate design points and a linear model, and the OPTEX procedure chooses points in a way that the model may be estimated as efficiently as possible. The D-efficiency score, with respect to blocks within replicates, is a numerical indicator of how well-balanced the design is. For this model design, a D-efficiency score of 94.8 out of 100 was considered strong and gave an output of 13 scenarios that would effectively represent the dataset. These 13 scenarios were split into two blocks for each survey. Block I included 7 choice sets and Block II included 6 choice sets. Surveys were split equally among the

200 randomly selected landowners. Landowners were given the same scenario of leasing 150 acres of good quality, non-irrigated farmland in Kansas. Landowners were given the choice of three possible tenants: Tenant A is a 30-year-old farmer with no farming experience, Tenant B is a 30-year-old farmer with 5 years of experience, and Tenant C is a 30-year-old farmer with 10+ years of experience. Each choice set offered the choice of these three tenants under differing prices and relationship status. An example of a landowner choice set can be seen below.

	Tenant			
Attributes	**Would not lease land to**	**Tenant A (No experience)**	**Tenant B (5 years of experience)**	**Tenant C (10+ years of experience)**
Relationship w/tenant	None	Stranger	Stranger	Family/Friend
Rent ($/acre)	$0.00	$49/acre	$36/acre	$36/acre
You would lease to:				

Figure 3.2 - Potential Choice Set

Landowner survey respondents were given the following definitions to assist in taking the relationship of the tenant into account:

> Acquaintance: Someone you have previously conducted business with, or you know someone who has previously conducted business with this person.
>
> Family/Friend: Someone that you are related to or is a personal friend.
>
> Stranger: Someone that you have no known relationship with.

Cash rent prices vary by location. This is especially true in Kansas where cash rent can vary from approximately $30/acre in Southwestern Kansas to approximately $150/acre in Northeastern Kansas. To account for this price distribution across Kansas, landowners were sent surveys with choice sets specific to the region in which their land is located. For example, for those in Marion

County received the Central Kansas Landowner Survey. This survey's choice sets informed the respondent that the average rent per acre is $49. Prices included in the choice set included a low price (2 standard deviations below the average), a medium price (the average price for the region), and a high price (2 standard deviations above the average).

Respondent Data Summary

Of the 3,600 surveys mailed out, 642 responded across all nine survey regions. The region with the highest response rate was Central and Southwest with the lowest response rates in the West Central and Northeast/West regions. Overall, however, there was adequate distribution of responses across the state as seen in Table 8.1 in the appendix. Given this dataset, the average Kansas landowner is a 68-year-old married male with 75% of all respondents having at least some college-level education. In addition, nearly 60% responded that their primary source of income is earned off-farm. With an average land size of 855 cropland acres and 456 pasture acres, landowners who currently lease, or 71% of the respondents, lease out the majority of their land. Almost two-thirds of respondents identified themselves as either an active or retired farmer, and 92% of respondents stated that either their parents, grandparents, or both parents and grandparents were farmers. This is important to note as a landowner's preferences may be more similarly related to a producer's when the landowner has a base knowledge of agricultural practices, either through familial experience or experience farming themselves. For this dataset, respondents had on average, 41-50 years of experience. Landowners who currently lease at least a portion of their land had an average of 2 tenants that they currently work with an average relationship of just over 15 years. This is notable not only because it is near the same average as similar, recent studies, but also gives insight into the average Kansas landowner. Those who have worked with a tenant for multiple years have built a relationship and a certain level of trust.

When contemplating leasing to a new tenant, a landowner that has typically worked with the same tenant, or tenants, for multiple years may have higher expectations. As previously mentioned, this study established three relationship levels. Landowners were asked to rank relationships when leasing based on their associated risk level, and as can be expected, the overwhelming majority (92%) ranked leasing to a stranger as the most amount of risk. Risk association was also asked for leasing to those with no, some, and multiple years of experience. Again, the majority of landowners (81%) ranked leasing to those with the least amount of experience as having the highest amount of risk. While this is all fairly straightforward, it becomes more interesting when landowners were asked to rate the level that they agree to a series of statements. Particularly interesting were the two statements that assessed the landowner's perception of risk involved with leasing to a producer with little to no experience (Figure 3.3) and if they would require a higher leasing rate to lease to a less experienced producer (Figure 3.4).

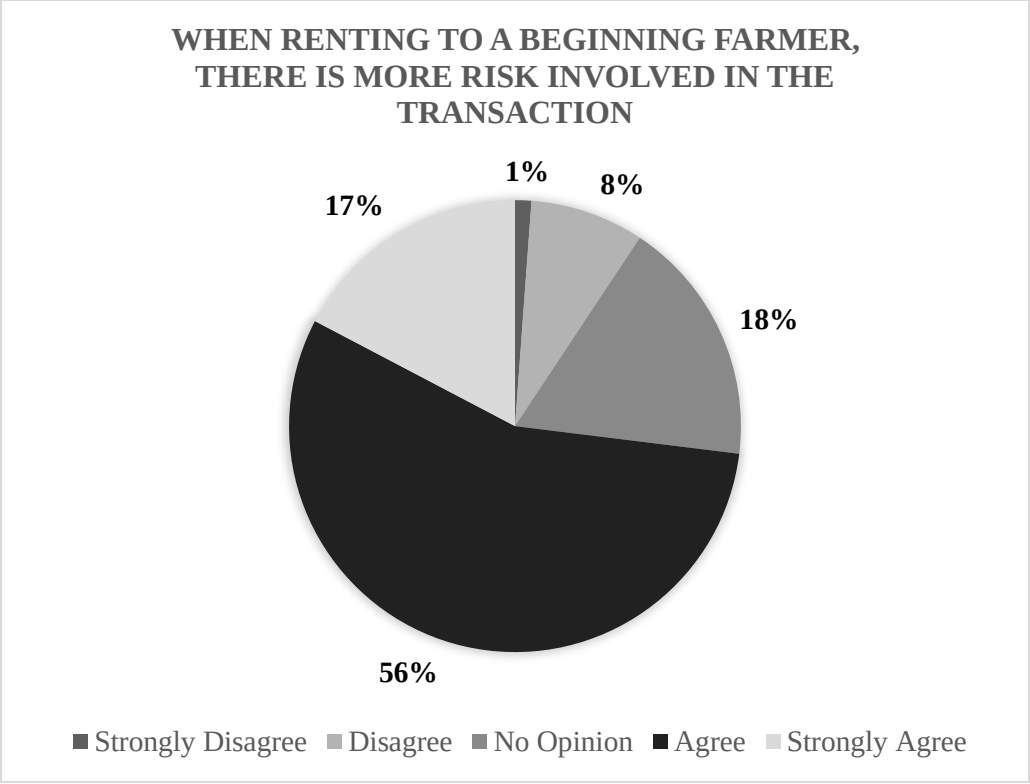

Figure 3.3 – Risk Involved with Beginning Farmer

73% of the landowners in this dataset responded that they either agree or strongly agree that there is more risk involved in the transaction when renting to a beginning farmer, or one with less experience. This would then imply that if there is more risk involved in the transaction then, typically, a higher monetary incentive is required to help offset the higher chance of risk. However, when landowners were asked if they would require more per acre to lease to a tenant with less experience, 60% responded with either disagree or strongly disagree with only 7% agreeing and 2% strongly agreeing.

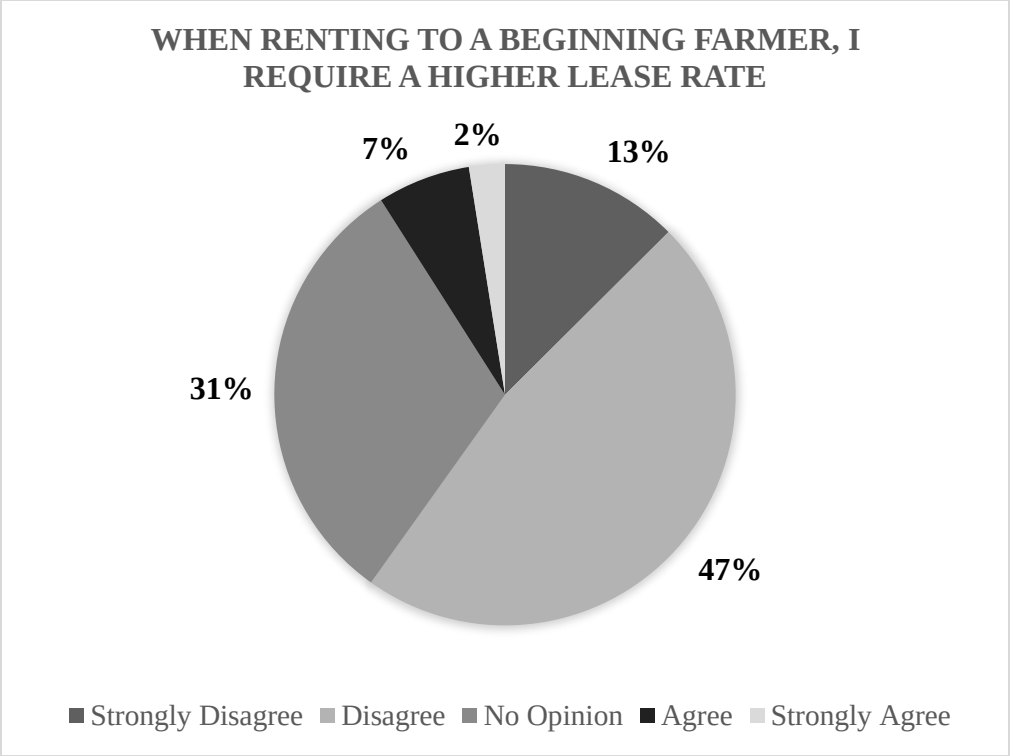

Figure 3.4 – Higher Lease Rate for Beginning Farmer

This shows that, for this dataset, Kansas landowners associated those with less experience with higher levels of risk from the landowner's perspective, but not so much that they would charge more for that association of risk. As our results show, this differs from what landowners' responded in the choice experiment describing their willingness-to-lease to young producers with less experience.

Empirical Framework

For this study, coefficients were derived using a multinomial logit model. The multinomial logit model has the assumption that the variation in choice outcomes is determined by the variation in the characteristics of the decision maker. It is also an adequate approximation for choice data as it assumes the independence of the irrelevant alternatives (IIA) property (Bernasco & Block,

2013). Each individual's potential utility for the alternate consists of two main components. These are a deterministic component as it relates to the individual's attitude toward the alternative and secondly, an unobserved random component which may result from any unobserved attributes or measurement errors (Ben-Akiva & Lerman, 1985). However, it should be noted that a multinomial logit regression is limited in that it does not allow or account for systematic variation in the differences in preferences among individuals (Kelly, Haider, Williams & England, 2007). A random utility model is coupled with the multinomial logit regressions and may be seen in equation (10).

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} \tag{10}$$

This random utility function is defined by a deterministic component (V_{it}) and a stochastic component (ε_{it}), which captures uncertainty, where *i* is the respondent (1-N), *j* is the option, and *t* is the scenario or choice set. U_{it} is, therefore, the utility for consumer *i* in situation *t*. The alternative with the highest utility should be chosen. The probability of respondent *i* choosing option *j* in choice set *t* can be written as seen in Equation 2.

$$Prob\{V_{ijt} + \varepsilon_{ijt} \geq V_{ijt} + \varepsilon_{ijt}; \forall j \in S_i\} \tag{11}$$

where S_i is the choice set that respondent *i* is completing. (S_i= {Tenant A, Tenant B, Tenant C, Opt Out}). Each option was a 30-year-old young producer and varied by experience level as follows: Tenant A (No experience), B (5 years of experience), C (10+ years of experience), and

"Would not Rent to" or opt out. If we assume that V_{ijt} is linear in its parameters, then the utility function can be written as:

$$V_{ijt} = V_A + V_B + V_C + ß_1\, familyfriend_{it} + ß_2\, acq_{it} + \gamma_i\, price_{it} \qquad (12)$$

It is expected that the coefficients of V_A will be less than V_B , and the coefficients of V_B will be less than those of V_C as Tenant C has more experience than Tenant B who has more experience than Tenant A. The "Opt out", or do not lease to any of the young producers, option is left out intentionally as to not have all observations included in the model and give a base to compare to. It is also expected that $ß_1 > ß_2$ as theory would expect a higher coefficient for closer relationships. Additionally, the betas in equation 12 are the estimated coefficients of leasing to one of the three available tenants given their relationship status. Again, three relationship levels were offered: family/friend, acquaintance, and stranger. The third relationship (stranger) is dropped from the equation as to keep from including all observations in the model. It is important to note that the base multinomial logit model does produce a coefficient that interacts both experience level and relationship level (i.e. a producer that had no experience and was a stranger). Therefore, the results section focuses on the multinomial logit model coefficients as related to experience level and relationship level separately. Lastly, γ_i, is the price coefficient derived given the differing levels of low, average, and high rent for each NASS region, and its related coefficient is expected to be positive as landowners should be seeking higher rent for higher profits. Multinomial logit coefficients of each of these (experience level/tenant choice, relationship level, and price coefficient) can be used to calculate a landowners' willingness-to-pay. In fact, marginal

willingness to pay for each of the attributes given can be derived post-estimation simply by calculating the ratio of the attribute and the price coefficient (Hanemann, 1984).

Results

This study utilizes a series of discrete choice scenarios designed where Kansas landowners were given the choice of three different young producers as tenants. A multinomial logit model is used to estimate coefficients of the landowner choice model. The coefficients for the first nested logit model can be seen in Table 3.2. This model includes the price variable, the three tenant experience levels, and the relationship variables: acquaintance and family/friend. The experience levels and relationship variables are as previously explained as the different options given in the discrete choice scenario; however, it should be noted that the price variable here is comprised of the rent level at which the respondent chose in their discrete choice scenario. Recall, that these prices are regionally specific and comprised of the average leasing rate for non-irrigated land in the USDA-NASS region at the time of the study. Pricing options include the average price, a low price (1 standard deviation below the mean), and a high price (one standard deviation above the mean). A second note is to recall that the surveys were sent to a random selection of landowners in Kansas. This included those that own the land that they operate on, but do not lease to others. Landowners, who are mainly producers and not landowners that actively lease their land (operating landowners), may have a different set of preferences and attitudes compared to a non-operating landowner who leases out their land. To distinguish this in the modelling, Table 3.2 has three base models: Model 1 includes all observations (Column 1), Model 2 includes the subset of observations from non-operating landowners, or landowners who are currently leasing at least a portion of their land (Column 2), and Model 3 which includes the subset of observations of landowners that are not currently

leasing their land, or operating landowners (Column 3). Recall that the discrete choice scenarios offered three young producers to choose from: Tenant A (No experience), Tenant B (5 Years of Experience), and Tenant C (10 Years of experience) along with three relationship levels that varied as the orthogonal design assigned. Accordingly, Table 3.2 lists each of the tenants as their experience level. As noted in the empirical section, to avoid including all observations in the model, one option was left out of the model. For the tenant choice, those who elected to "opt out" and not choose Tenant A, B, or C were left out of the model. For the relationship levels, those who selected Stranger were left out of the model. The coefficients of the multinomial logit model may be seen below in Table 3.2. It can be noted that the number of observations are given that it is a panel dataset and can be divisible by four (for each of the three tenant choices and the opt out choice). However, this was an unbalanced panel dataset meaning that some respondents answered 6 scenarios and others answered 7 scenarios. Due to this the number of observations cannot be cleanly divided to establish the exact number of respondent observations. Therefore, total number of observations are reported in each table.

Table 3.2 –Multinomial Logit Model Coefficients

	All Obs (1)	Non-Operating (2)	Operating (3)
Variables			
Price	0.0254***	0.028***	0.022***
	(0.001)	(0.002)	(0.002)
No Experience (vs. opt out)	-1.247	-1.216***	-1.322***
	(0.125)	(0.162)	(0.197)
5 Years' Experience (vs. opt out)	0.149***	0.249*	-0.067
	(0.105)	(0.137)	(0.162)
10 Years' Experience (vs. opt out)	0.438***	0.595***	0.090
	(0.105)	(0.137)	(0.165)
Acquaintance (vs. Stranger)	0.435***	0.471***	0.347***
	(0.600)	(0.073)	(0.106)
Family/Friend (vs. Stranger)	0.718***	0.787***	0.592***
	(0.070)	(0.086)	(0.123)
Number of Obs	3460	2392	1084

As expected, the price variable is positive across all three models and statistically significant. The signs for the three levels of experience and two relationship types are also as expected across the models. A young producer with no experience is less preferred across all models to the young producer with 5 years of experience which is also less preferred than the young producer with 10 years of experience when compared to not leasing the land at all. In addition, a family member or friend is preferrable to an acquaintance when compared to leasing to a stranger. In comparing the operating and non-operating landowner models, the signs are relatively consistent with only the operating landowners being less preferrable of those with less experience. An interaction term between the given variables and the currently leasing coefficient was also included in the model to test for statistical difference. A likelihood ratio test was completed for each three models presented. The results indicated that for each of the coefficients, the operating landowner model was statistically different than the non-operating landowner coefficients.

Willingness-to-Lease

In determining landowners' willingness-to-lease (WTL) to young producers, a Wald test was performed where the coefficients from the nested logit model are divided by the price coefficient to calculate the willingness-to-lease. These results are shown in Table 3.3. The calculated results can be interpreted as the dollar per acre level at which the landowner is willing to lease to a young producer. A negative sign indicates the amount that a young producer would be expected to pay (in addition to the average per acre leasing rate) when compared to the "opt out" option of not leasing to any of the three young producers. Again, the model was estimated for all observations, non-operating landowners, and operating landowners.

Table 3.3 –Willingness-to-Lease Per Acre

	All Obs (1)	Non-Operating (2)	Operating (3)
Variables			
No Experience (vs. opt out)	-49.061***	-44.159***	-59.895***
	(3.989)	(4.796)	(7.180)
5 Years of Experience (vs. opt out)	5.853	9.045*	-3.029
	(4.287)	(5.304)	(7.196)
10 Years of Experience (vs. opt out)	17.228***	21.624***	4.054
	(4.674)	(5.839)	(7.644)
Acquaintance (vs. Stranger)	17.118***	17.110***	15.721***
	(4.674)	(3.034)	(5.267)
Family/Friend (vs. Stranger)	28.268***	28.594***	26.825***
	(3.240)	(3.742)	(6.271)
Number of Obs	3460	2392	1084

The coefficient for No Experience from Model 1 (-49.061) suggests that a young producer in Kansas with no experience would need to offer a landowner $49 on top of the current leasing rate before the landowner will lease to them when compared to not leasing to any young producer. The coefficient for 5 Years of Experience (5.853) is not statistically different from zero. This means that the tenant would not pay a premium or receive a discount in the leasing arrangement with a landowner. The coefficient for 10 Years of Experience (17.228) suggests that a landowner would offer a discount to a young producer with greater than 10 years of experience in a leasing arrangement. This scaling effect of willingness to lease demonstrates a perception by landowners that experience is worth something in the leasing relationship.

The remaining coefficients in Model 1 provide estimates of the value of relationship in the leasing arrangement. The coefficient for Acquaintance (17.118) suggests that landowners, on average, will offer a tenant who is an acquaintance approximately a $17 discount in the leasing arrangement, as compared to leasing to a stranger. The coefficient for family/friend (28.268)

reveals that landowners offer a larger discount to family and friends of approximately $28 per acre as compared to leasing to a stranger.

Model 2 (Non-Operating) restricts the model to only include observations from the landowners that are currently leasing. For this model, the No Experience coefficient (-44.159) suggests that a young producer in Kansas with no experience needs to offer a landowner $44 in addition the current leasing rate before the landowner will lease to them when compared to not leasing to any young producer. The 5 years of experience coefficient (9.045) and 10 years of experience (21.624) are both statistically significant and can be interpreted as the landowner offering the young producer with 5 or 10 years of experience a $9 or $21 per acre discount. Model 2's WTL scaling effect, much like Model 1, again demonstrates that at least some experience is preferred in the leasing relationship.

Model 2's relationship variable coefficients are very similar to Model 1's. The coefficient for Acquaintance (17.110) again suggests that landowners will offer a $17 discount to a young producer that is an acquaintance when compared to leasing to a young producer that is a stranger. The coefficient for family/friend (28.594) again reveals that landowners offer a larger discount ($28) to young producers that are family or friends as compared to leasing to a young producer that is a stranger.

Model 3 (Operating), much like the Model 2, restricts the model to only include observations by landowners who do not currently lease any of their land. These landowners are more closely related to active producers than the typical Kansas landowner, and, as can be seen from the results, responded to young producers differently than the non-operating landowners. For this model, the no experience coefficient (-59.895) was the only of the experience level variables that was statistically significant and can be interpreted as the landowner would need

$59/acre in addition to the leasing rate. Both the 5 and 10 years of experience coefficients were not statistically different from zero. This, again, means that the young producer would not pay a premium or receive a discount in the leasing arrangement with the landowner. Model 3's relationship variables were marginally smaller than Model 1 and 2's coefficients at 15.721 for acquaintance and 26.825 for family/friend. Again, this can be interpreted as a landowner offering a $15 and $26 discount to a young producer that is an acquaintance or family or friend when as compared to leasing to a young producer that is a stranger.

Most notable in the three models is the large difference of willingness-to-lease to a young producer with no experience between an operating landowner and a non-operating landowner. The operating landowners expect an additional 15/acre premium from a young producer with no experience compared to non-operating landowners. This can most likely be attributed to the difference in preferences and attitudes between non-operating and operating landowners. Non-operating landowners are expected to have more experience in leasing than operating landowners, and, therefore, have an observed leniency to those with no experience as observed in both models. Additionally, the relationship WTL results across all three models are interesting to note especially as some notable previous literature has found that the familial relationship between landowner and tenant did not necessarily constitute a lower rental rate to the tenant (Bryan, Deaton, and Weersink, 2015). When estimating willingness-to-pay (or lease in this study), it is important to note that hypothetical bias, or when survey respondents may report unrealistic answers or values in the survey. Often hypothetical bias is considered one of the main sources of weakness in valuation surveys. Willingness-to-pay calculations of valuations surveys, such as this study, are, however, said to have a lower amount of hypothetical bias than a willingness-to-accept study (Penn & Hu, 2020). That being said, the willingness-to-lease results

from this study are likely inflated due to hypothetical bias and further research could offer a better explanation of how large of an effect hypothetical bias may have on the estimations.

It was the expectation of these models that a landowner prefers leasing to a young producer with more experience. This is evident given both the coefficients of the nested logit and the willingness-to-lease results across all three models. However, the WTL results across all models is highly intriguing if you recall Figure 3.3 and Figure 3.4 from the respondent summary. In their earlier responses, landowners (both operating and non-operating) stated that while a young producer was seen as having more risk in the transaction, an overwhelming majority said that they disagreed that they would charge the young producer more. Those statements are exactly the opposite of what the WTL results conclude; for a young producer with no experience, landowners across all three models expect a higher rate before leasing to the young producer and especially so for the operating landowner. This result is key in policy implications, but also in educating landowners that their stated belief and attitudes towards young producers do not hold when faced with a monetary-based decision.

Regional Willingness-to-Lease

Across the state of Kansas, farmland leasing rates vary greatly. A plot of non-irrigated land in southwest Kansas has an average leasing rate of around $30-40 per acre for the region; however, a plot of non-irrigated land in northeast Kansas has an average leasing rate of $160-170 per acre. To be more specific, Table 3.4 shows the average lease rate for non-irrigated land across each of the nine NASS regions and the average rate for each of the three regions used in the models presented in Table 3.5 and 3.6.

Table 3.4 – Average Lease Rate for Non-Irrigated Land in Each Region

NASS Region	Average Lease Rate/Acre
Western Kansas	
Northwestern	$47
West Central	$39
Southwestern	$34
Regional Average	$40
Central Kansas	
North Central	$68
Central	$49
South Central	$43
Regional Average	$53
Eastern Kansas	
Northeastern	$106
East Central	$61
Southeastern	$53
Regional Average	$73

Note: Averages were calculated using county averages for those in each NASS region

Due to a low number of observations, a model for each of the nine NASS regions could not be completed; however, a model for the three main regions of Kansas was conducted: West, Central, and East Kansas. Tables 5.14, 5.15, and 5.16 (located in Appendix B) have the coefficients for nested logit model for all observations, non-operating landowners only, and operating landowners only models. A likelihood ratio test was completed for each three regional models presented. The results indicated that for each of the coefficients, the regional models were each statistically different than each other.

In comparison to the base model, each of these models still have the expected positive sign on the price variable. A negative sign can be seen more often in the 5 and 10 years of experience variables, especially in the western model; however, the expectation of the young producer with more experience being preferred to the young producers with less experience remains along with the expectation regarding family members or friends being preferred to acquaintances in comparison to leasing to a young producer that is a stranger.

Table 3.5 – Willingness-to-Lease Per Acre for Each Region – All Observations

	West	Central	East
No Experience (vs. opt out)	-33.193***	-46.081***	-78.205***
	(2.839)	(4.262)	(6.788)
5 Years of Experience (vs. opt out)	-12.998***	-12.954***	-9.466
	(2.988)	(4.680)	(6.310)
10 Years of Experience (vs. opt out)	-7.368***	-6.251	1.820
	(3.203)	(5.056)	(6.725)
Acquaintance (vs. Stranger)	6.373***	10.484***	5.207
	(1.854)	(2.747)	(4.422)
Family/Friend (vs. Stranger)	8.952***	15.690***	27.197***
	(2.075)	(3.305)	(5.386)
Number of Obs	1052	1180	1232

Each of the regional models include all observations

As can be seen in Table 3.5, those in the western region have a lower WTL to a young producer with no experience of $33/acre expected compared to $46 in the central region and $78/acre in the eastern region. This large difference in values could be due to the dispersion of average rent across the three regions. Landowners in the east expect a larger amount as their leasing rates are proportionally larger. A noticeable difference in the regional models in comparison to the base model is that there is no longer a discount being offered for those with 5 years of experience. The expected additional per acre amount is lower at approximately $13/acre for west and central Kansas and $9, but when accounting for regional differences, landowners no longer offer a discount. This is true as well for those with 10 years of experience in western and

central Kansas at $7 and $6 per acre expected. When accounting for regional differences, perhaps the largest change is in the relationship variables. Both the acquaintance and family/friend variables for the western and central models have much lower discounts for their respective relationship. A landowner in the west only offers an $8/acre discount to a family member compared to a landowner in the east who offers a $27/acre discount.

Table 3.6 – Percentage of Premium/Discount as Percentage of Average Rental Rate per Region

	West	Central	East
No Experience (vs. opt out)	82.90%	86.95%	107.13%
5 Years of Experience (vs. opt out)	32.50%	24.44%	12.97%
10 Years of Experience (vs. opt out)	17.50%	11.79%	-2.49%
Acquaintance (vs. Stranger)	-15.00%	-19.78%	-7.13%
Family/Friend (vs. Stranger)	-22.38%	-29.60%	-37.26%

Each of the regional models include all observations.
Note: Positive values denote a premium that the tenant has to pay and negative values denote a discount the tenant receives.

Table 3.6 shows the percentage of the regional average leasing rate that the premium needed, or discount offered, represents. A key focus point of this table is that for a young producer with no experience, there is little feasibility that they can offer a landowner a premium of 82-107% on top of the current average price. In fact, for those in the eastern region, the 107% premium shows that they are essentially not willing to lease to young producers with no experience. The same conclusion can also be argued for the western and central regions as well at premiums of nearly 83 and 87%, respectively. However, the premium as a percentage of the region's average rent drops considerably for those with 5-years' experience and even further for a young producer with 10 years' experience. In fact, landowners in the east offer a discount (denoted by the negative sign) for the young producer with 10 years of experience, again, as compared to not leasing to any of the young producers. Additionally, discounts are offered across

all three regions for acquaintances and family/friend as compared to strangers. Interestingly, the eastern region offers an impressive 37% discounted rate for renting to a young producer that is also a family member. These results indicate that those in the eastern region have a strong desire to "help" a young producer in their family or close friend group by offering a sizable discount.

Tables 3.7 shows how the WTL for each region changes when controlling the model for non-operating landowner observations (currently leasing) only and for operating landowner observations only. The pattern of higher WTL in the east still remains for each of the models, but overall, there are differences in the WTL when comparing the non-operating landowners to the operating landowners. For the central and east regions, the non-operating landowners require less up front, or even a discount, in comparison to the operating landowners. Non-operating landowners in the west, however, have higher WTL for each of the experience levels, especially in comparison to those in the central and eastern regions.

Table 3.7 – Willingness-to-Lease Per Acre for Each Region

	West		Central		East	
	Non-Operating	Operating	Non-Operating	Operating	Non-Operating	Operating
No Experience (vs. opt out)	-27.504*** (4.219)	-39.902*** (3.947)	-46.424*** (4.487)	-42.866*** (11.099)	-74.973*** (8.542)	-90.637*** (10.860)
5 Years of Experience (vs. opt out)	-5.442 (4.677)	-23.196*** (3.670)	-17.670*** (4.679)	5.723 (15.434)	-2.939 (8.073)	-28.674*** (9.509)
10 Years of Experience (vs. opt out)	2.116 (5.059)	-22.167*** (3.865)	-10.411** (5.044)	8.624 (16.021)	6.584 (8.617)	-13.7747 (10.069)
Acquaintance (vs. Stranger)	6.072*** (2.261)	7.033*** (3.210)	11.737*** (2.837)	3.421 (6.978)	4.376 (5.303)	6.501 (7.838)
Family/Friend (vs. Stranger)	9.815*** (2.639)	7.6224** (3.342)	16.313*** (3.353)	14.193 (9.198)	27.462*** (6.552)	25.235*** (9.220)
Number of Obs	740	312	842	344	808	428

Again, acquaintances and family/friend relationships are discounted across the board but are much less in the west and higher in the east. It should be noted that these models, in comparison to the base model, have fewer number of observations when restricting to those that are operating and non-operating landowners. This could account for the high variability and lower statistical significance in the central and eastern models. Table 3.8 below again describes the percentage of premium/discount as a percentage of the average rental rate per region. The results shown in this table are very similar in pattern to Table 3.6's results. However, for this table, due to limitations of the models previously explained, there are a number of percentages that are not statistically significant, and can therefore, not be interpreted as either a premium or discount as they are not statistically different than zero.

Table 3.8 Percentage of Premium/Discount as Percentage of Average Rental Rate per Region

	West		Central		East	
	Currently Lease	Do not Currently Lease	Currently Lease	Do not Currently Lease	Currently Lease	Do not Currently Lease
No Experience (vs. opt out)	68.76%	99.76%	87.59%	80.88%	102.70%	124.16%
5 Years of Experience (vs. opt out)	--	57.99%	33.34%	--	--	39.28%
10 Years of Experience (vs. opt out)	--	55.42%	19.64%	--	--	--
Acquaintance (vs. Stranger)	-15.18%	-17.58%	-22.15%	--	--	--
Family/Friend (vs. Stranger)	-24.54%	-19.06%	-30.78%	--	-37.62%	-34.57%

Note: Non-statistically significant results are denoted with (--).
Note: Positive values denote a premium that the tenant has to pay and negative values denote a discount the tenant receives

Policy Implications and Conclusions

There is a vast amount of literature on U.S. farm policy and its relation to landowners, especially when looking at how subsidies impact market rental rates and land values (Goodwin, Mishra, and Oralo-Magne, 2004) and how they often benefit the landowner rather than the producer (Mishra, Goodwin, and Oralo-Magne 2011). The discussion has been made that landowners' personal preferences and attitudes towards young producers may affect their willingness-to-lease to them without knowing additional information, and the results of this study have shown that at across the state of Kansas, landowners require a higher leasing rate for a young producer with no experience despite previously stating that they would not require a

higher leasing rate to lease to a young producer (Figure 3.4). The results from the non-operating landowner models show that across all regions, a young producer with no experience is expected to pay anywhere from $39 to potentially $75 more per acre to gain access to that landowners' land. Young producers, however, are highly unlikely to have access to available funds to pay the higher leasing rate and lease the land. Given this thought, if it is imperative that young producers need have leasing access to farmland to be successful, but landowners in Kansas require a higher leasing rate to those with less experience, should a subsidy be given?

Agricultural subsidies are not a rarity in the United States. In fact, the ERS released that direct government payments made in 2020 totaled to over $35 billion, the highest level since 2001 (USDA, ERS, 2021). When it comes to leasing, often subsidies are given to landowners as well as tenants whether directly as a percentage of the subsidy for those under cropshare contracts, or indirectly through the increasing land value as an impact of farm subsidies (Goodwin, Mishra, Oralo-Magne, 2002). However, very little of the U.S.'s total available subsidies are directly aimed at landowner-tenant leasing arrangements specifically. There are, however, extension programs and state agricultural programs that are attempting to address the issue of matching producers with less experience and capital to the aging landowner to not only aid in the transition of land dilemma, but also give young producers and beginning farmers gain access to available farmland for lease.

Nebraska is such a state implementing two programs: Nebraska Land Link and NExt Gen. Nebraska Land Link is an extension-based program where landowners and producers complete an application and interview that extension personnel will then use to match aging landowners to young or beginning producers. This type of extension-based program is more common across the U.S.; however, it is much less common to find a program aimed at

landowners and young producers that the state government is directly helping fund. Nebraska's NExt Gen program is just that: a program to match aging landowners to young producers while offering a monetary incentive.

Utilizing the Beginning Farmer Tax Credit Act, NExt Gen's purpose is to attempt to give new and young producers a head start in both farming and ranching while simultaneously giving back to the landowners as an incentive to rent to the less experienced tenants. The program encourages landowners to enter the program and match with a young producer to increase retirement options, ensure the farm/ranch to continue in operation, to "cultivate your legacy" and to "pay it forward" as sentimental benefits, but the program also offers a monetary incentive to those that enter the program. Landowners receive a refundable state income tax credit for each year of a three-year lease when matched with a young producer equal to 10% of the agreed cash rent or 15% of the value of the cropshare rent received each of the three years. For example, a fixed cash rent contract of 100 acres at $280 an acre results in $28,000 of a total cash rent. A landowner in this program would receive a yearly tax credit of $2,800 for each of the three years enrolled. Young producers also receive benefits from the program that include an increased chance to rent available land when matched with a landowner, a guaranteed three-year lease that could help establish a working relationship, and qualification for the Personal Property Tax Exemption for three years. Producers in the program must, however, attend a financial management class approved by the state but are reimbursed for the class via a tax credit upon completion. To be eligible for the program, a tenant much be a Nebraska resident with less than 10 years of experience with a net worth of less than $200,000 and the main operator of their operation. By offering incentives to both landowners and producers, each are encouraged to enter and participate in the program. Nebraska's NExt Gen program has only been active for around 5

years, and currently, has no published policy impact report; however, they do report that the program has been successful. They report that 99% of the surveyed beginning farmers from the first year of the program were still farming, 85% were still farming the same ground initially enrolled in NExtGen, implying that the relationship with the landowner went beyond the three guaranteed years, and, finally, all of those surveyed stated that they would recommend others to join NextGen (Nebraska Department of Agriculture, 2021).

This program, and others that may follow, give insight into how to best handle the question of if a subsidy is needed, which party benefits more by receiving it? Initially, one might point to giving the young producers, who don't have access to capital and need to lease to meet production minimums, the subsidy to use in negotiating their lease with a potential landowner. However, as has been discussed, a landowners' preferences and the other outside factors do affect the landowner's willingness-to-lease and while an average can be estimated and used as the rate for the subsidy, it still may not be enough for some young producers to use. As seen in the Nebraska program, it may be a more efficient use of funds to subsidize the landowner as an incentive to lease to the younger producers. The results from the current model(s) in this study do not definitively state who benefits the most from a subsidy but there are certain conclusions that can be drawn. For example, it is important to note the implied difference in WTL between a young producer with no experience and 5 years of experience across the different regions, especially those in western Kansas. Suppose Kansas issued a subsidy for landowners of a tax incentive worth $40/acre for those willing to lease to a young producer with no experience. The average Kansas landowner in the western and centrals regions would cooperate voluntarily as the difference between their WTL to a producer with no experience and 5 years of experience is $16 and $37 per acre, respectively. In fact, any amount over $16 or $37 an acre subsidized would

allow the western and central landowner to work with a young producer. However, the landowners in the eastern regions would not as they have a much larger difference, $72/acre, in working with someone with 5 years of experience and no experience at all. These large regional differences are where a percentage-based tax credit for the landowners may be the most beneficial for those in Kansas as it would allow for some flexibility.

The results of this study clearly show that young producers, and especially young producers with no experience, are at an extreme disadvantage when trying to compete for access to available farmland. Currently, there are no statewide programs that incentivize landowners to lease to young producers over more experienced producers in Kansas. Additionally, landowners, overall, for this study, emphasize that they want to help young producers get started and state that though they find the transaction riskier, they wouldn't charge more. However, that was not what the results of the WTL choice experiment concluded. A young producer with no experience is expected to give the landowner a monetary incentive to lease to them, but with no access to funds, there is no clear way for them to do just that. This study lays a foundation for why a subsidy or, at minimum, a program such as Nebraska's Land Link or NExtGen should be implemented for Kansas landowners and young producers. In addition to a fixed cash-based subsidy is a subsidy that encourages landowners to pursue a cropshare with young producers. Cropshare contracts can be seen as having a higher level of risk, but perhaps a young producer could negotiate higher percentages of revenue going to the landowner. For example, a landowner my typically do a 50/50 profit split, but with a young producer, the higher risk involved may require the landowner to expect a higher percentage of the profit. This is an area for research expansion. Finally, the results from the study can be used to educate landowners of the difference in their thoughts and attitudes towards leasing to young producers and the actual

monetary incentive they require. Young producers will also find this study beneficial as they may understand that without “some” experience they are at a large disadvantage if they do not have the monetary incentive to give to the landowners. The interaction between experience level and relationship is perhaps the most beneficial to both landowners and young producers but assessing risk preferences and attitudes of landowners surveyed and controlling for them is also a potential for further beneficial research.

Chapter 4 - Conclusion

The essays presented in this dissertation were both focused on farmland leasing in Kansas. The issues addressed in each essay are relevant and prevalent problems facing Kansas landowner and producers. Essay 1's unique dataset that matched landowners to tenants provided an opportunity to estimate the relationship between contract choice, the degree of risk in farming, and risk attitudes of the tenants and landowners. Essay 2's survey and discrete choice scenarios allowed for Kansas landowners to state what a young producer would need to have to be given access to the farmland for lease. Each of these studies filled a literature gap in their respective areas, but more importantly, each essay provided results upon which a foundation for potential policies can be implemented.

Essay 1 benefits landowners and tenants by helping assess the potential effect of welfare consequences of farm policies, in addition to providing guidance on how risk-enhancing environmental changes affect managerial decisions. Specifically, in relation to irrigated land being leased. Irrigation laws are becoming more prevalent across western Kansas and their impact on leased farmland is great. If irrigation practices are restricted and production variability increases, the greater risk exposure to tenants may alter negotiations of leasing arrangements between tenants and landowners. Irrigation restrictions are not going to be lifted anytime in the near future and will long be a part of Kansas landowners' and producers' production decisions; therefore, it is imperative that studies such as essay 1 continue to allow both landowners and producers the opportunity to learn and adapt.

Essay 2's survey of landowner attitudes and expectations of young producers is beneficial in two ways: education and policy formation. The calculated WTP for young producers is too large for the majority of young producers to afford, especially when their only alternative is to

purchase land to operate on. Young producers in Kansas would benefit from a program such as Nebraska's NExtGen which provides an economic incentive to landowners to lease to young farmers. The results from each of the models indicate that landowners are highly unwilling to lease to a young producer with no experience as they expect premiums as high as 83-107% of the regional average leasing rate. A program that gives landowners a tax incentive, much like NExtGen, would potentially close the gap needed to lease to a young producer with no experience. While the tax incentive would be beneficial for the landowners, it is exceptionally beneficial for young producers. A young producer with access to a state program that incentivizes landowners to lease to young producers increases the probability of a young producer gaining access to farmland and building a relationship with the landowner. As stated previously, this relationship is symbiotic in that it gives the young producer access to farmland, and it gives the landowner a producer that has potentially many years to lease to.

A program with a tax incentive is understandably a large undertaking for a state and may not be practical until attempts at other avenues has occurred. An alternative that could be essential to Kansas, and its route to a tax incentive-based program, could be a program such as LandLink. A matching program, in conjunction with an extension program, could educate landowners on the benefits of leasing to a young producer. In addition, a matching program allows young producers the opportunity to meet an aging landowner and start building a working relationship. As landowners continue to age and the age of the average producer continues to rise, more and more young producers will inevitably enter the market, and with the correct policies in place, young producers will have the resources they need to be successful in the beginning of their career.

Essay 1 and Essay 2 both offer a contribution to the current related literature. However, that is not to say that improvements could have been made. Essay 1's dataset included data from across the entire state of Kansas. The models presented and results found could have been improved by using a dataset that surveyed those specifically in an active, or soon to be active, LEMA. This would allow for observing the different viewpoints held by producers and landowners in these areas compared to those in the general population. Observing these differences would allow for a better understanding of the impact a water-restrictive policy could have on those within the region.

Essay 2 could benefit by first expanding the base models to include interaction terms. These interaction terms could display a willingness-to-lease to a young producer that is both a family/friend and has no experience, or any combination of the attributes. By allowing for interaction terms that combine attributes (i.e. both a family member or friend and has no experience), young producers could have a more accurate estimate of what landowners in their region expect them to pay in order to lease from them. Additionally, a larger dataset surveying all Kansas counties, instead of a limited selection of oversampled counties, could help distinguish the regional differences. Lastly, while it is important to understand a landowners' perspective in leasing to a young producer, it is also important to access a young producers' perspective. As seen in the responses to the survey, there are certain expectations landowners have for young producers. A survey aimed at young producers that could capture their perspectives on leasing to landowners of different attributes would complement this study exceptionally. It would not only further fill the literature gap but would also aid in the understanding of what young producers need and are willing to do to gain access to farmland and expand their production. It has been established that young producers, or those will less

experience, are at a disadvantage, but it should be noted that others are also at a disadvantage such as minorities and females in agriculture. NASS reported in 2012 that 95.4% of principal operators in the United States are white with 1.6% and 1.8% of principal operators identified as Black and American Indian/Alaskan Native, respectively. Additionally, only 13.67% of principal operators are female. (USDA NASS, 2012). This study, and the survey sent, did not include questions or scenarios where race or gender is observed to determine if those populations as young producers are at even larger disadvantages than the average young producer. However, this is an area of growth and an area of limited research that should be built upon.

Additionally, a limitation of this survey that should be noted is that experience, unlike the relationship variables, was not clearly defined in the survey, and, therefore, respondents' may have had different interpretations of what they deem as experience. For example, some respondents may only count years of experience that were gained by the tenant while operating on their own while other respondents may count the years a tenant lived, or was raised, on a farming operation as experience.

Chapter 5 - References

Allen, D., and Lueck, D. 1992. "Contract Choice in Modern Agriculture: Cash Rent versus Cropshare". *The Journal of Law and Economics. Agricultural and Applied Economics Association.*

Allen, D. W., & Lueck, D. 2002. "The Nature of the Farm: Contracts, Risk, and Organization in Agriculture". MIT Press.

At, C. and Thomas, L. 2018. "Optimal Tenurial Contracts Under Both Moral Hazard and Adverse Selection". *American Journal of Agricultural Economics.* Oxford University Press.

Bernasco, W., & Block, R. 2013. Discrete Choice Modeling. In Crime Stat IV: A Spatial Statistics Program for the Analysis of Crime Incident Locations (Version 4.0). Ned Levine & Associates/National Institute of Justice.

Bigelow, D., Borchers, A., and Hubbs, T. 2016. "U.S. Farmland Ownership, Tenure, and Transfer". United States Department of Agriculture (USDA).

Bryan, J., Deaton, B. J., and Weersink, A. 2015. "Do Landlord-Tenant Relationships Influence Rental Contracts for Farmland or the Cash Rental Rate?" *Journal of Land Economics*. University of Wisconsin Press.

Ben-Akiva, M. E. and Lerman, S. R. 1985. "Discrete Choice Analysis: Theory and Application to Travel Demand". MIT Press, Cambridge, Ma.

Caliendo, M., F. Fossen, and A. Kritikos. 2009. "Risk Attitudes of Nascent Entrepreneurs–New Evidence from an Experimentally Validated Survey". Small Business Economics 32(2):153-167.

Dohmen, T., A. Falk, D. Huffman, U. Sunde, J. Schupp, and G.G. Wagner. 2005. "Individual Risk Attitudes: New Evidence from a Large, Representative, Experimentally-Validated Survey". DIW Berlin. German Institute for Economic Research.

Fukunaga, K., and Huffman, W. E. 2009. "The Role of Risk and Transaction Costs in Contract Design: Evidence from Farmland Lease Contracts in U.S. Agriculture". *American Journal of Agricultural Economics.* Agricultural and Applied Economics Association.

Gollehon, N. and Winston, B. 2013. "Groundwater Irrigation and Water Withdrawals: The Ogallala Aquifer Initiative". U.S. Geological Service REAP Report. 2013.

Goodwin, B. K., Mishra, A. K., & Ortalo-Magné, F. 2005. "Landowners' Riches: The Distribution of Agricultural Subsidies". University of Wisconsin-Madison School of Business, Department of Real Estate and Urban Land Economics.

Hanemann, W. M. 1984. “Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses”. American Journal of Agricultural Economics, 66(3), 332–341. https://doi.org/10.2307/1240800

Holmstrom, B. 1979. “Moral Hazard and Observability”. *The Bell Journal of Economics*. RAND Corporation.

Houston, N., Gonzales-Bradford, S., Flynn, A., Qi, S., Peterson, S. Stanton, J. Ryter, D., Sohl, T. and Senay, G. 2013.” Geodatabase Compilation of Hydrogeologic, Remote Sensing, and Water-Budget Component Data for the High Plains Aquifer”. U.S. Geological Service Report.

Huffman, W. and Just, R. 2004. “Implications of Agency Theory for Optimal Land Tenure Contracts”. *Economic Development and Cultural Change*. University Chicago Press.

Kansas Department of Agriculture. 2018. “Local Enhanced Management Areas Fact Sheet”. Retrieved from: https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/lema_fact_sheet.pdf?sfvrsn=bfce80c1_4. February 20, 2020.

Katchova, A. L, & Ahearn, M.C. 2016. “Dynamics of Farmland Ownership and Leasing: Implications for Young and Beginning Farmers”. *Applied Economic Perspectives and Policy*, 38(2), 334-350.

Kelly, J., Haider, W., Williams, P. W., & Englund, K. 2007. Stated Preferences of Tourists for Eco-Efficient Destination Planning Options. *Tourism Management*, 28(2), 377-390.

Llewelyn, Richard V. 2020. Kansas State University Department of Agricultural Economics. “Grain Basis Database”. Personal Communication. August 2020.

Lynch, L., Hardie, I. W., & Parker, D. D. 2002. “Analyzing Agricultural Landowners' Willingness to Install Streamside Buffers”. 1667-2016-136178.

Mishra, A. K., Goodwin, B., & Ortalo-Magné, F. 2011. “The Buck Stops Where? The Distribution of Agricultural Subsidies”. https://doi.org/10.3386/w16693

Nebraska Department of Agriculture. 2021. NExtGen. Retrieved from: https://nextgen.nebraska.gov/resources.html

Penn, J. M., & Hu, W. 2021. “The Extent of Hypothetical Bias in Willingness to Accept.” *American Journal of Agricultural Economics*, 103(1), 126-141.

Schlenker, W. and Roberts, M.J., 2009. “Nonlinear Temperature Effects Indicate Severe Damages to US Crop Yields under Climate Change”. *Proceedings of the National Academy of Sciences*, 106(37), pp.15594-15598.

Taylor, M. R., & Featherstone, A. M. 2018. “The Value of Social Capital in Farmland Leasing Relationships”. *Agricultural Finance Review*.

Thunberg, E., & Shabman, L. 1991. “Determinants Of Landowner's Willingness to Pay for Flood Hazard Reduction”. *Journal of the American Water Resources Association.* 27(4), 657-665.

Tibshirani, R. 1996. “Regression Shrinkage and Selection via the Lasso”. *Journal of the Royal Statistical Society.* Royal Statistical Society.

USDA National Agriculture Statistics Service. 2012. “Selected Principal Operator Characteristics by Race.” Retrieved from: https://www.nass.usda.gov/Publications/AgCensus/2012/Full_Report/Volume_1,_Chapter_1_US/st99_1_062_062.pdf

Uematsu, H., and Ashok, M. K. 2011. “Learning by Doing, Risk Aversion and Use of Risk Management Strategies”. *Proceedings of the Agricultural and Applied Economics Association.*

USDA National Agricultural Statistics Service. 2017. Census of Agriculture.

Xianghong, L. and Tsoodle, L. 2020. “Non-irrigated crop leasing arrangements in Kansas”. Department of Agricultural Economics. Kansas State University. Retrieved from: https://agmanager.info/land-leasing/land-buying-valuing/land-use-value-research/2020-non-irrigated-crop-leasing

Zou, H. 2006. “The Adaptive Lasso and Its Oracle Properties”. *Journal of the American Statistical Association.* Western Agricultural Economics Association.

Appendix A - Landowner Survey Data Summaries

Table 5.1 – Regions Surveyed

	Number Reporting	Percentage Reporting
Central	90	14.04%
East Central	65	10.14%
North Central	72	11.23%
Northeast	80	12.48%
Northwest	60	9.36%
South Central	58	9.05%
Southeast	71	11.08%
Southwest	88	13.73%
West Central	57	8.89%
	641	100%

Table 5.2—Respondent Demographics

Demographics		
	Number Reporting	Percentage Reporting
Male	461	73.88%
Female	163	26.12%
	624	**100%**
Marital Status		
Single	46	7.32%
Married	482	76.75%
Divorced/Separated	28	4.46%
Widowed	72	11.46%
	628	**100%**
Farming Status		
Active Farmer	241	38.50%
Retired Farmer	169	27.00%
Neither	216	34.50%
	626	**100%**
Education		
	Number Reporting	Percentage Reporting
Less than 12 years	8	1.28%
High School/Equivalent	148	23.64%
Associate's/Technical	123	19.65%
Bachelor's Degree	212	33.87%
Graduate Degree	135	21.57%
	626	100%
	Number Reporting	Percentage Reporting
Off-Farm Income	366	58.56%

Farm-based Income	259	41.44%
	625	100%
Proportion of Income from Agriculture		
Less than 25%	269	43.04%
25%-50%	115	18.40%
51%-75%	92	14.72%
76%-100%	148	23.68%
	624	100%

Table 5.3—Respondent Experience

Years of Experience				
	Respondent		Spouse	
	Number Reporting	Percentage Reporting	Number Reporting	Percentage Reporting
0-10 years of experience	44	10.38%	61	22.43%
11-20 years of experience	42	9.91%	18	6.62%
21-30 years of experience	51	12.03%	31	11.40%
31-40 years of experience	71	16.75%	58	21.32%
41-50 years of experience	102	24.06%	59	21.69%
51-60 years of experience	66	15.57%	27	9.93%
61-70 years of experience	36	8.49%	13	4.78%
70+ years of experience	12	2.83%	5	1.84%
	424	100%	272	100%
Generational Farming Experience				
	Number Reporting		Percentage Reporting	
Parents	63		10.02%	
Grandparents	99		15.74%	
Parents & Grandparents	414		65.82%	
Neither	53		8.43%	
	629		**100%**	

Table 5.4—Current Leasing Averages

	Currently Leasing		Not Currently Leasing	
	Cropland Acres	Pasture Acres	Cropland Acres	Pasture Acres
Average Acres	854.92	456.14	809.75	719.06
Std. Dev	1735.50	1794.03	1471.61	2309.63
Min.	0	0	0	0
Max	20,000	30,000	12,000	20,000
No. of Obs.	416	300	175	134
Proportion of Land Currently Leased				
	Number Reporting		Percentage Reporting	

Less than 25%	48	10.74%
25%-50%	37	8.28%
51%-75%	35	19.02%
76%-100%	327	73.15%
	447	100%
Distance from Land Leased to Tenant		
	Number Reporting	Percentage Reporting
Less than 10 miles	119	27.05%
10-25 miles	81	18.41%
26-50 miles	39	8.86%
51-75 miles	21	4.77%
76-100 miles	17	3.86%
100+ miles	163	37.05%
	440	100%
Land Managed by Farm Manager		
	Number Reporting	Percentage Reporting
Yes	45	10.39%
No	388	89.61%
	433	100%

Table 5.5—Inherited Leased Land

Land Inherited		
Prop. Of Land Inherited		
	Number Reporting	Percentage Reporting
0%	114	25.68%
1%-25%	65	14.64%
25%-50%	43	9.68%
51%-75%	37	8.33%
76%-100%	185	41.67%
	444	100%
Inherited Land in Trust		
	Number Reporting	Percentage Reporting
Yes	189	52.79
No	169	47.21
	358	100%
Main Contact of Trust		
	Number Reporting	Percentage Reporting
Yes	170	87.63
No	24	12.37
	194	100%
Years Owned Inherited Land		
Average Years	20.83	
Std. Dev.	15.54	

Min.	0
Max	75
No. of Obs.	325

Table 5.6—Landowner/Tenant Relationship

Number of Tenants and Length of Relationship		
Number of Tenants		
Average # of Tenants	2.17	
Min	0	
Max	25	
No. of Obs.	449	
Length of Relationship		
Average # of Years	15.11	
Std. Dev.	12.71	
Min	0	
Max	75	
No. of Obs.	436	
Relationship with Tenant		
	Number Reporting	Percentage Reporting
Family	121	26.83%
Friend	115	25.50%
Neighbor	71	15.74%
Acquaintance	37	8.20%
Business Only	107	23.73%
	451	100%

Table 5.7—Lease Negotiations and Type

How often do you meet with tenants to discuss issues related to the land that you lease them?		
	Number Reporting	Percentage Reporting
Less than once a year	82	18.43%
Once a year	79	17.75%
2-4 times per year	187	42.02%
5+ times per year	97	21.80%
	445	100%
	Number Reporting	Percentage Reporting
Written Lease	204	45.23%
Oral Agreement	247	54.77%

Lease Negotiation Meetings		
	Number Reporting	Percentage Reporting
Never	183	41.78%
Once a Year	105	23.97%
Every 2 Years	28	6.39%
Every 3-4 Years	56	12.79%
Every 5+ Years	66	15.07%
	438	100%
Most Commonly Used Contract		
	Number Reporting	Percentage Reporting
Cropshare	253	56.73%
Fixed Cash	174	39.01%
Flex Lease	19	4.26%
	446	100%
Number of Installments		
	Number Reporting	Percentage Reporting
1, at beginning of year	45	10.66%
1, at end of harvest	147	34.83%
2, at beg. Of year and end of harvest	91	21.56%
Other	139	32.94%
	422	100%

Table 5.8 – Profit Split and Input Sharing

Profit Split and Input Sharing		
	Number Reporting	Percentage Reporting
1/3 – 2/3 Split	193	73.95%
30 – 70 Split	8	3.07%
40 – 60 Split	19	7.28%
50 – 50 Split	38	14.56%
Other	3	1.15%
		100%
Input Sharing	Number Reporting	Percentage Reporting
Yes	253	67.65%
No	121	32.35%
	374	100%
Fertilizer		
Yes	220	91.67%
No	20	8.33%
	240	100%
Chemical		

Yes	40	16.60%
No	201	83.40%
	241	100%
Seed		
Yes	73	31.20%
No	161	68.80%
	234	100%

Table 5.9 – Contract Choice Risk Preferences

Risk Associated with Contract Choice		
	Number Reporting	Percentage Reporting
Cropshare		
Most amount of risk	371	67.58%
Moderate amount of risk	45	8.20%
Lowest amount of risk	133	24.23%
	549	100%
Fixed Cash Rent		
Most amount of risk	112	20.86%
Moderate amount of risk	64	11.92%
Lowest amount of risk	361	67.23%
	537	100%
Flex		
Most amount of risk	58	10.92%
Moderate amount of risk	415	78.15%
Lowest amount of risk	58	10.92%
	531	100%

Table 5.10 – Leasing Risk Preferences - Association

Risk Associated with leasing to someone…		
	Number Reporting	Percentage Reporting
I have worked with.		
Most amount of risk	40	7.04%
Moderate amount of risk	31	5.46%
Lowest amount of risk	497	87.50%
	568	100%
I know others have worked with, but I have not.		
Most amount of risk	21	3.74%
Moderate amount of risk	504	89.68%
Lowest amount of risk	37	6.58%
	562	100%
I do not know.		

Most amount of risk	520	92.69%
Moderate amount of risk	2	0.36%
Lowest amount of risk	39	6.95%
	561	100%

Table 5.11-Leasing Risk Preferences - Relationship

Risk Associated with leasing to someone who is…		
	Number Reporting	Percentage Reporting
Family		
Most amount of risk	69	12.00%
Moderate amount of risk	175	30.43%
Lowest amount of risk	331	57.57%
	575	100%
A Friend		
Most amount of risk	51	8.98%
Moderate amount of risk	343	60.39%
Lowest amount of risk	174	30.63%
	568	100%
A Stranger		
Most amount of risk	520	92.69%
Moderate amount of risk	2	0.36%
Lowest amount of risk	39	6.95%
	561	100%

Table 5.12 – Leasing Risk Preferences – Beginning Farmer

Risk Associated with leasing to someone who has…		
	Number Reporting	Percentage Reporting
Recently began farming.		
Most amount of risk	458	80.92%
Moderate amount of risk	16	2.83%
Lowest amount of risk	92	16.25%
	566	100%
Some years of experience in farming.		
Most amount of risk	25	4.42%
Moderate amount of risk	499	88.32%
Lowest amount of risk	41	7.26%
	565	100%
Multiple years of experience in farming.		
Most amount of risk	82	14.24%
Moderate amount of risk	36	6.25%
Lowest amount of risk	458	79.51%
	576	100%

Table 5.13 – Leasing Risk Preferences – Beginning Farmers and Relationship

Risk Associated with leasing to someone who has recently began farming and…		
	Number Reporting	Percentage Reporting
I know.		
Most amount of risk	55	9.65%
Moderate amount of risk	238	41.75%
Lowest amount of risk	277	48.60%
	570	100%
I know their family.		
Most amount of risk	49	8.66%
Moderate amount of risk	303	53.53%
Lowest amount of risk	214	37.81%
	566	100%
I do not know.		
Most amount of risk	496	88.10%
Moderate amount of risk	9	1.60%
Lowest amount of risk	58	10.30%
	563	100%

Appendix B - Nested Logit Coefficient Tables

Table 5.14 – Multinomial Logit Model Coefficients for Each Region – All Obs

	West	Central	East
Variables			
Price	0.723***	0.041***	0.024***
	(0.006)	(0.004)	(0.002)
No Experience (vs. opt out)	-2.422***	-1.879***	-1.870***
	(0.301)	(0.257)	(0.205)
5 Years' Experience (vs. opt out)	-0.948***	-0.529**	-0.226
	(0.269)	(0.222)	(0.158)
10 Years' Experience (vs. opt out)	-0.538**	-0.255	0.044
	(0.263)	(0.222)	(0.159)
Acquaintance (vs. Stranger)	0.465***	0.428***	0.124
	(0.118)	(0.100)	(0.103)
Family/Friend (vs. Stranger)	0.653***	0.640***	0.650***
	(0.133)	(0.119)	(0.118)
Number of Obs.	1052	1180	1232

Table 5.15 – Multinomial Logit Model Coefficients for Each Region – Non-Operating Landowners

	West	Central	East
Variables			
Price	0.071***	0.0496***	0.024***
	(0.007)	(0.005)	(0.002)
No Experience (vs. opt out)	-1.945***	-2.304***	-2.127***
	(0.403)	(0.329)	(0.328)
5 Years' Experience (vs. opt out)	-0.385	-0.879***	-0.673***
	(0.356)	(0.282)	(0.252)
10 Years' Experience (vs. opt out)	0.145	-0.156*	-0.323
	(0.347)	(0.281)	(0.250)
Acquaintance (vs. Stranger)	0.429***	0.853***	0.153
	(0.139)	(0.124)	(0.179)
Family/Friend (vs. Stranger)	0.694***	0.810***	0.592***
	(0.161)	(0.146)	(0.202)
Number of Obs	740	842	808

Table 5.16 – Multinomial Logit Model Coefficients for Each Region – Operating Landowners

	West	Central	East
Variables			
Price	0.080***	0.025***	0.024***
	(0.011)	(0.006)	(0.002)
No Experience (vs. opt out)	-3.199***	-1.091***	-2.127***
	(0.524)	(0.417)	(0.328)
5 Years' Experience (vs. opt out)	-1.186***	0.146	-0.673***
	(0.449)	(0.367)	(0.252)
10 Years' Experience (vs. opt out)	-1.777***	0.219	-0.323
	(0.451)	(0.369)	(0.250)
Acquaintance (vs. Stranger)	0.564**	0.087	0.153
	(0.224)	(0.173)	(0.179)
Family/Friend (vs. Stranger)	0.611**	0.361***	0.592***
	(0.241)	(0.210)	(0.202)
Number of Obs	312	344	428