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EXAMINING CONTEMPORANEOUS FARM AND COUNTY LOSSES USING FARM LEVEL DATA

**Carl R. Zulauf, Vecdi Demircan, Gary Schnitkey,
Art Barnaby, Gregg Ibendahl, and Kevin Herbel***

Carl R. Zulauf is a Professor at Ohio State University (zulauf.1@osu.edu). Vecdi Demircan is a Professor, Suleyman Demirel University, Turkey, and Visiting Scholar, Ohio State University. Gary Schnitkey is a Professor in the Department of Agriculture and Consumer Economics, University of Illinois. Art Barnaby is Professor in the Department of Agricultural Economics, Kansas State University. Gregg Ibendahl is Associate Professor in the Department of Agricultural Economics, Kansas State University. Kevin L. Herbel is KFMA Program Administrator, Department of Agricultural Economics, Kansas State University.

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Examining Contemporaneous Farm and County Losses Using Farm Level Data

Abstract

Characteristics of farm level yield and revenue loss that is systemic with yield and revenue loss at the county, state, and U.S. level are examined using farm yields from the Illinois and Kansas farm business management associations. The data begins with 1972. Share of yield and revenue loss systemic with the larger geographical areas declines as the level of loss increases, implying a greater share of larger losses is idiosyncratic to an individual farm. Farm loss systemic with the county generally is larger for Kansas than Illinois farms, which calls into question that county-based programs are less effective for plain states due to the larger size of their counties. Last, for the small set of farms that yields for a crop for all years of the analysis, the correlation between a farm and county yield/revenue deviations had limited ability to explain the share of a farm's loss that is systemic with a county. This finding suggests that only by examining loss experiences for the farm and the county can the value of county risk management programs be ascertained.

Examining Contemporaneous Farm and County Losses Using Farm Level Data

The relationship between contemporaneous losses on an individual farm and losses at larger geographic areas is critical to the design and analysis of risk management programs. This relationship was at the heart of the debate over whether the Average Crop Revenue Election (ACRE) farm program in the *Food, Conservation, and Energy Act of 2008* would be at the farm, county, state, or U.S. level. It remains a key issue in the current farm bill debate over revenue programs and the Supplemental Coverage Option (SCO) (Zulauf and Orden, 2012). In addition, it is a key factor in the decision by farms to buy individual farm insurance or group insurance.

Most studies of farm versus area risk management programs have simulated a typical farm for a county using U.S. Department of Agriculture (USDA), Risk Management Agency (RMA) data. Exceptions include Miranda (1991), who calculated the correlation between farm and county yields for a set of Kentucky farms to test his model for the design of county insurance. Claassen and Just (2011) used farm level data to characterize both systematic and random yield variability. Cooper et al. (2012) used farm level data to explore the potential for enhancing RMA's premium estimation techniques. Williams et al. (1993) used stochastic dominance and farm level data from the Kansas Farm Management Association (KFMA) to compare alternative crop insurance and disaster assistance designs.

These articles have made notable contributions to understanding the relationship between farm and county yield variability, but to the knowledge of the authors no study has documented the size and relationship between contemporaneous losses at the farm and larger geographical areas and analyzed how these contemporaneous losses vary with acres planted to a crop and size of loss. This study will provide such documentation using data from the Illinois Farm Business Farm Management (FBFM) Program and KFMA beginning in 1972 and 1973, respectively.

The next section of this article contains a review of the literature. Discussions of the data and methods follow. Next, results of the analysis are presented. The article ends with a summary, conclusion, and implication section.

Literature Review

While individual farm insurance tends to be the focus of research, research on area insurance dates to Halcrow (1949). Farms enrolled in area insurance receive indemnity payments when, for example, county yield falls short of the county's expected yield prior to planting. Miranda recast Halcrow's discussion in terms of a single factor capital market model, stimulating additional research by others, including Chambers and Quiggin (2002), and Bourgeon and Chambers (2003). A related line of research examines the feasibility of area-based weather index products, such as average county rainfall (for example, Mahul, 2001).

There are 3 key attractions of area insurance (Glauber, 2004). Because farms generally are not large enough to influence area yield, area insurance has less moral hazard. Adverse selection also is lower because the insured event is not the individual farm, for which the farmer probably has better information than an insurance provider. Moreover, administrative costs are lower because individual farm data is not needed to calculate indemnities nor monitor for adverse selection and moral hazard. However, the effectiveness of area insurance in reducing risk on an individual farm is related to the relationship between risk on the individual farm and risk for the area in which the farm is located.

While considerable research exists on crop insurance and public policies for crop insurance, economists do not agree if any economic rationale exists to justify public subsidies for crop insurance. This debate is highlighted in recent articles by Goodwin and Smith (2012) and

by Coble and Barnett (2012). The argument for public subsidies is rooted in the observation that crop yield insurance, other than insurance for hail and fire, has not been consistently offered by the private market without government subsidies. This contrasts with the development of the private market of futures and options markets for price risk. The counter argument is that government subsidies have prevented the development of private crop insurance.

Arguments for why private crop insurance has not developed rest upon the argument that the cost of providing private crop insurance exceeds the willingness to pay for crop insurance given the existence of other risk management strategies, such as crop diversification and off-farm income. Following Coble and Barnett's description of the components of insurance premiums, the high cost of private crop insurance is specifically attributed to the presence of high administrative costs due to the site specific nature of yield, including monitoring moral hazard and adverse selection, and to the presence of high ambiguity and reserve load costs due to the existence of large systemic losses from widespread weather events. Miranda and Glauber (1997) find that U.S. crop insurer portfolios are 20 to 50 times riskier than if yields were stochastically independent across farms and that their portfolio risks are 10 times larger than those faced by private insurers offering more conventional lines of insurance. The counter argument is that the international reinsurance market is large enough to cover these costs.

Data

The data for this analysis are from the Illinois Farm Business Farm Management (FBFM) program and Kansas Farm Management Association (KFMA). FBFM is a farmer-owned cooperative that has a working relationship with the University of Illinois at Urbana-Champaign. Farmer members maintain production and financial records for their farms. At the end of a

calendar year, financial statements and production records are prepared and aggregate databases of crop and livestock production, receipts, expenses, inventories, and capital accounts are produced to develop benchmarks against which farmers can compare their farms. To be included in the database, FBFM personnel must certify a farm's data to be reliable and usable. KFMA data are developed in a similar fashion (Langemeier, 2005).

Consistent preparation of farm level data, including yields, begins in 1972 for FBFM and 1973 for KFMA. Yields are available through the 2012 crop year. Crops included in this analysis are corn, soybeans, and wheat in both states, as well as grain sorghum in Kansas. These are the largest acreage field crops in each state (U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS), 2013). Wheat in Illinois has the smallest planted acres. They were as low as 330,000 in 2010, but exceed 600,000 in all other years.

An Illinois or Kansas farm was included in the analysis if it had yields for the current and 5 previous crop years. A 5-year average was used as the estimate of expected yield. In addition, yields had to be available for the county in which the farm was located for all 6 years. County yields became more problematic latter in the analysis period, especially for Kansas. Thus, a number of farms were eliminated from the analysis not because of missing data for the farm, but because of missing data for the county in which the farm was located.

KFMA data are available for corn by irrigated and dryland acres. However, since 2007, USDA, NASS no longer consistently reports yields for dryland and irrigated corn acreage by Kansas counties. For years after 2007, at most 3 counties had the data needed to calculate a 5-year average. Thus, it decided not to conduct an analysis for Kansas irrigated and dryland corn.

Number of usable farm management association farms for a year varied by crop and year. Table 1 contains the minimum and maximum observations by crop, as well as the year in which

they occurred. Number of observations is largest for Illinois corn and soybeans and Kansas wheat, which is not surprising since they are planted on the most acres in each state.

The FBFM and KFMA data contain planted acres and yield per planted acre. In contrast, the *Census of Agriculture* reports values for harvested acres. Thus, a direct comparison on acres and yields is not possible. Nevertheless, to provide perspective, Table 2 contains a comparison for 2007 using the available data. FBFM and KFMA farms averaged more planted acres in 2007 than the average harvested acres reported in the *2007 Census of Agriculture*. Thus, on average, the farms in this study are likely to be larger than all farms in Illinois and Kansas. Average yield of FBFM farms exceeded the average yield for Illinois from the census. In contrast, average yields for KFMA farms are lower for all crops except grain sorghum. The difference between planted and harvested yield for Kansas wheat can be attributed in part to substantial non-harvested acres resulting from widespread freeze damage in central and eastern Kansas in 2007. In summary, when taken as a group, the differences in 2007 acres and yields for the FBFM and KFMA farms in this study and the *2007 Census of Agriculture* imply caution when extending the results of this study to farms not in this study.

Methods

Because FBFM and KFMA report yields on a per planted acre basis, per planted acre yields were calculated for the county, state, and U.S. The data for these calculations were obtained from USDA, NASS Quickstats data program. Planted yields for soybeans and wheat were calculated by dividing total production by the acres reported planted in the geographical area. For corn and sorghum another consideration exists — planted acres can be harvested for grain or for silage. Corn acres harvested for silage are available for some Kansas counties, the states of Illinois and

Kansas, and the U.S. Corn acres harvested for silage are not reported at the county level in Illinois. Sorghum acres harvested for silage are available for some counties in Kansas, the state of Kansas, and the U.S. FBFM does not report data on sorghum production.

Counties for which USDA, NASS does not report harvested silage acres means either no acres were harvested for silage in the county or USDA could not release data for harvested silage acres without potentially revealing information about an individual farm. The latter situation likely means silage acres are a small share of corn or sorghum acres in the county.

It was decided that, when available, harvested silage acres would be subtracted from planted acres. Thus, it was assumed that all non-harvested acres were intended for harvest as grain. While non-harvested acres could have been intended for harvest as silage, acres that have production stress are more likely to be harvested for silage than for grain because silage utilizes the entire plant while grain is harvested from only part of the plant.

Crop yield loss is calculated for the farm, county, state, and U.S. as follows:

(1) $(\alpha \bullet \text{trend yield}_{i,t}) - \text{yield}_{i,t}$, where

α = loss level, t = year, and i = farm, county, state, or U.S.

Trend yield is the average yield for the 5 years prior to the year of production. A 5-year historical average is used because it allows for an out-sample test while minimizing the number of years to calculate expected yield, thus minimizing the loss of observations.

Crop revenue loss is calculated for the period that spans the determination of the insurance price prior to planting to the determination of the insurance price associated with harvest. Specifically, crop revenue loss is calculated as follows:

(2) $[\alpha(\text{plant insurance price}_t \bullet \text{trend yield}_{i,t}) - (\text{harvest insurance price}_t \bullet \text{yield}_{i,t})]$, where

α = loss level, t = year, and i = farm, county, state, or U.S.

The α term in both equations is analogous to the insurance coverage level. Varying α allows examination of the behavior of loss contemporaneous between the farm and a larger geographical area as the level of loss changes. For example, the loss contemporaneous between a farm and a larger geographical area could differ for coverage levels of 60% and 90%, or, stated alternatively, for losses that exceed 40% and 10%.

Share of a farm's loss contemporaneous with the loss at a larger geographical area is:

$$(3) [\text{Minimum}(\text{farm loss}_{\alpha, t}, \text{area loss}_{\alpha, j, t}) / (\text{farm loss}_{\alpha, t})]$$

If loss is smaller for the larger geographical area than for the farm, the share of farm loss contemporaneous with the larger geographical area is less than 1. If loss at the larger geographical area loss exceeds the farm loss, then all of the farm's loss is contemporaneous with the loss at the larger geographical area.

Because farms enter and exit the FBFM and KFMA data sets, average loss and average loss contemporaneous with the county, state, and U.S. are calculated for each year for all farms with the 6 years of yields needed for inclusion in that year's data set. In essence, a representative average acre is calculated for each year and crop based on the FBFM and KFMA farms in the data set for that year. Given the 5-year average yield used to measure trend yield, losses were first calculated for FBFM farms in 1977 and KFMA farms in 1978. An average is computed of the annual average loss for the years through 2012. These summary averages are discussed in the next section.

Results

For corn, soybeans, and wheat; the average annual yield loss as a share of the 5-year average historical yield was at least 40% larger for Kansas farms than for Illinois farms (see Table 3). Of

particular note, Kansas soybeans had the highest yield loss per acre (17%) while Illinois soybeans had the lowest yield loss per acre (6%). The finding that yield loss was higher in Kansas was expected because the agricultural production environment is more variable in Kansas than Illinois. It is also consistent with Kansas having higher crop insurance rates than Illinois (USDA, Risk Management Agency (RMA)).

For a given crop-state combination, revenue loss per acre relative to expected revenue per acre exceeded yield loss per acre relative to expected yield per acre. However, the increase was equaled 1 to 3 percentage points, implying that yield loss was more important than price loss for FBFM and KFMA farms, at least over the period of this study.

Yield loss and revenue loss were also calculated on a per farm basis. These calculations take into account the number of acres planted to a crop on a farm. Yield loss per farm is generally smaller than yield loss per acre. The same finding occurs for revenue loss per farm relative to revenue loss per acre. These findings imply that the size of relative yield and revenue loss declines as acres planted to a crop increases. Thus, they are consistent with the higher subsidy levels for insurance for enterprise insurance units than for optional and basic insurance units (USDA, RMA) and with higher discounts being offered for more acres in an enterprise unit (Knight, et al., 2010).

Results – comparing systemic losses

Given the similarity of findings for per acre and per farm analyses, the rest of the discussion will focus on the per acre findings. In this discussion, the economic term, systemic loss is used instead of contemporaneous loss. The share of losses systemic with the county, state, and U.S. are discussed for (1) all losses, (2) losses greater than 15%, which coincides with the highest

coverage level of individual crop insurance, (3) losses greater than 30%, the loss level at which farm yield losses systemic with the U.S. essentially becomes zero for all state-crop combinations, and (4) losses greater than 50%, the insurance catastrophic and largest possible loss level. The loss level applies to farm, county, state, and U.S. losses. Thus, to illustrate, the 56% systemic share for Illinois corn yield losses greater than 15% (table 4) means that 56% of farm yield losses that exceeded 15% of the farm's expected yield coincided with county yield losses that exceeded 15% of the county's expected yield.

For yield loss (table 4) and revenue loss (table 5), share of loss systemic with the county exceeds share of yield loss systemic with the state, which exceeds share of yield loss systemic with the U.S. This finding was expected because, the larger the geographical area, the more likely its production situation will differ from the production situation of an individual farm.

The share of revenue loss systemic with the county, state, and U.S. tends to be larger than the share of yield loss systemic with the county, state, and U.S. for all losses. However, as the level of loss increases, the relative ranking of the share of loss that is systemic for yield and revenue becomes mixed. For example, at the 0% loss level, the share of revenue loss that is systemic with the county always exceeds the share of yield loss that is systemic with the county. In contrast, at the 50% loss level, the share of revenue loss that is systemic with the county always exceeds the share of yield loss that is systemic with the county for only 3 of the crop-state combinations. This finding implies that price risk tends to be more prevalent at shallower losses, which is not surprising given that price declines of 30% or more from planting to harvest are rare.

The difference between the share of yield loss and revenue loss that is systemic with the larger geographical areas is particularly large for Illinois soybeans and Illinois wheat at the 0%

loss level. Part, but not all, of the explanation for both exceptions lie with 1 year: 2008 for Illinois soybeans and 2009 for Illinois wheat. Removing the year reduces the share of farm loss systemic with the county from 59% to 51% for Illinois soybeans and from 57% to 49% for Illinois wheat. While these 2 observations illustrate the potential systemic impact of a large decline in insurance prices, the general finding of this analysis is that the share of a farm's revenue loss systemic with larger geographical areas is not much larger than the share of a farm's yield loss systemic with larger geographical areas.

For both yield and revenue, the share of loss that is systemic declines as the level of loss increases. This finding holds for the county, state, and U.S. Thus, the larger an individual farm's loss, the more likely the farm's loss was idiosyncratic to it.

In general, as the level of loss increases, the share of loss systemic with the county declines at a slower rate than does the share of loss systemic with the state and U.S. This finding is consistent with the desire on the part of farm groups to move from the state orientation of the ACRE farm program to a county based approach.

Comparing Illinois and Kansas soybean and wheat finds that the share of farm loss that is systemic with the county generally is larger for Kansas than for Illinois, especially for yield. The comparable comparison at the state and U.S. level finds a more mixed ranking by state. Corn is not included in this comparison because irrigation is an important practice for Kansas corn production.

The finding that farm loss systemic with the county generally is larger for Kansas farms than for Illinois farm, especially for yield, may be surprising. The reason is that the average size of a county in Kansas is 794 square miles, which is 38% larger than the average size of an Illinois county (568 square miles). A common argument is that the larger size of counties in the

plains states reduces the effectiveness of county based programs. In another study using farm level yields, Claassen and Just (2011) find that the random variation of yield at the farm level is only a slightly larger component of the farm's total variation of yield, which includes the systemic county variation of yield, for the North and South Dakota wheat farms than for the Illinois corn farms that they analysis. Their farm level data is from RMA.

Results – farms that have yields for all years

A small number of farms in both Illinois and Kansas have yield data for every year for a crop. The number of such farms reaches double digits for Illinois corn and soybeans and for Kansas soybeans and wheat, with the largest number being 18 farms for Kansas wheat (see table 6). Given the small sample sizes, it is not surprising that the individual numbers vary between this analysis and previously discussed analysis. However, for both yield loss as a share of expected yield and the share of a farm's loss that is systemic with the county, state, and U.S., the values in table 6 generally follow the same pattern as the comparable values in table 4. The results for revenue loss are similar in pattern to the results in table 5, but are not reported to conserve space. Note that results are not presented for the 50% loss level because only 1 Illinois soybean farm has a yield loss of 50% or more.

Another reason for examining these farms is that they allow an examination of the ability of the correlation between farm and county deviations from expected values to explain the share of farm loss systemic with its county loss. Correlations are an important tool in economic analysis of risk management strategies and policies.

The average correlation for the 4 state-crop combinations ranges from 0.78 for Kansas wheat yield deviations to 0.88 for Illinois corn yield deviations (see table 7). Only 1 farm had a correlation less than 0.50, a Kansas wheat farm.

Despite what are generally considered to be high correlations between yield and revenue deviation for these farms and their counties, the R^2 from a regression of the share of farm loss systemic with its county loss on the correlation between farm and county deviations is low (see Figure 1). The highest percent of variation in the share of farm loss systemic with the county loss explained by the correlation between farm and county deviations is 45% for Illinois corn yield deviations. All the remaining R^2 's imply an explanatory below 20%. While the number of observations is limited, this analysis raises a question about how much information the correlation between a farm and county yield/revenue deviations provides to understanding the share of a farm's loss that is systemic with a county.

Summary, Conclusions, and Implications

This analysis examines the characteristics of farm level yield and revenue loss that is systemic with yield and revenue loss at the county, state, and U.S. level. The farm level data are from the Illinois Farm Business Farm Management (FBFM) program and Kansas Farm Management Association (KFMA). Crops examined are corn, soybeans, and wheat for Illinois and Kansas, as well as sorghum for Kansas. The observation period begins in 1972 for Illinois and 1973 for Kansas.

Most characteristics of systemic loss are consistent with the existing literature and/or commonly-accepted expectations. The level of yield and revenue loss is higher for Kansas farms and crops than Illinois farms and crops, which was expected because Kansas has a more variable

agricultural production environment. The share of yield and revenue loss systemic with the larger geographical areas declines as the level of loss increases, implying that a greater share of larger losses is idiosyncratic to an individual farm. The share of yield and revenue loss systemic with the county is highest while the share of loss systemic with the U.S. is lowest, which is consistent with the observation that the larger the geographical area, the greater the likely deviation of the production situations on an individual farm and the larger geographical area.

The finding that farm loss systemic with the county generally is larger for Kansas than Illinois farms, especially for yield, implies further investigation is needed of the common assertion that county-based programs are less effective for plain states due to the larger size of their counties. Size of a county is only one factor that influences the effectiveness of a county program. Other factors include the heterogeneity of the production environment, the size of yield reducing events when they occur, and the size of farms, both in acres and the diffuseness of these acres.

A key question facing the U.S. crop insurance program is the appropriate level of subsidy from the government. There is no widely-accepted economic rationale for whether or not federal subsidies should exist for crop insurance, let alone what the level of such subsidies should be. However, there is no known economic rationale that would imply that federal subsidies should exist for idiosyncratic risk that is unique to an individual farm. Subsidizing idiosyncratic risk encourages producers to take on more individual risk and likely will encourage moral hazard and adverse selection behavior. Also, the private market can provide insurance for idiosyncratic risk. This observation suggests that an upper bound on the subsidy level would be the share of loss that is systemic. Within this context and given that a county is the smallest available systemic geographical area, this research suggests that the maximum subsidy rate for individual farm

enterprise insurance should be around 50%. Fifty percent is the approximate share of loss that this study finds is systemic with the county at the 15% loss level, or the loss level associated with the highest coverage level of individual insurance. The reason for focusing on enterprise insurance is that the unit of analysis in this article is all acres of a given crop on the farm, which is closest to the enterprise unit. At present the subsidy rate for enterprise insurance ranges from 80% at the 50% through 75% coverage levels to 53% at the 85% coverage level. Thus, the subsidy level at 85% is too far off from this proposed decision rule. However, the subsidy level is too high for the lower coverage levels.

Correlations are an important tool in economic analysis of risk management strategies and policies. However, an analysis using the small number of Illinois corn and soybean farms as well as Kansas soybean and wheat that have yield data for all years in the analysis finds that the correlation between a farm and county yield/revenue deviations has limited ability to explain the share of a farm's loss that is systemic with a county. This finding in turn raises questions about the usefulness of the correlation between a farm and its county yield and revenue deviations in assessing the usefulness of county-based programs in helping manage the farm's risk. Moreover, it suggests that only by examining loss experiences for the farm and the county can the value of county risk management programs be ascertained.

This study is in essence a case study. It can only generate perspectives that raise questions and issues for further study. Thus, the results of this analysis need to be confirmed by analyses for other states, crops, and production environments.

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Table 1. Range of Annual Observations, Illinois and Kansas Farm Management Association Farms, 1977-2012

State and Crop	Minimum		Maximum	
	Number	Year	Number	Year
Illinois				
Corn for grain	992	1977	3787	2000
Soybeans	744	1977	3692	2000
Wheat	64	1977	356	2000
Kansas				
Corn for grain	159	1984	517	2001
Sorghum for grain	124	2012	750	1997
Soybeans	238	1980	625	2004
Wheat	455	2012	1038	1978

SOURCES: Illinois Farm Business Farm Management (FBFM) program and Kansas Farm Management Association (KFMA).

Table 2. Comparison of Illinois and Kansas Farm Management Association Farms in this Study with State Averages from 2007 Census of Agriculture for Farms Growing the Crop, Illinois and Kansas, 2007

State and Crop	<u>Farm Management Association Farms, 2007</u>		<u>2007 Census of Agriculture</u>	
	Planted Acres	Yield per Planted Acre	Harvested Acres	Yield per Harvested Acre
Illinois ^a				
Corn for grain	569	189	342	172
Soybeans	351	50	244	43
Wheat	118	56	95	53
Kansas ^a				
Corn for grain)	464	125	328	136
Sorghum for grain	263	84	231	77
Soybeans	415	29	196	32
Wheat	611	21	377	32

NOTES: a. Number of farm management association farms for 2007 by state and crop is: Illinois corn (3,304), Illinois soybeans (3,146), Illinois wheat (242), Kansas corn (453), Kansas grain sorghum (381), Kansas soybeans (547), and Kansas wheat (739).

SOURCES: data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, *2007 Census of Agriculture*.

Table 3. Average Annual Yield Loss and Revenue Loss of Illinois and Kansas Farm Management Association Farms in this Study as a Share of Expected Yield and Revenue, per Acre and per Farm, 1977-2012

State and Crop	Yield loss per acre	Yield loss per farm	Revenue loss per acre	Revenue loss per farm
Illinois				
Corn for grain	7%	7%	10%	9%
Soybeans	6%	5%	8%	8%
Wheat	9%	8%	12%	11%
Kansas				
Corn for grain	12%	11%	15%	15%
Sorghum for grain	15%	15%	18%	18%
Soybeans	17%	16%	18%	17%
Wheat	13%	13%	14%	13%

SOURCES: original calculations using data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, Quick Stats.

Table 4. Share of Average Annual Farm per Acre Yield Loss Systemic with County, State, and U.S. Yield Loss, Selected Yield Loss Levels, Illinois and Kansas Farm Management Association Farms, 1977-2012

State and Crop	Loss > 0%			Loss > 15%			Loss > 30%			Loss > 50%		
	County	State	U.S.	County	State	U.S.	County	State	U.S.	County	State	U.S.
Illinois												
Corn for grain	61%	48%	25%	56%	38%	12%	47%	22%	0%	28%	0%	0%
Soybeans	45%	30%	18%	35%	11%	0%	23%	0%	0%	7%	0%	0%
Wheat	44%	34%	8%	39%	23%	2%	35%	18%	0%	20%	0%	0%
Kansas												
Corn for grain	54%	32%	18%	46%	13%	6%	40%	0%	0%	26%	0%	0%
Sorghum for grain	55%	39%	26%	47%	29%	10%	39%	18%	1%	28%	2%	0%
Soybeans	62%	45%	11%	54%	28%	0%	43%	11%	0%	24%	0%	0%
Wheat	54%	29%	11%	50%	17%	2%	47%	6%	0%	40%	0%	0%

SOURCES: original calculations using data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, Quick Stats.

Table 5. Share of Average Annual Farm per Acre Revenue Loss Systemic with County, State, and U.S. Revenue Loss, Selected Revenue Loss Levels, Illinois and Kansas Farm Management Association Farms, 1977-2012

State and Crop	Loss > 0%			Loss > 15%			Loss > 30%			Loss > 50%		
	County	State	U.S.	County	State	U.S.	County	State	U.S.	County	State	U.S.
Illinois												
Corn for grain	62%	48%	33%	43%	14%	6%	29%	0%	0%	23%	0%	0%
Soybeans	59%	48%	44%	43%	28%	29%	15%	0%	10%	0%	0%	0%
Wheat	57%	52%	27%	51%	43%	15%	42%	35%	9%	10%	0%	0%
Kansas												
Corn for grain	59%	38%	23%	48%	11%	3%	38%	0%	0%	27%	0%	0%
Sorghum for grain	58%	42%	29%	48%	28%	13%	39%	13%	0%	29%	0%	0%
Soybeans	63%	47%	24%	56%	31%	6%	46%	14%	1%	29%	1%	0%
Wheat	56%	26%	22%	48%	12%	6%	43%	6%	0%	35%	0%	0%

SOURCES: original calculations using data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, Quick Stats.

Table 6. Share of Average Annual per Acre Yield Loss Systemic with County, State, and U.S. Yield Loss, Selected Yield Loss Levels, Illinois and Kansas Farm Management Association Farms with Yields for All Years, 1977-2012

State and Crop ^a	Farms	Average Yield Loss per acre	Loss > 0%			Loss > 15%			Loss > 30%		
			County	State	U.S.	County	State	U.S.	County	State	U.S.
Illinois											
Corn for grain	13	7%	52%	49%	26%	53%	44%	19%	47%	34%	0%
Soybeans	11	5%	43%	36%	27%	46%	22%	0%	41%	0%	0%
Kansas											
Soybeans	14	16%	63%	50%	16%	56%	30%	0%	43%	12%	0%
Wheat	18	12%	48%	37%	17%	44%	26%	4%	46%	9%	0%

NOTE: a. Three farms for Illinois corn and three farms for Illinois soybean did not have a loss greater than 30%.

SOURCES: original calculations using data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, Quick Stats.

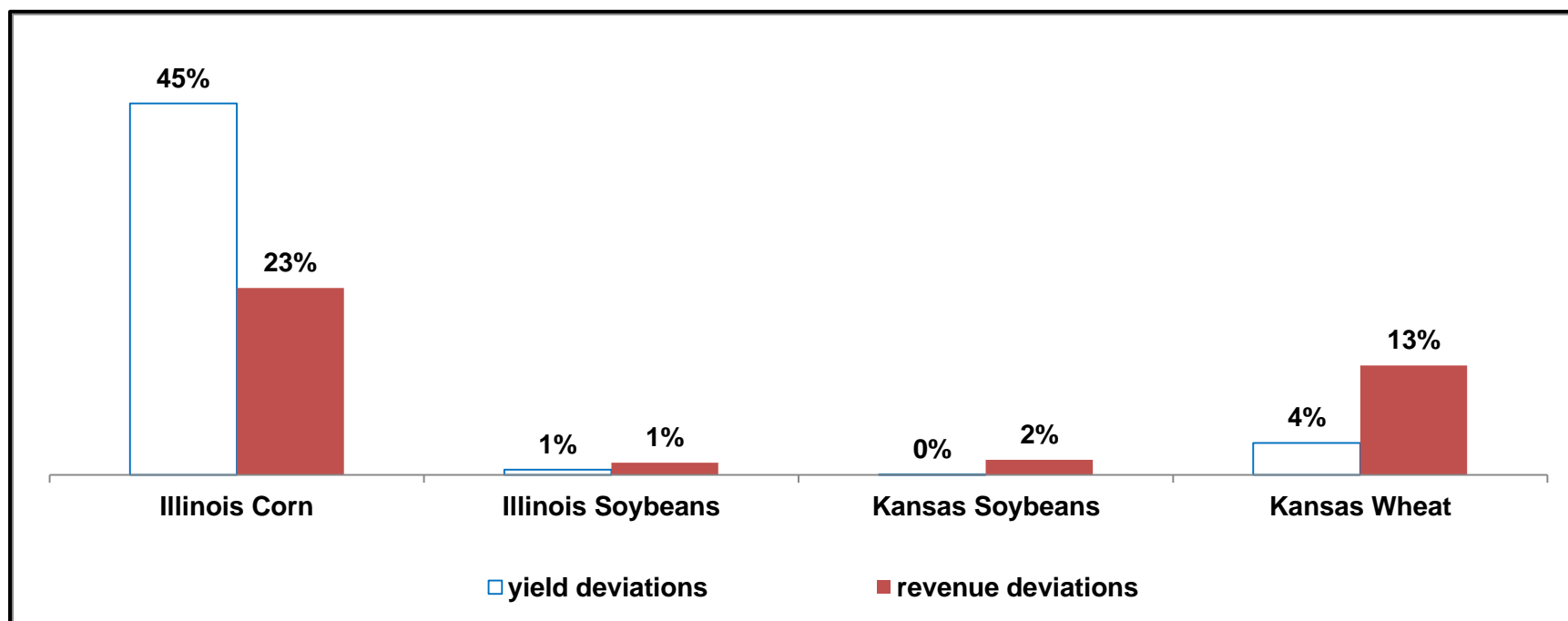
Table 7. Descriptive Statistics of Correlation between Percent Deviation^a of Farm and County Yields and Revenues from Their Expected Values, Illinois and Kansas Farm Management Association Farms with Yields for All Years, 1977-2012

State and Crop	Correlation between Percent Deviations of Farm and County Yields from Expected				Correlation between Percent Deviations of Farm and County Revenue from Expected			
	Average	Standard Deviation	Minimum	Maximum	Average	Standard Deviation	Minimum	Maximum
Illinois								
Corn for grain	0.88	0.06	0.78	0.94	0.85	0.05	0.74	0.92
Soybeans	0.81	0.08	0.66	0.90	0.87	0.04	0.78	0.93
Kansas								
Soybeans	0.85	0.06	0.74	0.92	0.83	0.06	0.70	0.91
Wheat	0.78	0.11	0.46	0.90	0.80	0.10	0.51	0.92

NOTE: a. For both farm and county yield, percent deviation is calculated for year t as $(X_t / (\text{average } X \text{ for 5 years prior to } t))$. For both farm and county revenue, percent deviation is calculated for year t as $((\text{pre-plant insurance revenue}_t) / (\text{harvest insurance revenue}_t))$.

SOURCES: original calculations using data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, Quick Stats.

Figure 1. Share of a Farm's Yield or Revenue Loss Systemic with its County Explained by the Correlation between Percent Deviation^a of Yield or Revenue for a Farm and its County, Illinois and Kansas Farm Management Association Farms with Yields for All Years, 1977-2012



NOTE: a. For both farm and county yield, percent deviation is calculated for year t as $(X_t / (\text{average } X \text{ for 5 years prior to } t))$. For both farm and county revenue, percent deviation is calculated for year t as $((\text{pre-plant insurance revenue}_t) / (\text{harvest insurance revenue}_t))$.

SOURCES: original calculations using data from Illinois Farm Business Farm Management (FBFM) program, Kansas Farm Management Association (KFMA), and U.S. Department of Agriculture, National Agricultural Statistical Service, Quick Stats.