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Deductibles vs. Coinsurance in Shallow-Loss Crop Insurance

Thomas W. Sproul, David Zilberman, and Joseph C. Cooper

Abstract

Shallow-loss policies take center-stage in many proposals for the current Farm Bill. We examine the choice of deductible coverage vs. coinsurance to show risk premiums and loss adjustment costs matter little when comparing policies. Thus, policy makers should base decisions more on costs to taxpayers than specific risk management features.

JEL Classifications: Q14, Q18

Since the advent of the Supplemental Revenue Assistance Program (SURE) as a free supplement to crop insurance in the 2008 Farm Bill, shallow-loss policies have become an area of increasing focus in the farm safety net. These policies provide coverage for smaller revenue losses in the range where revenues remain higher than the guarantee provided by crop revenue insurance, and are more politically palatable than direct payments in times of record-high farm revenues. While SURE is history (Smith and Hewlett, 2013), debate continues in Congress over a range of policy alternatives including deductible and coinsurance-style revenue insurance, area coverage, whole farm vs. single crop, and even price supports, all of which are heavily subsidized (CRS, 2012).

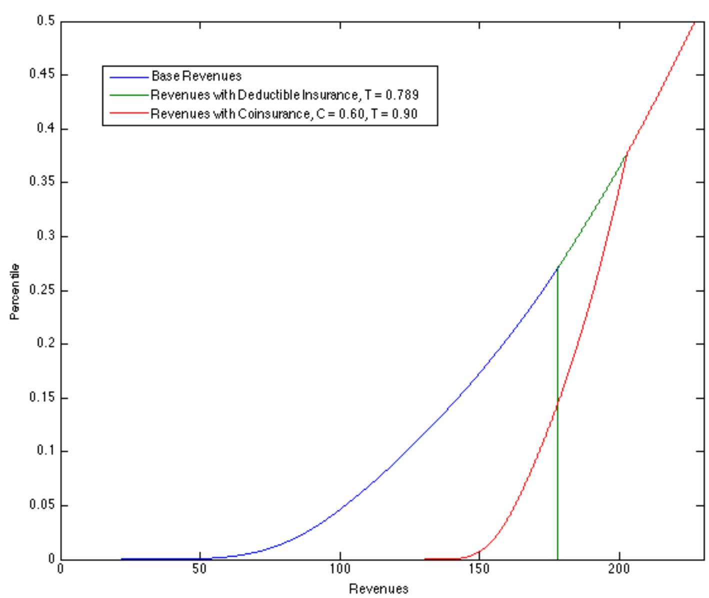
With so many alternative insurance policies proposed for the new farm safety net, it is easy to assume that the exact risk-management features of each policy should drive the discussion. This is not the case. Using the deductible vs. coinsurance choice as a motivating example, we find that both risk premiums and changes in loss adjustment costs are economically insignificant across a broad range of shallow-loss policies, crops, and counties, relative to differences in the expected value of claims payments. This result is driven largely by the nature of shallow-loss policies, which act on smaller, more frequent claims around the peak of the revenue distribution. Thus, our research suggests that policy specifics can be ignored if they do not materially affect the level of claims payments, and policy makers should focus almost exclusively on the expected cost of proposed shallow-loss programs. We do not, however, address distributional issues of which constituencies are the primary recipients of subsidies. Differences in the House and Senate bills along these lines are discussed in detail in Smith et al. (2012).

Deductibles vs. Coinsurance

We motivate the discussion by focusing on the choice of deductible vs. coinsurance policy because this choice leads to changes in both risk characteristics and claims adjusting costs, even when expected claims payments are held constant. It has been well known by economists since at least the 1960s that a risk-averse decision maker will strictly prefer deductible insurance to coinsurance when the two policies have the same expected value of payments and the same premium. Figure 1 compares the cumulative distribution of revenues under deductible insurance and a coinsurance of the same fair value; since the outcomes under coinsurance are more spread out to the downside, the coinsurance policy exposes the policyholder to additional risk relative to a deductible. The risk premium is then defined as the amount of higher expected value, in terms of claims payments, that the coinsurance policy must provide to attain indifference between the two policies. This comparison applies to shallow-loss crop insurance policies as well, which are generally written “stacked” on top of an underlying deductible coverage.

For example, consider a farmer who takes the standard crop insurance with a guarantee of 80% of mean revenues per acre. This arrangement would provide dollar-for-dollar payments for losses below the 80% threshold. If we choose parameters similar to the original SURE policy and ignore the disaster component, we would have a coinsurance policy with a shallow-loss coverage threshold at 90% of mean revenues, and with a 60% reimbursement rate. In the insurance literature, this policy would be identified as carrying 40% coinsurance, which is the insured party's share of the loss. The policy would pay sixty cents for every dollar of losses below the 90% threshold, down to the 80% threshold where the standard crop insurance kicks in. In contrast, the farmer may view a shallow-loss deductible policy with an 86% threshold as equally appealing, or *indifferent*. The deductible policy pays dollar-for-dollar losses below 86% of mean revenues, effectively just increasing the crop insurance guarantee. The indifferent deductible threshold will always be lower than the coinsurance threshold, but its exact level will depend on the farmer's risk aversion. For winter wheat farmers with moderate risk aversion in Hyde County, South Dakota, we estimate that the expected value of claims payments is $17.23 per acre under the coinsurance program above, but only $17.22 under the indifferent deductible program with 86% threshold, so the risk premium is $0.01 per acre.

Figure 1: Effect of Deductible and Coinsurance on the Cumulative Distribution of Revenues



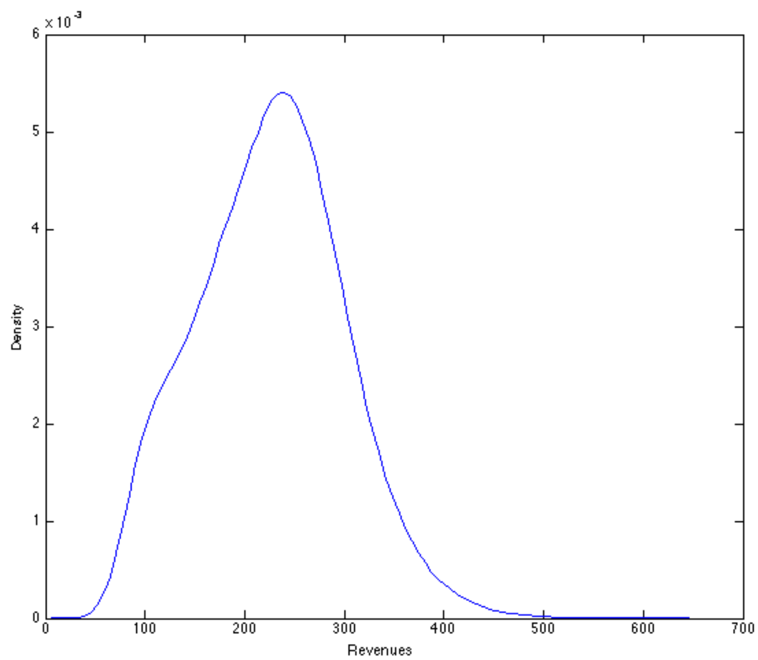
The deductible vs. coinsurance choice also affects the size and frequency of claims, which may affect the administrative costs associated with claims payments. When comparing insurance policies of equal expected value, the coinsurance guarantee must be higher than the deductible guarantee, so switching from deductible to coinsurance will lead to more frequent claims of smaller size. A well-known model for claims adjustment costs (Raviv, 1979) includes a fixed cost per claim, a variable cost based on the size of the claims payment, and possibly, returns to scale. Thus, whether the change from deductible to coinsurance will lead to higher loss adjustment costs depends on the exact cost structure of the insurer.

Estimating the Distribution of Revenues Per Acre

To evaluate these tradeoffs, we started by estimating probability distributions of per acre revenues for representative farmers of various crops in a number of U.S. counties. County-level and national-level yield data are drawn from the National Agricultural Statistical Service (NASS) for the period 1975-2011, and expected and realized prices are taken from grain futures prices, according to USDA Risk Management Agency (RMA) definitions. We used copula methods to estimate the joint distribution of yields and prices at the county level, following Cooper, Delbecq, and Davis (2012), and to forecast the empirical distribution for the 2012 crop year, just following the final year of the dataset. Farm-level conditions are represented by adding Gaussian white noise to inflate the standard deviation of county-level yields until it matches RMA-calculated fair premiums for the 2012 crop year (following

Coble and Dismukes, 2008). A sample, per-acre gross revenue distribution for winter wheat in Hyde County, South Dakota, is shown in Figure 2.

Figure 2: Kernel Density of the Empirical Revenue Distribution for Winter Wheat, Hyde County, S.D.



Policy Indifference and Risk Premiums

We identify indifferent policies using an exponential utility function of wealth and the full range of *reasonable* risk aversion coefficients, as identified in Babcock, Choi, and Feinerman (1993). For each risk aversion coefficient, we used a numerical optimization procedure to identify the deductible guarantee that makes the representative farmer indifferent to the coinsurance parameters of SURE. We found that the indifferent deductible guarantee was quite stable, often varying by less than 0.1% of mean revenues across most of the range of risk aversion coefficients when baseline coverage was 70% or above, and by less than 0.2% at extreme levels of risk aversion.

Estimated risk premiums were stable as well, and small. For nearly all combinations of crop, county, underlying coverage, and risk aversion, risk premiums were estimated to be less than $0.15 per acre, and in many cases were less than $0.05 per acre. These values are economically insignificant when compared to insurance policies with fair values ranging from $10 up to $100+ per acre in some high revenue corn counties. The maximum risk premium estimated was $0.19 per acre for DeKalb, IL, where per acre revenues were $974.44 and the 90/60 coinsurance policy had a fair value of $48.31. Table 1 below shows estimated means and standard deviations of revenues for select crops/counties, and the highest risk premium estimated. The highest risk premiums were observed when risk aversion was sufficient to turn down a $100 gamble with 3:1 odds of winning.

Table 1: Means, Standard Deviations and Maximum Risk Premiums Estimated, Select Counties and Crops

County	Crop	Mean	Std. Dev.	Max Risk Premium
DeKalb, IL	Corn	$974.44	$304.25	$0.19
McLean, IL	Corn	$1,009.80	$202.87	$0.17
Howard, NE	Corn	$905.61	$449.42	$0.13
Beadle, SD	Corn	$619.02	$319.81	$0.06
Montgomery, MS	Cotton	$942.76	$512.72	$0.13
Hoke, NC	Cotton	$850.92	$364.65	$0.12
Howard, TX	Cotton	$373.59	$373.89	$0.01
Logan, IL	Soy	$697.53	$198.33	$0.11
Sumner, KS	Soy	$395.42	$306.86	$0.02
Sanilac, MI	Soy	$570.16	$256.83	$0.06
Logan, KY	Winter Wheat	$470.77	$248.70	$0.04
Marion, OH	Winter Wheat	$449.92	$165.73	$0.04
Hyde, SD	Winter Wheat	$225.34	$74.48	$0.03

Loss Adjustment Expenses

We obtained crop insurance performance data from the RMA Summary of Business for years 1995-2010. These data included premiums, indemnities, and number of units with claims by crop, county, coverage level and year, for all U.S. counties. We also obtained a crop insurance industry report, the 2011 Grant-Thornton Report, which uses a survey of U.S. crop insurers to estimate loss adjustment expenses as a percentage of gross premiums (also for 1995-2010). Loss-adjustment expenses were only available on a national aggregate basis, so we aggregated the RMA data and combined the two into a simple regression model estimating the structure of loss adjustment costs, as described above.

The model performed quite well. At a 99% significance level, we estimated per-claim fixed costs of $132.41, variable costs of 4.39% of indemnity payments, and returns to scale of 0.025 cents per claim, on a national scale. Given estimated distributions of per acre revenues, these results can be used to estimate expected savings (or costs) from switching between deductible and coinsurance shallow-loss coverage. Variable costs will be identical for two policies with the same fair value, so comparing deductibles vs. coinsurance means assessing fixed costs saved against lost economies of scale.

We will use our estimated data for wheat in Hyde County, South Dakota, as a back-of-the-envelope example. Before adjusting for claims frequency, fixed costs average $1.64 per acre per claim, while economies of scale average $1.86 per acre per claim when counting only the 599K+ insured units of farmed wheat in the United States, and using an average of 80.67 acres per insured unit. Transition from our example coinsurance policy with SURE parameters to a deductible policy of equal fair value actually results in higher claims costs, though they are tiny (about $0.002 per acre). The higher costs arise because lost returns to scale outweigh the savings of fixed costs, when comparing larger claims under a deductible policy against smaller, more frequent claims under a coinsurance policy.

As with the risk premium differences estimated above, these values are economically insignificant, even when extended to policies with different expected values of claims payments. If we consider an 89% shallow-loss deductible guarantee with base coverage at 80%, it has an expected value $2.11 per acre higher than our sample 90/60 coinsurance policy. In this scenario, the higher expected value of payments will lead to higher variable loss adjustment costs, averaging $0.033 per acre. So, while variable costs are likely their largest component, any changes in loss adjustment costs are likely to be dwarfed by increases in expected claims payments.

What Next?

As we witness the continued transition of the farm safety net away from direct payments and towards subsidized insurance-style products like shallow-loss policies, it is important to remember that risk management may not be the primary concern driving these innovations. This article has presented evidence that farmers are not likely to care about the exact risk management characteristics of shallow-loss crop insurance, and that efficiency gains from saved loss adjustment expenses are not likely to arise from subtle differences between policies. Thus, shallow-loss policies can be judged almost exclusively on the expected value of claims and subsidy payments.

For More Information:

Babcock, B., Choi, E., and Feinerman, E. (1993). Risk and Probability Premiums for CARA Utility Functions. *Journal of Agricultural and Resource Economics*, 18(1), 17-24.

Coble, K., and Dismukes, R. (2008). Distributional and Risk Reduction Effects of Commodity Revenue Program Design. *Review of Agricultural Economics*, 30, 543-553.

Cooper, J.C., Delbecq, B., and Davis, C. *Fiscal and Farm Level Consequences of 'Shallow Loss' Commodity Support Programs*. Presented as a Selected Paper in the 2012 AAEA Annual Meeting, Seattle, WA, August 12-14, 2012.

Raviv, A. (1979). The Design of an Optimal Insurance Policy. *The American Economic Review,* 69(1), 84-96.

Shields, D.A., and Schnepf, R. (2012). CRS Report R42040: Farm Safety Net Proposals in the 112th Congress, a Report of the Congressional Research Service.

Smith, V. H., Babcock, B., and Goodwin, B. (2012). Field of Schemes Mark II: The Taxpayer and Economic Welfare Costs of Price Loss Coverage and Supplementary Insurance Coverage Programs. Working paper #2012-03 in the American Enterprise Institute for Public Policy Research Series "American Boondoggle: Fixing the 2012 Farm Bill."

Smith, V.H., and Hewlett, J.P. (2013). Farm Policy and Disaster Aid Programs: The Path Looking Forward. *Choices,* 28(1).

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