Agricultural Disaster Aid Programs

A SURE Invitation to Wasteful Spending

by Myles Watts and Anton Bekkerman
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Introduction

The US government has funded agricultural disaster aid programs for nearly a century, mainly on an ad hoc basis between 1970 and 2008. In 2008, five permanent disaster programs were created through the Food, Conservation, and Energy Act of 2008 (the 2008 Farm Bill). A major objective of the bill was to permanently end persistent demands by farm organizations for Congress to supply escalating amounts of ad hoc disaster aid.¹ Three of the new programs target livestock operations, and a fourth targets orchard and tree operations. However, the new Supplemental Revenue Assistance Payments (SURE) program for crops is the budgetary and economic-efficiency elephant in the disaster aid policy room.

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When the 2008 Farm Bill was introduced, the four livestock, orchard, and tree disaster aid programs had a total estimated annual cost of $125 million. In contrast, the Congressional Budget Office (CBO) anticipated that the SURE program would cost $425 million per year. Although the estimate was revised to $714 million per year in March 2010, the CBO estimate still grossly underestimated (by $1.29 billion) the SURE program’s actual outlays of $2.04 billion in 2008, the first year farmers could access the program. Further, these single-year expenditures on the SURE program were nearly $1 billion greater than the $1.1 billion annual average expenditures on ad hoc disaster payments made between 1970 and 2008.

The CBO grossly underestimated (by $1.29 billion) the SURE program’s actual outlays of $2.04 billion in 2008.

While outlays of the SURE program in its first year clearly demonstrate that it is more expensive than Congress and the CBO expected, it is also economically inefficient. It is essentially an add-on to existing federal crop insurance programs, which are already heavily subsidized and provide many crop producers with an extensive, publicly funded safety net. As discussed in detail below, the SURE program links disaster aid payments to a farmer’s choice of crop insurance coverage, and indemnity payments are triggered by yield losses. The effect is to reduce most farmers’ crop insurance deductibles, increasing moral-hazard incentives. In response, farmers are more likely to adjust their production practices to incur indemnifiable losses more frequently and to increase the size of indemnity payments. The result is a waste of economic resources and increases in taxpayers’ costs.

The SURE program increases farmers’ moral-hazard incentives for several reasons. First, to be eligible for SURE payments, farms have to be in a county (or adjacent to a county) declared to have experienced a weather-related or other natural disaster by the secretary of agriculture. If such declarations were infrequent, then farmers would rarely receive SURE payments, and both tax outlays on the program and its moral-hazard consequences would be modest. As illustrated in the map on page 3, however, this is not the case, and most farms are eligible for SURE payments every year. Second, the SURE program allows farms to receive payments when production losses are minimal (at least 10 percent of actual production histories [APH]), making moral-hazard detection extremely difficult. Finally, the program’s structure increases the disaster-revenue guarantee, in effect reducing a farmer’s insurance deductible in the event of crop and revenue losses.

If the SURE program is to be retained, several major changes are in order. First, the provisions by which counties become eligible for SURE payments should be changed by altering the conditions under which counties are declared natural-disaster areas, as well as increasing the minimum losses necessary to trigger payments. Changing disaster-designation and loss criteria would reduce how often farms expect to become eligible for payments, reducing moral-hazard incentives and moderating superfluous monetary transfers to farms not suffering catastrophic losses. Further reductions in budgetary costs and behavior-distorting effects could be achieved by diminishing the connection between the SURE revenue guarantee and the current year’s market prices. When market prices are atypically high, total SURE outlays will also likely be excessively high. One viable (and World Trade Organization [WTO] compatible) option would be to use a five-year average of national market prices for each crop, stabilizing taxpayer obligations to individual farms.

Budget pressures are likely to reduce or eliminate some agricultural programs. Because of the increased potential for moral hazard, the SURE program should be a candidate for modification or elimination.
A Brief History of US Disaster Programs

In the early 1900s, various federal grants and loans were enacted to offset damages caused by disasters; these programs focused primarily on replacing public facilities. In 1938, the federal government initiated a crop insurance program. The first permanent federal disaster program was established in 1949; it provided low-income loans to farmers affected by natural disasters and was supervised by the Farmers Home Administration. It was not until the 1970s that disaster programs began providing direct (or nearly direct) payments with little or no provision for their repayment. Congress passed the Agricultural and Consumer Protection Act in 1973 for cotton, feed grains, and wheat, and the Rice Production Act in 1975. These programs were renewed in the Food and Agricultural Act of 1977, the Farm Disaster Assistance Program of 1987, and the Disaster Assistance Acts of 1988 and 1989. Policymakers perceived the programs as expensive, with disaster payments exceeding $4 billion in 1989. In 1993, a large flood in the Midwest prompted Congress to pass the Emergency Supplemental Appropriations for Relief from Major, Widespread Flooding in the Midwest Act, which provided $2.5 billion in financial assistance. Since the 1990s, government has funded frequent and widespread disaster programs, with an average of...
more than three programs per state between 1994 and 2004.

The 2008 Farm Bill introduced five permanent disaster programs (these programs are not part of the ongoing base budget): the Livestock Forage Disaster Program; the Livestock Forage Indemnity Program; the Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program; the Tree Assistance Program for Orchardists and Nursery Tree Growers; and the SURE program. Unlike the first four programs, SURE provides disaster-payment insurance for all insurable and economically feasible crops in a “whole farm” approach.7

**Most farms are eligible for SURE payments every year.**

**Livestock Forage Disaster Program (LFP).** The LFP compensates eligible producers for grazing losses from drought or fire. Permanent vegetative cover of native or improved pasture qualifies, as do crops planted specifically for grazing. A qualifying drought is determined by the US Drought Monitor severity rating, and a drought in any part of a county makes all qualifying producers in that county eligible for payments.8 The LFP also compensates grazing losses due to a qualifying fire on federal-land grazing permits.9

Producers must obtain coverage through a federally subsidized crop insurance product or the Noninsured Disaster Assistance Program (NAP) and own livestock that is commercially raised or grazes in the county.10 Exceptions include recreational, some exotic, and feedlot livestock. Furthermore, producers must privately own or lease land with the county designated for payments. Producers must meet several qualifications to be eligible for LFP payments. In general, compensation is 60 percent of daily feed costs for a qualifying drought and 50 percent of daily feed costs for a qualifying fire, and individuals’ payment amounts are limited. **Livestock Forage Indemnity Program (LIP).** The LIP compensates livestock producers—both owners and contract growers—for excess livestock mortality as a result of adverse weather conditions.11 The LIP does not compensate producers for drought-related losses. The payment rate is 75 percent of the average market value of the livestock, as determined by the Farm Service Agency. Participation in a risk-management program is not required to qualify for LIP indemnities, but producers must substantiate their losses with verifiable documentation, which may need to be from a third party. Individuals’ payment amounts are limited.

**Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP).** The ELAP requires producers to purchase federally subsidized agricultural insurance or NAP coverage for all commodities except grazing land. However, socially disadvantaged producers or those meeting other exemption criteria may not be required to purchase a risk-management product for eligibility.

Compensation under the ELAP may be provided for damaged or destroyed feed, honeybee losses, farm-raised fish losses located within the county, transportation of livestock feed, purchase of feed above the normally required amount, or livestock losses not covered by the LIP.12 Producers receive compensation for 60 percent of the costs associated with damaged or destroyed feed, and losses on federally permitted grazing are indemnified for up to 50 percent of the grazing value. Livestock death losses are covered at up to 75 percent of the livestock’s market value, honeybee and farm-raised fish feed losses are compensated at 60 percent of the feed’s value, and honeybee colony losses are compensated at 60 percent of the colony replacement cost. Total payments are limited to $50 million annually.

**Tree Assistance Program for Orchardists and Nursery Tree Growers (TAP).** To qualify for compensation, producers must (1) suffer more than a 15 percent loss from a qualified disaster; (2) own the eligible
trees or vines, although land ownership is not required; (3) replace the eligible trees or vines within twelve months after the loss occurs; (4) purchase a federally subsidized crop insurance or NAP product (with some exceptions); and (5) earn less than $500,000 in nonfarm income. For each producer, annual TAP payments must not exceed $100,000, and payments cannot be claimed on more than five hundred acres. Furthermore, payments cannot exceed 70 percent of actual costs for replanting or replacement. Compensation for pruning, salvaging, and removal cannot exceed 50 percent of actual costs.

The SURE Program. The SURE program’s original intent was to expand the portfolio of risk-management policies available to US farms by providing automatic disaster payments if producers suffer losses from a natural event. Farms are eligible if they are located in or adjacent to counties with secretarial disaster declarations. Furthermore, farms not in or adjacent to declared disaster counties can become eligible for SURE payments if they experience an actual farmwide yield that is less than 50 percent of their proven yields.13 To be eligible for SURE payments, a producer must also insure each of the economically relevant crops produced on a farm using a federally subsidized crop insurance product; if such a product is not available, then the crop must be insured using the NAP.14

A Closer Look at the SURE Program

A closer examination of the SURE program reveals how the program can create market and behavior distortions and why economists find many farm programs objectionable. Understanding why the SURE program may create moral-hazard incentives requires a more in-depth analysis of its structure. The following discussion provides a broad overview of the structure and its implications for producer behavior. A detailed mathematical model is provided in appendix A.

Structure of the SURE Program. From a farm’s perspective, receiving payments from SURE depends on two major components: the farm’s disaster-revenue guarantee and its revenue to count against the guarantee. The farm’s disaster-revenue guarantee is tied directly to crop insurance decisions. For each insured crop, a producer must select a coverage level and price election and establish a proven per-acre yield (APH).15 The trigger or insured yield for a farm’s crop is established by multiplying the crop’s APH yield by the coverage level selected for the crop.16 The farmer also chooses an insurance-price election that ranges from 30 to 100 percent of the maximum price at which the crop can be valued for insurance purposes. Most farmers choose a 100 percent price election, possibly because this maximizes the subsidy dollar amount they are likely to receive for any given coverage level.17

SURE provisions define the disaster-revenue guarantee as a proportion of the sum of expected revenues for each crop. For a crop insured under a USDA Risk Management Agency (RMA) product, the crop’s SURE expected revenue is a farm’s trigger yield multiplied by the farm’s insurance-price election and the total area planted to the crop. The crop’s contribution to the farm’s revenue guarantee is then defined as 115 percent of this amount. The farm’s revenue guarantee is capped at 90 percent of the expected market value of the farm’s expected crops, where the expected market value for each crop is assumed to be the farm’s APH yield multiplied by its insured price and the area planted to the crop.

To receive payments, the farm’s revenue guarantee must be greater than its revenue to count for every crop. A crop’s revenue to count includes the farm’s estimated market revenue, defined as the farm’s actual production of the crop multiplied by its regional or local harvest price, plus the sum of 15 percent of the farm’s direct payments, all countercyclical payments, and all crop insurance or NAP indemnities.18 The farm’s total revenue to count is the sum of the revenues to count for all the farm’s crops. If the farm produces only crops that are insured under a traditional...
multiple-peril crop insurance contract, then it will receive a per-acre indemnity equal to the difference between its trigger yield and its actual yield multiplied by the farm’s elected price for the crop, as long as the actual yield is smaller than the trigger yield. If the farm is eligible for a SURE payment, then it receives a payment equal to a proportion of the difference between the farm’s revenue guarantee and its revenue to count. Under the 2008 Farm Bill, this proportion is 60 percent.

As shown in appendix A, farmers seek to maximize expected profits, which consist of expected net market revenues, crop insurance payments, and SURE payments. Before the SURE program, farmers chose a level of production inputs that maximized their expected profits. After the program’s introduction, however, the chosen level is suboptimal, causing farmers to reduce their input quantities to return to a profit-maximizing state. This suggests that the SURE program encourages moral-hazard behavior.

One reason the SURE program creates substantial moral-hazard incentives is the current criteria used to assign secretarial disaster declarations to counties. For example, a disaster declaration can be made if a county incurs a 30 percent loss for any one crop, even if the production of that crop is minor. The extensive flexibility available to the secretary of agriculture for designating disaster areas substantially increases a farmer’s probability of becoming eligible for SURE payments on an annual basis, contributing to changes in behavior conditional on such expectations. Table 1 shows annual natural-disaster-area declarations in counties throughout the United States and in major corn, soybean, and wheat production states. Between 1999 and 2009, the Federal Emergency Management Agency (FEMA) declared between 54.2 percent (in 2000) and 97.6 percent (in 2005) of all US counties natural-disaster areas. Between 2005 and 2009, at least 83 percent of counties in major corn, soybean, and wheat production states were declared disaster areas. While FEMA can declare counties disaster areas for numerous reasons, most declarations are weather related. For example, several widespread disaster declarations were made in response to droughts and spring floods in 2007 and 2008. Hence, producers in many states, including those with major grain production, can expect to be eligible for SURE payments in most years.

Moral-hazard incentives associated with the current disaster-declaration criteria are exacerbated by two additional SURE program provisions. First, because farms in declared disaster counties or adjacent counties become eligible for SURE payments when their actual yields fall below 90 percent of APH

Budget pressures are likely to reduce or eliminate some agricultural programs. Because of the increased potential for moral hazard, the SURE program should be a candidate for modification or elimination.
yields, monitoring whether such small production losses are due to unpredictable catastrophic events or moral-hazard behavior is difficult. The low likelihood of moral-hazard detection can substantially motivate producers in disaster-declared or adjacent counties to alter their production inputs and trigger payments. Second, the program’s structure increases the disaster-revenue guarantee by 15 percent of a farm’s maximum insurance indemnity, reducing the insurance deductible farmers must pay in the event of losses. This adjustment was politically rationalized as preventing farmers affected by catastrophic events from incurring excessive financial hardship. However, because disaster declarations include any farmer in the declared or adjacent counties, regardless of whether these farmers actually suffered a catastrophic event, reduced insurance deductibles increase the amount of subsidized insurance indemnities. Therefore, the SURE program raises the incentives for moral hazard by farmers who may not have been affected by a natural disaster.

Lastly, in addition to reducing the insurance deductible, the revenue guarantee is calculated using current year’s crop insurance contract prices. This links the probability and magnitude of SURE payments to recent market conditions. In years succeeding those with atypically high market prices, producers may be more likely to receive larger SURE payments. The combination of low probability of moral-hazard detection and high likelihood of receiving SURE payments can compound behavioral distortions by farmers.

**Empirical Evidence.** To investigate whether there is statistical evidence of behavior distortions after the introduction of the SURE program, an empirical model of farmers’ behavior during the first two years of the SURE program is presented in appendix B. The model characterizes changes in the demand for federally subsidized crop insurance products as a function of variables indicating producers’ predisposition to trigger SURE and crop

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Table 1: Counties Declared by FEMA to Have Experienced a Natural Disaster

<table>
<thead>
<tr>
<th>Year</th>
<th>Declared counties in the United States</th>
<th>Declared counties in major production states¹</th>
<th>Declared counties in the United States (%)²</th>
<th>Declared counties in major production states (%)³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>2,275</td>
<td>1,186</td>
<td>72.4</td>
<td>67.8</td>
</tr>
<tr>
<td>2000</td>
<td>1,702</td>
<td>1,107</td>
<td>54.2</td>
<td>78.4</td>
</tr>
<tr>
<td>2001</td>
<td>2,152</td>
<td>1,280</td>
<td>68.5</td>
<td>64.1</td>
</tr>
<tr>
<td>2002</td>
<td>2,040</td>
<td>1,046</td>
<td>64.9</td>
<td>80.3</td>
</tr>
<tr>
<td>2003</td>
<td>2,576</td>
<td>1,311</td>
<td>82.0</td>
<td>73.9</td>
</tr>
<tr>
<td>2004</td>
<td>2,624</td>
<td>1,207</td>
<td>83.5</td>
<td>100.0</td>
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<tr>
<td>2005</td>
<td>3,065</td>
<td>1,633</td>
<td>97.6</td>
<td>83.2</td>
</tr>
<tr>
<td>2006</td>
<td>2,198</td>
<td>1,359</td>
<td>70.0</td>
<td>89.8</td>
</tr>
<tr>
<td>2007</td>
<td>2,304</td>
<td>1,467</td>
<td>73.4</td>
<td>97.8</td>
</tr>
<tr>
<td>2008</td>
<td>2,620</td>
<td>1,597</td>
<td>83.4</td>
<td>85.2</td>
</tr>
<tr>
<td>2009</td>
<td>2,422</td>
<td>1,391</td>
<td>77.1</td>
<td>67.8</td>
</tr>
</tbody>
</table>

**Source:** Data from FEMA (US Department of Homeland Security). Disaster declarations due to fires are excluded to better represent weather-related disasters.

**Notes:** 1. The following states are included: Arkansas, Idaho, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Texas, Washington, and Wisconsin. 2. There are 3,141 total counties in the United States. 3. There are 1,633 total counties in the major corn, soybean, and wheat production states. Counties directly adjacent to major production states are included.
insurance payments. Because eligibility for SURE requires participation in crop insurance or NAP, counties in which producers are more likely to receive SURE payments would also be more likely to demonstrate increased crop insurance demand after the introduction of the SURE program. As shown in table 2, the empirical analysis indicates that this is the case for corn, soybean, and wheat producers in major production states.

A disaster declaration can be made if a county incurs a 30 percent loss for any one crop, even if the production of that crop is minor.

This result has important implications for both the short- and long-term actuarial performance of insurance products for all three crops. In the short term, loss ratios are likely to increase in counties where the SURE program has encouraged participation by producers who are more likely to have losses. In addition, total SURE payments are likely to be higher than initial congressional estimates implied. In the longer term, as the RMA increases premium rates in response to higher losses, some producers who were already insured may suffer adverse consequences. Furthermore, because current subsidies are proportional to actuarially fair premiums, taxpayers will likely incur higher costs from subsidizing federal crop insurance programs.

Recommendations for Reducing Moral-Hazard Incentives. The above discussion provides theoretical and empirical evidence of major behavior-distorting effects associated with the SURE program. If budget constraints force the elimination of at least one risk-management program, it is reasonable to suggest that US disaster programs (both permanent and ad hoc) be discontinued first. Although this recommendation may not be the least costly or socially optimal solution, it is sensible for several reasons. Crop insurance programs and NAP, which is often lumped with insurance, appear to be the primary agricultural policy choices in other countries. The WTO continues to encourage worldwide farm-program uniformity, making it likely that crop insurance will continue and even expand. Countercyclical payments for most commodities are currently not triggered, so they will not result in less government spending. Therefore, because it is unlikely that all government risk-management programs are necessary or socially beneficial, the subsidized disaster programs should be high on the list of programs considered for termination.

A next-best solution, however, may be an extensive restructuring of the SURE program to address provisions that are most likely to exacerbate moral-hazard incentives. First, it is necessary to modify the conditions under which counties are declared disaster areas by the secretary of agriculture. For example, counties could be declared disaster areas if the five-year Olympic average of countywide crop yields (or revenues), based on all crops grown in the county, declined by at least 30 percent. Alternatively, declarations could be made if five-year averages declined by at least 50 percent, which would make the provision consistent with the current 50 percent extreme-loss rule for farmers not located in declared disaster counties. Once a county is designated a disaster area, eligible farmers must demonstrate that, across all crops, yield reductions are consistent with average countywide losses. Behavioral distortions may be further dampened by removing SURE-payment eligibility for farmers in counties adjacent to declared disaster areas and increasing the minimum production-loss requirement from 10 percent to 25 percent or 30 percent. These changes would substantially reduce the frequency with which producers become eligible for SURE payments and improve the effectiveness of providing assistance to producers who have truly suffered unexpected, catastrophic losses.
Changing the revenue-guarantee structure can also remove distortion effects. One change is separating the revenue guarantee from crop insurance decisions and capping the revenue guarantee at a lower percentage (for example, 70 percent) of expected market value of the farm’s expected crops rather than the current 90 percent cap. Additionally, moral-hazard incentives associated with lower deductibles could be eliminated by removing the 15 percent allowable adjustment to the crop’s expected revenue.23 These changes (along with at least a 30 percent loss requirement for eligibility) would make the SURE program compliant with the WTO, qualifying SURE as a green-box program. Currently, SURE indemnities would be classified as non-product specific payments, potentially counting against the amber-box limit.

In addition, the revenue guarantee should be separated from most recent market crop prices. That is, instead of using the current year’s crop insurance contract price to calculate the revenue guarantee, it would be more reasonable to use a five- or ten-year Olympic average of market crop prices. By averaging across a longer period as well as eliminating the impact of atypically high or low prices, the revenue guarantee would provide a more accurate representation of expected revenues for each crop. Consequently, this would lower the expected probability and magnitude of SURE payments, reducing moral-hazard incentives.

Barriers to Policy Change

The typical economist’s view of farm programs—that they are economically inefficient and inequitable (mainly redistributing income from taxpayers to farmers)—may not be widely shared by the general population. Goodwin and Smith suggest that the public’s approval for subsidized disaster-assistance policies may stem from the belief that payments are made only when farmers are in financial distress.24 However, the general population may not recognize or accept the market distortions and social costs associated with many subsidized assistance programs. Therefore, policy recommendations seeking to limit market distortions and more effectively fulfill the stated intentions of a disaster program may be viewed unfavorably by the general public and be challenging to implement.

Caplan suggests that many voters have the following four views that are at odds with what economists believe.25 First, the general public perceives profit-seeking behavior to be inconsistent with socially beneficial outcomes. That is, they fail to understand Adam Smith’s key insights about the world.26 Second, voters do not understand the concept of comparative advantage and the benefits of trade. Economists believe there is an excessive, unfounded concern about food security, resulting in the erroneous assumption that farm subsidies help their country be self-sufficient in food production. Third, the general population believes that programs that keep people in their current jobs (including farming) are necessary to maintain rural employment and are therefore socially beneficial. Fourth, many people may have a rose-tinted, romantic image of the morally, aesthetically, and environmentally ideal nature of life on small farms. Although this image has little to do with reality, it motivates voters to decry changes to policies promoting the survival of small farms. All these factors create political barriers to effective and efficient agricultural policy change.

Conclusion

The 2008 Farm Bill introduced five permanent disaster programs: the Livestock Forage Disaster Program; the Livestock Forage Indemnity Program; the Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program; the Tree Assistance Program for Orchardists and Nursery Tree Growers; and the SURE program. The first four programs do not appear to create substantial market and behavior distortions, and total outlays and the frequency with which producers become eligible for payments under these programs have
not grossly diverged from CBO expectations. However, the outlays for the SURE program quickly and substantially exceeded the CBO’s anticipated expenditures and the historical expenditures on ad hoc disaster aid programs for crop producers between 1980 and 2007. The SURE program has become extremely costly for several reasons. First, most farms are eligible for SURE payments every year because of the frequency with which the secretary of agriculture declares that counties experienced natural disasters. Second, as demonstrated in this analysis, the rules of the SURE program allow farms to receive payments when losses are minimal and reduce farmers’ deductibles associated with crop insurance indemnities. Third, the program’s provisions increase incentives for moral-hazard behavior, which also results in economically inefficient market outcomes. Because farmers’ moral-hazard behavior is difficult to detect, the frequency and size of SURE payments is substantially increased.

If the SURE program is to be retained, then substantial reforms are in order. First, more rigorous, binding conditions should be established for the secretary of agriculture to declare counties natural-disaster areas, reducing the frequency with which farms become eligible for SURE payments. Moreover, removing the eligibility of farms in counties adjacent to declared disaster areas and raising the minimum production-loss requirement could improve the effectiveness of the program to provide assistance to farms truly suffering unexpected, catastrophic losses. Second, reducing the link between the SURE program’s revenue guarantee and the current year’s market prices could lower SURE outlays in years when prices are atypically high. For instance, using a five-year average of national market prices for each crop could make the SURE program WTO compatible and stabilize taxpayer obligations. Lastly, moral-hazard incentives could be reduced by removing the lower deductibles associated with the SURE program.
Appendix A

Modeling Moral-Hazard Incentives in the SURE Program

Farms located in or adjacent to counties declared to be natural-disaster areas maximize an expected profit function consisting of expected market profits ($M$), expected crop insurance indemnities ($CI$), and expected SURE payments ($S$). For a farm producing one crop, the expected profit function under a natural-disaster declaration ($D$) is characterized as follows:

\[ E_D(\pi) = E_D(M) + E_D(CI) + E_D(S). \]

Farms in counties not declared natural-disaster areas also maximize an expected profit function consisting of expected market profits, crop insurance indemnities, and SURE payments. For a farm producing one crop, the expected profit function with no natural-disaster declaration ($N$) is characterized as follows:

\[ E_N(\pi) = E_N(M) + E_N(CI) + E_N(S). \]

The farm’s total expected profit is a weighted sum of expected profits $E_D(R)$ and $E_N(R)$, with weights $\theta$ and $(1 - \theta)$ corresponding to the probability of the farm being located inside or outside a declared disaster area. That is, the total expected profits a producer seeks to maximize are characterized by the following function:

\[ E(\pi) = \theta E_D(\pi) + (1 - \theta) E_N(\pi). \]

Producers’ moral-hazard behavior can be characterized by changes in production inputs. Rational producers will choose inputs that maximize their profits on an insured farm. In the representative expected-profit-maximization problem, the marginal effect of changes in inputs ($X$) is as follows:

\[ \frac{dE(\pi)}{dX} = \theta \left( \frac{\partial E_D(\pi)}{\partial X} \right) + (1 - \theta) \left( \frac{\partial E_N(\pi)}{\partial X} \right). \]

To characterize the marginal effect of input changes by producers whose farms are located in or adjacent to counties declared to be disaster areas, we first define the three components of $E_D(\pi)$. The expected market profits are characterized by the function:

\[ E_D(M) = \int_{0}^{\infty} \int_{0}^{\infty} [rf(X)\nu + G - Z(c)]g_D(v)h(r)dvdr, \]

where $r$ denotes the expected market price, $f(X)$ is the deterministic level of output, $\nu$ is a random component affecting output, $G$ denotes government payments, and $Z(c)$ represents the premium paid for crop insurance coverage, dependent on elected coverage level, $c$. Furthermore, $g_D(v)$ and $h(r)$ are probability density functions of random variables $\nu$ and $r$.

Expected crop insurance indemnities are denoted by the function:

\[ E_D(CI) = \int_{0}^{\infty} p[c\mu - f(X)\nu]g_D(v)dv, \]
where \( p \) represents the price at which a crop is insured and \( \mu \) is the crop's per-acre APH. Without loss of generality, \( p \) and \( \mu \) are normalized to one, and the expected value of the market price is assumed to be equal to the insured price (\( E[r] = p \)). Crop insurance payments occur when a farm's output falls below a particular chosen coverage level. The term \( v_{ci} \) is the value below which crop insurance is triggered; that is, \( v_{ci} \) is the value \( v \) at which \( c = f(X)v \). Therefore, \( v_{ci} = \frac{c}{f(X)} \).

Farms located in or adjacent to declared disaster areas may receive SURE payments that may or may not be accompanied by crop insurance indemnities. That is, if a farm experiences yield losses between 10 percent and the selected crop insurance coverage level \( c \), then the farm is eligible only for SURE payments. If yield losses exceed \( c \), then SURE and crop insurance payments may be received. Therefore, a farm's expected SURE indemnities are characterized by the sum of expected payments when the farm is eligible to receive both SURE and crop insurance and expected payments when yield losses trigger only SURE payments.

\[
E_{D(S)} = \int_0^{r_D} \int_{v_{ci}}^{\infty} 0.6[1.15c - rf(X)v - (c - f(X)v) -YG]\gamma_g(v)h(r)dvdr \\
+ \int_{v_{ci}}^{\infty} \int_0^{r_D} 0.6[1.15c - rf(X)v - YG]g_\gamma(v)h(r)dvdr,
\]

where \( \gamma \) is a scalar representing the portion of government payments, \( G \), deducted when calculating the SURE payment. The integration endpoints \( r_D \) and \( R_D \) are market prices below which SURE payments are triggered. The term \( r_D \) is determined by setting \( [1.15c - rf(X)v - (c - f(X)v) - YG] = 0 \) and solving for \( r_D = (0.15 - YG)/(f(X)v) + 1 \). Similarly, \( R_D \) is determined by setting \( [1.15c - rf(X)v - YG] = 0 \) and solving for \( r_D = \frac{1.15c - YG}{f(X)v} \).

The following equation represents the expected-market-profit function for farms not located in a declared disaster area:

\[
E_{(M)} = \int_0^{r_D} \int_{v_{ci}}^{\infty} [rkf(X)v + G - X - Z(c)]g_\gamma(v)h(r)dvdr.
\]

For simplicity, yields are scaled by a factor \( k > 1 \) for farms not located in or adjacent to counties declared natural-disaster areas. Furthermore, the expected crop insurance indemnities for these farms are represented by the function:

\[
E_{N(CI)} = \int_0^{v_{ci}} [c - kf(X)v]g_\gamma(v)dv.
\]

Lastly, for farms not located in or adjacent to declared disaster counties, SURE payments are triggered if a farm's yields fall below 50 percent of the crop's per-acre APH. Therefore, it is always the case that SURE payments are accompanied by crop insurance payments. The function characterizing SURE payments is as follows:

\[
E_{N(S)} = \int_0^{r_D} \int_{v_{ci}}^{\infty} 0.6[1.15c - rkf(X)v - (c - kf(X)v) - YG]g_\gamma(v)h(r)dvdr.
\]

Integration endpoints \( r_n \) and \( v_n \) are values below which SURE payments are triggered. That is, \( r_n \) is determined by setting \( [1.15c - rkf(X)v - (c - kf(X)v) - YG] = 0 \) and solving for \( r_n \) and \( v_n \) is the point at which yields are less than 50 percent of expected APH yields. Therefore, \( r_n = \left( \frac{1.15c - YG}{f(X)kv} \right) + 1 \) and \( v_n = \left( \frac{0.5}{f(X)k} \right) \).
Although a full derivation of SURE's effect on input levels, $X$, is outside the scope of this paper, the SURE program's impact on farmers' decisions to alter $X$ (and therefore yields) can be shown using comparative statics, by setting $\frac{\partial E[\pi]}{\partial X} = 0$ and solving for $\frac{\partial f}{\partial X}$. Because the introduction of SURE leads to an increase in $\frac{\partial f}{\partial X}$, the profit-maximizing quantity of inputs is reduced, suggesting that SURE encourages moral-hazard behavior.$^{27}$

**Appendix B**

**Empirical Analysis of Moral Hazard in the SURE Program**

An indicator of potential moral-hazard behavior or adverse selection should account for producers' actions that affect yields, conditional on the producer's predisposition to trigger SURE and crop insurance payments. SURE program payments are also more likely to be triggered in counties where yields have historically exhibited a relatively high degree of variability; moral-hazard and adverse-selection incentives for crop insurance participation are also expected to be greater in these counties. Following Goodwin, a county's yield variability is measured using the coefficient of variation (CV) from an estimated yield trend line.$^{28}$ This CV measure is then interacted with the county's ratio of recent to historical yields to form the term $yld_{cv}$. This interaction term is used to identify counties in which producers who are more likely to receive SURE indemnities are also more likely to exhibit adverse selection and moral-hazard behavior.

The interaction term can be modeled as part of a function describing farmers' decisions to purchase crop insurance. Because eligibility for SURE requires that farmers purchase a federally subsidized crop insurance or NAP product, in counties where net insured acreage increased after the introduction of SURE, the incentives for moral-hazard and adverse-selection behavior (as measured by the $yld_{cv}$ term) are expected to be relatively high. The following equation characterizes changes in the demand for crop insurance (as measured by changes in net insured acres):

\[
\Delta Net\_acres_{ij} = \beta_{i0} + \beta_{i1} \cdot yld\_dev_{ij} + \beta_{i2} \cdot yld\_cv_{ij} + \beta_{i3} \cdot X_{ij}^{farm} + \epsilon_i.
\]

The variable $\Delta Net\_acres_{ij}$ is defined as the log-difference of the ratio of net insured acres to total planted acres between 2007 and 2009 for crop $i$ in location $j$, $yld\_dev_{ij}$ is the ratio of recent to historical average yields, and $yld\_cv_{ij}$ is the interaction term between $yld\_dev_{ij}$ and the yield trend coefficient of variation. In addition, log-differenced multiple-peril crop insurance premium rates and loss ratios are represented by the $X_{ij}^{farm}$ vector; log-differenced producer age, farm acreage, number of planted crops, farmland value, and proportions of full farm owners and irrigated acres are represented by vector $X_{ij}^{farm}$; $\beta_i$'s represent parameters; and $\epsilon_i$ is the error term. All dollar-denominated variables are deflated to 1990 equivalent dollars using the prices-paid-by-farmers index (see USDA, National Agricultural Statistical Service, “Census of Agriculture,” various years, www.nass.usda.gov).

In modeling crop insurance participation, all reported parameters are estimated using ordinary least squares. Robust standard errors are estimated to account for potential heteroscedasticity. First, changes in net insured acres across all multiple-peril-yield and revenue products are modeled for corn, soybeans, and wheat farms. Parameter estimates for these three models are presented in table 2. For each crop, the interaction term $yld\_cv$ is positive and statistically significant at the 5 percent level. Other variables have expected signs and are significant in at least one of the three estimated models.
presented in table 2. For example, the premium-rate coefficient is negative, the loss-ratio coefficient is positive, and farm size is positive in each of the three models, and these coefficients are statistically significant for at least one crop. However, parameter estimates for other variables vary in sign across models and are generally not statistically significant. This finding suggests that adverse-selection and moral-hazard effects engendered by the SURE program may have been the major driving force in increasing crop insurance participation between 2007 and 2009.

The estimated coefficients presented in table 2 can be interpreted as elasticities because the dependent and continuous explanatory variables are measured as log-differences. The results imply that a 1 percent increase in yld.cv—the variable indicating the extent of potential incentives for moral-hazard behavior resulting from the introduction of the SURE program and adverse selection—would increase net insured corn acres by 0.249 percent, net insured soybean acres by 0.312 percent, and net insured wheat acres by 0.465 percent.

Table 2: Estimation Results for the Crop Insurance Participation Model: Overall and by Crop (Top Ten Production States for Corn, Soybeans, and Wheat)

<table>
<thead>
<tr>
<th></th>
<th>ALL CROPS</th>
<th>CORN</th>
<th>SOYBEANS</th>
<th>WHEAT</th>
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<tr>
<td></td>
<td>Estimate</td>
<td>Standard Error</td>
<td>Estimate</td>
<td>Standard Error</td>
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<td>intercept</td>
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<td>0.63</td>
<td>2.147*</td>
<td>1.25</td>
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<tr>
<td>yld_dev</td>
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<td>0.39</td>
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<td>2.52</td>
</tr>
<tr>
<td>yld_cv</td>
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<td>0.14</td>
<td>0.561**</td>
<td>0.28</td>
</tr>
<tr>
<td>premium</td>
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<td>0.14</td>
<td>-0.656***</td>
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<tr>
<td>loss_ratio</td>
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<td>0.001</td>
<td>0.00</td>
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<tr>
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<td>0.042</td>
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<tr>
<td>R²</td>
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<td>0.117</td>
<td>0.091</td>
<td>0.147</td>
</tr>
<tr>
<td>Observations</td>
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<td>762</td>
<td>688</td>
<td>456</td>
</tr>
</tbody>
</table>

Likelihood ratio test for equivalence of yld.cv parameter across the corn, soybean, and wheat models:
L.R. Statistic: 19.15
P-value: 0.0001

NOTES:
1. For each estimated crop insurance participation model, data are included for counties in the top ten corn, soybean, and wheat production states. The following states are included: Corn: Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, Ohio, South Dakota, Wisconsin.
   Soybeans: Arkansas, Indiana, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota.
2. Single, double, and triple asterisks indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.
Notes

1. The likelihood of meeting this objective is open to question. For example, fifteen months after the Farm Bill was passed, then-chair of the Senate Agricultural Committee Blanche Lincoln successfully lobbied for additional ad hoc disaster aid to benefit farmers and voters in her state.

2. An additional $400 million per year was anticipated to cover increased crop insurance and NAP costs associated with the insurance-coverage requirement for disaster-payment eligibility. Although these expected costs are small relative to those of the SURE program, they nontrivially contribute to total outlays.

3. Actual 2008 outlays for the LIP and LFP were around $188 million.


6. For example, the Des Moines Register reported on May 23, 2010, that even though many Iowa producers enjoyed record farm revenues because of high corn and soybean prices, SURE payments in Iowa for that year were likely to exceed $169 million. In many cases, producers with relatively small losses received payments because their farms were located in counties adjacent to disaster-declared counties.

7. “Whole farm” implies that if farmers have farms in different locations, the insurance payment is based on losses on all the farms, not just a single farm.

8. Typically, droughts qualify if during the normal grazing period the drought is severe (D2) for eight consecutive weeks or the drought is severe (D3) or exceptional (D4).

9. A qualifying fire on federal grazing permits requires that the permittee be prohibited from grazing the permit as a result of the fire.

10. The NAP, offered by the Farm Service Agency, is available for any crop or forage not covered by Federal Crop Insurance Corporation programs, but it provides relatively limited coverage for yield losses. NAP coverage costs $300 per crop per farm, so it is relatively cheap for farms with large areas of a certain crop. The NAP only provides a payment for losses in excess of 50 percent of a crop’s expected yield, and those losses are valued at only 55 percent of the crop’s estimated market price. This coverage against loss is comparable to the amount of protection provided by the USDA RMA programs for insurable crops under Catastrophic Coverage, which also costs $300 per crop per farm.

11. Qualifying weather events include blizzards, tornadoes, lightning, earthquakes, extreme cold or heat, specified wildfire events, and some diseases.

12. Eligible losses include honeybee hive or colony losses from causes such as colony collapse, and farm-raised fish losses due to adverse weather and other natural causes.

13. The 2008 Farm Bill states that a farm is eligible for a SURE payment if “the total loss of production of the farm relating to weather is greater than 50% of the normal production of the farm.” However, the act does not define what is meant by 50 percent production. For a farm producing more than one crop, it is not yet clear whether a 50 percent loss would have to occur for each crop or only one crop, or whether yield losses would be weighted by each crop’s expected share of total revenues from all crops. In the case of a farm that produces only one crop, the assumption that the farm will qualify if its actual yield is less than or equal to 50 percent of its APH yield seems reasonable, as it would also have experienced an equivalent percentage loss in terms of expected crop revenues.

14. Economically relevant crops are those whose market revenue contributes to at least 5 percent of the farm’s total revenue.

15. A farm’s APH yield for a given crop may be established in several ways, depending on the availability of credible yield records for the crop over the previous ten years in which the crop was, or could have been, planted. Many farms have some flexibility in how they establish an APH for the crop, so the APH process itself is a potential source of adverse selection and moral-hazard behavior. For details on how farms may establish APH yields, see James B. Johnson and Vincent H. Smith, “Supplemental Revenue Assistance Payments Program (SURE): Montana” (Agricultural Marketing Policy Paper No. 33, Agricultural Marketing Policy Center, Bozeman, MT, February 2010).

16. Coverage levels and price elections available for a crop depend on the insurance product the farm selects. In traditional-yield insurance products, coverage levels range from 50 percent to 85 percent of the farm’s proven yield, and price elections range from 30 percent to 100 percent of the market price.
maximum price at which a producer can value crop losses for indemnity purposes.

17. A premium subsidy rate is established for each yield-coverage election, regardless of the producer’s selected price election. For example, the premium subsidy rate for a 65 percent coverage election in an APH contract is 59 percent. So if a farm’s per-acre maximum indemnity at a 50 percent price election is $120 and the actuarially fair premium rate is 10 percent, then the full actuarially fair per-acre premium would be $12, of which the farm would pay only 41 percent, or $4.92. The expected subsidy (the expected net return from buying the insurance coverage) would be $7.08. If the farm chooses a 100 percent price election, however, the maximum indemnity and actuarially fair premium double to $240 and $24, the per-acre premium paid by the producer doubles to $9.84, and the expected subsidy doubles to $14.16; hence, there is an incentive for producers to select 100 percent price elections.

18. The regional or local harvest price at which a farm’s crop is valued is computed by the USDA as the crop’s national market price adjusted for the USDA’s estimates of typical regional or local quality premiums or discounts and the local basis. A farmer producing commodity-program crops may opt to participate in the new Average Crop Revenue Election (ACRE) program. In the SURE program, all ACRE program payments are treated the same as countercyclical payments; that is, they are included in a farm’s revenue to count against its revenue guarantee. A farm only receives an ACRE payment for a crop if the statewide average revenue per acre for that crop falls below a prespecified trigger level and the farm also experiences an estimated revenue loss for the crop. Farms that qualify for SURE payments will almost certainly meet the ACRE requirement that the farm experience an estimated revenue loss (relative to estimated average revenue for the crop), though the requirement that statewide average revenues be sufficiently low may not be satisfied.

19. Fraud is an issue for US crop insurance programs and can take several forms. Some frauds are obvious (for example, a grower in a Southern state was found to be smashing his own fruit while the fruit was still growing on the farm’s trees). Other frauds are more subtle. Atwood, Robinson-Cox, and Shaik provide evidence that many producers who have been able to insure different areas of their farm under different insurance contracts appear to have deliberately misreported yields on those different areas to gain larger insurance indemnities, a behavior identified as a potential problem by Vercammen and van Kooten. See Joseph A. Atwood, James F. Robinson-Cox, and Saleem Shaik, “Estimating the Prevalence and Cost of Yield-Switching Fraud in the Federal Crop Insurance Program,” *American Journal of Agricultural Economics* 88, no. 2 (2006): 365–81; and James Vercammen and G. Cornelis van Kooten, “Moral Hazard Cycles in


20. In addition, producers also incur dynamic costs by reducing yields to obtain larger insurance indemnities and SURE payments because low yields in the current year reduce their APH yields and potential insurance indemnities and SURE payments in future years. However, as a reviewer pointed out, these effects on moral-hazard decisions related to the SURE program may be relatively modest because producers are allowed to use yield plugs in their APH yield histories for years in which their farm yields are low. These yield plugs equal 60 percent of USDA RMA transition yields, which are generally relatively similar to average county yields reported by the USDA National Agricultural Statistical Service, and therefore are likely to exceed 50 percent of most producers’ APH yields.

21. For example, corn, soybean, and wheat prices in 2007 reached historical highs, leading to atypically high insurance contract prices in 2008.

22. An Olympic average is a five-year average that does not count the highest and lowest values. This helps reduce the impact of atypically high or low outcomes.


26. These perceptions do not reflect the fact that farmers operate as profit-maximizing entities, reacting to market conditions by accruing reserves and excess credit capacity to survive changing market conditions and natural disasters. For example, the current debt-to-asset ratio in agriculture is about 13 percent.

27. The full derivation and empirical support is provided in Anton Bekkerman, Vincent H. Smith, and Myles Watts, “The SURE Program: An Empirical Investigation of Moral Hazard and Adverse Selection Behavior.”


29. As described by the equation

\[ \frac{1}{\text{Sum}_{T=0}^{T=29}} \sum_{t=0}^{T} \frac{y_{kt}}{y_{kt-6}}. \]

The numerator is the average of the trended yields in the most recent seven years, and the denominator is the average over the previous thirty years. Yields are detrended using a nonparametric penalized B-spline estimation.
Agricultural Disaster Aid Programs
A SURE Invitation to Wasteful Spending
by Myles Watts and Anton Bekkerman

This paper examines the structure and cost of the federal government’s primary program to support farmers who lose crops from natural disasters: the Supplemental Revenue Assistance (SURE) program. The authors’ main conclusions are:

1) “Disaster” aid covers much more than real disasters: SURE is sold as a program that protects farmers when they suffer from natural disasters. However, the definition of “disaster” is so loose that virtually any drop in crop production triggers federal aid. If any county suffers a 30 percent drop in production for any one crop, even if that crop is rarely grown, then all farmers in that county are eligible for disaster aid for all the crops they grow if the value of any of their crops is only 10 percent lower than their selected crop insurance coverage level.

2) Farmers who do not suffer from “disasters” are eligible for disaster aid: If one county is declared a “disaster area,” then farmers in all adjacent counties are also eligible for disaster aid. As a result, farmers in virtually every county in the United States were eligible for disaster aid from the SURE program for any crop they grew in either 2008 or 2009. Common sense tells us that the entire United States was not subject to natural disasters in those two years.

3) The SURE program costs taxpayers billions of dollars, nearly five times what it was estimated to cost when approved by Congress: When the SURE program was created in the 2008 Farm Bill, the Congressional Budget Office estimated it would cost $425 million per year. In its first year of operation, the SURE program actually cost taxpayers $2.04 billion.

4) The SURE program must be repealed or substantially reformed: Congress should repeal the SURE program entirely and rely on federally subsidized crop insurance to repay farmers for crop losses. If there must be both crop insurance and a standing disaster program, the program must:

   a. Change the definition of disaster. A county should be declared a “disaster area” only if the drop in countywide crop yields is 30 or 50 percent below a five-year average based on all crops grown there. A farmer could receive aid only if his overall crop production decline equaled or exceeded that in the county;

   b. Eliminate eligibility for farmers living in counties adjacent to disaster counties; and

   c. Reimburse eligible farmers’ losses based on a five-year price average rather than current market prices. This eliminates farmers’ incentives not to take care of their crop in years with abnormally high prices.

The SURE program takes advantage of Americans’ legitimate desire to help farmers in extreme need by sending taxpayer dollars to farmers who suffer very minimal losses. If retained, the program must be reformed to its stated purpose. This will save taxpayers billions of dollars while helping farmers who genuinely need it.