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Implications of Integrated Commodity Programs and Crop Insurance

Keith H. Coble and Barry J. Barnett

Moving from price-triggered to area revenue–triggered programs was perhaps the most common theme among 2007 farm bill proposals. Area revenue–triggered commodity programs may make farm-level revenue insurance products seem redundant, raising questions about why the federal government should continue both programs. Area revenue–triggered programs would remove much of the systemic risk faced by producers. As a result, private sector insurers may be able to insure the residual risk without federal involvement. This paper examines the effects of moving to area revenue–triggered commodity programs with a focus on public policy issues that would likely arise.

Key Words: commodity programs, revenue insurance, systemic risk

JEL Classifications: D81, G22, Q18

For decades, the commodity title of the farm bill has focused on price-triggered agricultural support programs that protect crop producers from price risk. Loan Deficiency Payments (LDPs) and Counter-Cyclical Payments (CCPs) represent the most recent permutations of these programs. Of course, crop agriculture is also beset by production risk caused by extreme weather, insects, disease, and other perils. Traditionally, the federal government has provided U.S. producers with subsidized crop insurance—and frequently ad hoc disaster payments—to assist with production risk.

Combining federal price and production risk programs into a revenue risk program was considered as early as 1983 (Offutt and Lins). Later, Miranda and Glauber (1991) proposed an area revenue–triggered program as an alternative to ad hoc disaster payments and Babcock and Hart proposed replacing the LDP and CCP programs with an area revenue–triggered program. Efforts by Midwestern groups to promote a revenue-triggered commodity program failed during the 1996 farm bill debate but did contribute to the initiation of crop revenue insurance introduced that same year. Farm-level (and later, county-level) revenue insurance programs rapidly captured significant market share and for 2007 together accounted for 79%, 77%, and 75% of insured corn, wheat, and soybean acres, respectively.

In addition to its role in providing commodity programs (LDPs, CCPs, and fixed direct payments) and ad hoc disaster payments, the federal government also facilitates the offer of crop yield and revenue insurance products. The government provides premium subsidies that reduce the premium cost to insured farmers and reimburses private insurance companies for the Administrative and Operating (A&O) costs of selling and servicing crop insurance policies. The federal government also provides reinsurance at favorable terms to the private insurance companies that sell federal crop insurance policies. The potential for widespread systemic losses that could undermine the financial solvency of private crop insurance companies

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has been the primary historic rationalization for the federal role in providing reinsurance on crop insurance policies (Glauber and Collins; Kramer; Miranda and Glauber 1997).

Several 2007 farm bill proposals focused on replacing some portion of price-triggered commodity programs with programs that make payments when the average revenue over a geographic area falls short of expected or target levels. Coble and Barnett note that among these proposals were those that triggered payments due to shortfalls in county (National Corn Growers), state (Senate Committee on Agriculture, Nutrition and Forestry and American Farm Bureau) and national (USDA, House Committee on Agriculture, and American Farmland Trust) revenue.

Given the widespread use of crop revenue insurance and the likelihood of new area revenue–triggered commodity programs, it is important to consider whether these programs are duplicative or can be made to complement each other. Some farm bill proposals (e.g., the National Corn Growers) suggested "wrapping" farm-level insurance around an area revenue–triggered commodity program (Babcock and Paulson). With a wrapped insurance product, any payment received from the underlying area revenue–triggered commodity program would be deducted from the indemnity due on an associated farm-level revenue insurance policy. In principle, the area revenue–triggered commodity program would provide protection against systemic loss events (such as drought) while the farm-level policy would protect against residual, idiosyncratic losses.

The premium for wrapped insurance should be less than for current farm-level revenue insurance since the underlying revenue-triggered commodity program would cover some risks currently indemnified by the insurance policy. Both the premium subsidy and the A&O reimbursement are percentages of the total premium cost of the insurance policy. Thus, wrapping crop insurance policies around an area revenue–triggered commodity program would also reduce federal outlays for premium subsidies and A&O reimbursements (Coble and Dismukes).

The central question addressed in this paper is whether wrapping insurance around area revenue–triggered commodity programs would eliminate, or at least reduce, the need for a federal role in providing reinsurance on crop insurance policies. Miranda and Glauber (1997) examined the potential for the federal government to use area (state and national) yield-triggered reinsurance contracts to reinsure farm-level yield insurance policies. They found that state-level yield-triggered reinsurance contracts would allow insurance companies to reduce their portfolio risk on crop insurance policies to levels that were comparable to lines of insurance that were sold without federal involvement. Similarly, Vedenov, Epperson, and Barnett analyzed the potential for reinsuring Georgia cotton crop insurance using catastrophe bonds based on state-level yields. They found that the bonds could reduce the variance of crop insurance loss ratios for cotton crop insurance in the state by as much as 56%.

This study extends previous work by explicitly examining the extent to which an underlying area revenue–triggered commodity program can transfer systemic production risks to the federal government. To the extent that the underlying commodity program can transfer these locally nondiversifiable risks, a wrapped farm-level insurance policy need only protect against residual, idiosyncratic risks that, at least in principle, should be diversifiable within a portfolio of wrapped crop insurance policies—thus undermining the primary historic argument for federal involvement in providing reinsurance on crop insurance policies.[1] Specifically, we analyze the distribution of state-level

[1] Other arguments have also been used to rationalize the role of the federal government in providing reinsurance. The federal government (not the reinsured private insurance companies) establishes premium rates for all crop insurance policies. Further, to address the political goal of universal availability, the private insurance companies are required to sell crop insurance to any eligible applicant. Given these unusual conditions, the reinsurance agreement allows private insurance companies to adversely select against the federal government. The companies can choose those policies on which they wish to retain a significant amount of premium and loss risk and those policies on which they wish to cede most of the premium and loss risk to the federal government (Coble, Dismukes, and Glauber; Ker and Ergun; Mason, Hayes, and Lence; Vedenov et al., 2004; Vedenov et al., 2006).

crop insurance portfolios given three types of wrapped farm-level crop insurance (yield insurance, revenue insurance, and revenue insurance with up-side price protection). Also three types of underlying area revenue–triggered commodity programs are considered—national, state, and county.

Methods and Data

The model used here is designed to simulate random yields, prices, and revenues at various levels of aggregation. The model explicitly accounts for correlations across different levels of aggregation and correlation between yields and prices at any given level of aggregation. The analysis is based on county, state, and national yield data and national crop price data from USDA's National Agricultural Statistics Service (NASS). We also utilize publicly available Risk Management Agency (RMA) crop insurance data on effective premium rates to model county-specific farm yields. The model includes four crops—corn, soybeans, wheat, and cotton in every county of the United States where data is available. The final model reflects at least 86% of U.S. acreage for each crop.

To measure variability of yields at the county, state, and national levels, we estimated a linear time trend for each data series using 1975–2004 data and calculated variability from the residuals relative to the predicted yield for 2007. Given detrended national, state, and county yield series, we next simulate 10 representative farms for each crop/county. The representative farms are modeled following Miranda (1991) as:

$$(1) \quad \tilde{y}_{ft} = \mu_f + \beta(\tilde{y}_{ct} - \mu_c) + \varepsilon_{ft} \quad \forall f \in c$$

where $\tilde{y}_{ft}$ is the realization of the random yield on farm f in year t, $\tilde{y}_{ct}$ is the realization of the random yield in county c in year t, $\mu_f = E(\tilde{y}_{ft})$, $\mu_c = E(\tilde{y}_{ct})$, and ε_{ft} is a normally distributed error term with $E(\varepsilon_{ft}) = 0$ and $Var(\varepsilon_{ft}) = \sigma^2$.

If we define $\omega_{ft} = \tilde{y}_{ft} - \mu_f$ and $\omega_{ct} = \tilde{y}_{ct} - \mu_c$ then Equation 1 can be rewritten as

$$(2) \quad \omega_{ft} = \beta\omega_{ct} + \varepsilon_{ft}.$$

This demonstrates that the coefficient β measures the responsiveness of deviations in farm yield relative to the expected value to deviations in county yield relative to the expected value. The error term ε_{ft} represents idiosyncratic effects on farm yield deviations relative to the expected value that are orthogonal to county yield deviations relative to the expected value. A grid search is conducted for the value of σ (the standard deviation of ε_{ft}), which simulates current RMA effective premium rates for farm-level yield insurance at the 65% coverage level for each crop/county (see Coble and Dismukes for more details).[2]

Within a county, different farms will have different values of β. Thus, the representative farms within each county are varied by randomly drawing each farm's β from a normal distribution with a mean of one and a standard deviation of 0.28, which approximates the distribution of β from Miranda. Miranda showed that if the county yield were truly an aggregation of all farms in the county, then the acreage weighted average of all β's in the county would be equal to one. A matrix $[Y]$ is constructed that contains national, state, and county yield deviations relative to the expected value for each of the four crops. Thus the matrix has T rows representing T years of historical yields.

Price variability is estimated from NASS state and national price data. National annual marketing-year average (MYA) prices for 1974 through 2005 are used. These data are used to estimate a percentage price change from the previous year's price level. State basis adjustments from the national price are also derived from the historical data so that state harvest-time prices are the sum of the MYA price and the basis. These data for the four crops are maintained in the matrix $[P]$, which also has T rows of annual prices.

[2] Crop insurance is generally sold at the basic or optional unit level, which is typically more disaggregated than the farm. Thus, the effective premium rate data is largely a mix of basic and optional unit rates and captures some other risks that might not be considered yield risk (e.g., prevented planting or quality loss).

Planted acreage for each crop/county was obtained from NASS for the 2005 crop year and is assumed constant throughout the simulation period. Each of the representative farms is assumed to represent 10% of the planted acres in the county. Base acreage for 2002 for each county was obtained from the Farm Service Agency. Each representative farm is also assumed to represent 10% of the base acres in the county. Base yields were derived by comparing the national average base yield with the expected yield. This ratio is applied to the 2007 expected yield for each county. The representative farm yield, price, and revenue simulation is based on 350 random draws. For every location, a row is simultaneously drawn at random from yield matrix [Y] and price matrix [P] (i.e., all yield deviations from trend and price changes are drawn from the same historical year) to maintain the empirical correlations between prices and yields, between yields at different levels of aggregation, and between yields in different counties. The idiosyncratic portion of farm yield is independently drawn for each representative farm. Starting prices for the simulations are determined from December 2007 futures market prices for 2008 delivery months.

Insurance Wrapping Alternatives Examined

While several area revenue–triggered commodity program designs have been proposed, this analysis focuses on the Senate average crop revenue (ACR) option. The ACR would provide producers with a state-level revenue-triggered commodity program. In the analysis presented here, we also vary the ACR design to consider programs with national- and county-level revenue triggers. For each year, the ACR payment is calculated as:

$$ACR_{fj} = 0.85 \times BA_f \times \bar{y}_f \times \frac{\max\left[\left(\left(0.9P_E\hat{y}_j\right) - P_{MYA}y_j\right),\ 0\right]}{\hat{y}_j} \quad \forall f \in j \tag{3}$$

where j designates the geographical area (nation, state, or county) for which a payment is triggered. Thus, ACR_{fj} is the payment for farm f in area j, $\bar{y}_f$ is the farm's program yield and BA_f is the farm's base acreage. The revenue trigger is 90% of preseason expected price, P_E, times $\hat{y}_j$ which is a trend-adjusted expected yield per planted acre for area j. Revenue to count is the product of market year average price, P_{MYA}, and the realized yield per planted acre for area j, y_j. If the revenue to count is less than the revenue trigger, an ACR payment is made. The fraction in Equation 3 solves to a price measure since the numerator is a revenue measure and the denominator is the expected yield per acre for area j.

Wrapping Insurance around ACR

The original Senate committee language, as proposed in the Chairman's mark, would have integrated farm-level revenue insurance with the ACR program by "wrapping" revenue insurance around the ACR.[3] This implied that ACR program payments would be deducted from any revenue insurance indemnity payments. The ACR program would cover systemic losses and the farm-level insurance product would cover any residual idiosyncratic losses. We model three insurance products assuming a farm-level insurance product with 65% coverage. The insurance products are assumed to be actuarially fair so the federal transfer associated with the insurance products is simply the premium subsidy, which is currently 59% for 65% coverage.[4] In a given year, the indemnity for the wrapped yield insurance is modeled as:

$$\textit{Wrapped APH Indemnity}_f = \max\left[0,\ P_E\left(\left(65\% \times APH_f\right) - \tilde{y}_f\right) - ACR_{fj}\right] \quad \forall f \in j \tag{4}$$

where APH_f is the farm's crop insurance actual production history (APH) yield and

[3] This language was removed from the Bill passed out of committee.

[4] Preliminary analysis examining other coverage levels did not result in implications that differed from those reported here.

all other variables are as defined previously. The wrapped APH indemnity is calculated by subtracting the ACR payment from the unwrapped insurance indemnity.

We also consider farm-level revenue insurance with 65% coverage wrapped around the ACR. For this design (designated RA) the insurance indemnity is calculated as:

$$\begin{aligned} &\mathit{Wrapped\ RA\ Indemnity}_f = \\ (5)\qquad &\max\left[0, \left(P_E \times 65\% \times APH_f\right) - P_H\tilde{y}_f - ACR_{fj}\right] \forall f \in j \end{aligned}$$

where P_H is the harvest-time price.

We also consider farm-level revenue insurance with 65% coverage and upside price protection wrapped around the ACR. For this design (designated CRC),[5] the insurance indemnity is calculated as:

$$\begin{aligned} &\mathit{Wrapped\ CRC\ Indemnity}_f = \\ (6)\qquad &\max\left[0, \left(\max(P_E, P_H) \times 65\% \times APH_f\right) - P_H\tilde{y}_f - ACR_{fj}\right] \forall f \in j. \end{aligned}$$

Results

The results of this analysis are potentially voluminous since so many representative farms are modeled simultaneously. Thus, the simulated results are presented across the four crops and aggregated by state and insurance design. Of course, these scenarios do not reflect the actual portfolios of crop insurance companies nor is the book of business in any state uniformly one insurance design or coverage level. However, we present the data by state and insurance design to demonstrate the *ceteris paribus* effects of wrapping on different regions.

Table 1 reports the effect of wrapping on the mean of the portfolio loss cost (indemnities/liability). The results are reported for each of the three insurance designs. Note that the mean effect on loss cost does not directly affect the insurability of the portfolio. That is, a portfolio of insurance policies may be low risk or high risk, but if the aggregate losses of the portfolio are stable then it is likely insurable. However, in the context of the current U.S. crop insurance program, A&O reimbursement is a function of premiums and premiums are constructed to reflect expected loss cost. Thus, the amount of systemic risk removed by wrapping around an underlying area revenue–triggered commodity program has implications for the A&O reimbursement paid by the federal government to private insurance companies.

For all three insurance designs, wrapping around an underlying area revenue–triggered commodity program reduces the average loss cost. Further, the magnitude of the reduction increases as the commodity program trigger becomes more disaggregated. Wrapping APH around a national revenue–triggered commodity program reduces the loss cost by 8.89% on average. Wrapping around a state revenue–triggered commodity program reduces loss cost by an average of more than 13% and wrapping around a county revenue–triggered commodity program reduces loss cost by an average of 18.33%. However, considerable variation is observed by state. In general, southern states have smaller reductions in average loss cost while wheat-producing Plains states generally have higher reductions in average loss cost.

The results for wrapping RA around area revenue–triggered commodity programs are reported in the center columns of Table 1. The national averages show that wrapping RA around area revenue–triggered commodity programs reduces loss cost by about 4% more than for APH. This occurs because, relative to APH indemnities, RA indemnities are more highly correlated with payments from area revenue–triggered commodity programs. The national revenue–triggered commodity program tends to reduce wrapped RA loss costs relatively more in Cornbelt states, such as Iowa. For example in Iowa, Illinois, and Indiana the loss cost reduction for RA is about 50% higher than what it was for APH.

The most rightward portion of Table 1 shows the loss cost reduction from wrapping

[5] We recognize there is a version of revenue assurance (RA-HPO) with up-side price protection. However, we use the terms RA and CRC to distinguish the two designs.

Table 1. Percent Reduction in Average Loss Cost

State	APH with National Wrap	APH with State Wrap	APH with County Wrap	RA with National Wrap	RA with State Wrap	RA with County Wrap	CRC with National Wrap	CRC with State Wrap	CRC with County Wrap
AZ	3.76	3.81	4.28	5.44	6.06	6.74	5.00	5.57	6.19
AR	4.87	6.64	7.28	6.31	8.11	8.62	5.72	7.35	7.82
CA	13.51	23.13	26.38	16.01	22.51	26.15	13.56	20.73	23.72
CO	14.20	12.41	19.61	17.10	15.23	22.85	15.04	13.55	20.31
GA	5.21	13.11	16.87	7.25	16.78	19.58	6.28	14.58	17.54
IL	7.53	8.44	13.36	14.49	15.05	19.42	11.68	12.34	16.35
IN	7.36	9.25	11.66	12.84	14.96	17.56	10.87	12.67	14.98
IA	9.33	16.94	24.93	19.60	25.64	32.66	15.24	20.96	27.11
KS	15.45	15.49	29.21	19.12	18.15	31.34	16.94	16.10	28.46
KY	7.21	9.88	11.91	10.41	13.12	14.89	9.02	11.42	13.05
LA	4.06	6.82	10.21	5.88	9.62	12.57	5.25	8.57	11.36
MI	8.80	10.61	14.40	12.53	14.57	18.50	10.91	12.67	16.14
MN	9.43	16.99	22.29	15.51	22.02	27.13	12.70	18.77	23.49
MS	8.59	14.01	14.78	14.36	21.31	22.23	11.98	17.80	18.59
MO	6.68	9.06	14.83	9.62	12.64	18.19	8.04	10.57	15.66
MT	15.08	24.11	34.14	17.20	23.96	33.48	15.89	22.62	31.85
NE	10.84	10.60	15.29	18.25	17.70	22.96	14.83	14.36	18.91
NC	5.53	8.58	11.81	8.22	11.51	14.44	7.16	10.05	12.86
ND	9.56	12.81	16.28	15.62	18.42	21.99	13.08	15.69	18.86
OH	12.59	12.62	20.66	14.67	14.07	21.63	13.76	13.17	20.65
OK	24.94	35.45	47.83	58.42	59.74	74.30	45.48	46.51	60.22
PA	5.34	12.94	20.11	8.32	13.80	20.93	6.95	12.25	18.50
SC	5.44	13.89	15.68	7.61	15.12	16.91	6.71	14.16	15.82
SD	8.73	10.85	19.47	12.24	14.41	22.50	10.60	12.72	20.03
TN	5.95	8.17	9.74	9.27	11.77	13.26	7.61	9.67	10.92
TX	6.37	10.24	22.70	7.58	11.21	23.55	6.85	10.24	21.57
VA	5.34	12.24	17.76	7.41	14.29	19.90	6.48	12.67	18.26
WI	7.18	17.18	19.66	12.61	22.05	24.66	10.71	19.46	21.77
Average	8.89	13.08	18.33	13.71	17.28	22.46	11.58	14.90	19.68

CRC around area revenue–triggered commodity programs. The weighted-average national results show that the loss cost reduction from wrapping CRC around an area revenue–triggered commodity program is roughly halfway between the loss cost reduction for APH and RA. This result is fairly robust across states. In general, we find that with all three insurance products the results are influenced by the geographical diversity of the state. For example, moving from a national revenue–triggered commodity program to a state revenue–triggered program captures much of the loss cost reduction in Arkansas and Mississippi. There is little further reduction associated with moving to a county revenue–triggered commodity program. This is likely because both states have concentrated row crop production regions. Conversely, in Texas crop production is geographically diverse and thus there is significant additional reduction in loss cost associated with moving from state revenue–triggered commodity programs to county programs.

Table 2 shows how wrapping reduces the standard deviation of loss cost. These results directly speak to the insurability of state portfolios. If the standard deviation of the portfolio in a state is relatively small, then the insurance book-of-business is relatively more insurable. Interestingly, the effect of wrapping

Table 2. Percent Reduction in Standard Deviation of Loss Cost

State	APH with National Wrap	APH with State Wrap	APH with County Wrap	RA with National Wrap	RA with State Wrap	RA with County Wrap	CRC with National Wrap	CRC with State Wrap	CRC with County Wrap
AZ	−3.75	−3.98	−3.78	11.07	12.59	12.39	4.91	5.60	5.06
AR	5.48	12.67	13.52	13.06	21.74	22.24	6.83	12.82	13.37
CA	6.47	19.86	20.05	12.20	21.37	21.87	8.67	19.75	20.55
CO	11.57	17.31	24.76	19.84	23.58	32.72	11.25	17.30	23.41
GA	1.55	15.59	17.30	5.98	31.29	32.28	2.20	16.15	17.82
IL	−5.09	1.81	15.79	30.51	36.57	48.05	3.05	8.17	18.84
IN	−3.51	−1.11	3.39	26.26	34.26	38.88	5.22	6.83	9.81
IA	−0.80	23.65	37.16	16.31	40.34	53.83	4.16	24.12	35.74
KS	17.47	25.11	43.26	28.96	38.79	55.32	17.18	24.17	39.54
KY	−2.33	10.19	9.58	6.26	18.15	18.40	−0.82	8.32	7.52
LA	−1.50	3.13	7.15	−0.88	4.72	9.22	−2.46	1.29	5.34
MI	5.41	13.85	21.19	23.25	32.45	39.72	11.92	18.11	24.45
MN	−0.47	29.23	35.58	11.01	45.04	49.99	1.85	28.46	34.02
MS	0.01	6.67	6.90	19.45	27.98	28.12	10.38	14.12	14.11
MO	1.52	4.76	12.22	13.43	20.00	27.18	3.35	6.34	12.02
MT	8.62	42.84	52.14	10.75	42.23	50.20	7.98	38.29	47.01
NE	1.35	2.29	8.02	36.28	37.84	43.69	12.59	13.80	17.45
NC	−3.11	5.25	14.47	3.30	16.96	22.27	−1.84	4.90	12.44
ND	3.20	14.38	20.21	23.62	41.11	44.94	9.78	21.31	25.29
OH	4.33	16.22	21.34	4.12	16.38	20.59	2.28	14.77	19.60
OK	19.65	29.35	39.23	43.69	55.15	65.84	26.83	33.28	41.26
PA	−2.29	20.98	28.29	1.64	26.11	31.77	−2.67	15.50	21.60
SC	−0.38	18.18	21.81	0.76	18.53	21.95	−1.08	15.31	18.56
SD	3.74	19.11	28.84	10.50	28.46	36.76	3.59	17.96	26.28
TN	1.41	4.37	7.71	3.41	8.49	11.99	−0.33	2.17	5.04
TX	−3.35	5.24	16.58	−0.84	6.55	17.12	−3.68	3.00	12.61
VA	−0.25	14.95	21.88	5.60	27.37	32.83	−0.29	11.66	16.81
WI	0.89	23.48	26.52	7.55	30.80	33.97	2.79	23.22	25.20
Average	2.35	14.12	20.40	13.82	27.32	33.00	5.13	15.24	20.38

on the standard deviation of loss cost follows a very similar pattern to the effect of wrapping on the mean of loss cost. The more disaggregated the underlying area revenue–triggered commodity program, the greater the reduction in the variability of loss cost. Further, RA generally experiences greater reductions in the standard deviation of loss cost that APH or CRC. Wrapping APH around a national revenue–triggered commodity program is shown on average to reduce portfolio risk by 2.35%. For some states the percent reduction is negative, indicating that wrapping actually increases the portfolio risk—though this result is primarily seen in states that represent marginal production areas. Wrapping CRC around a national revenue–triggered commodity program reduces portfolio risk by 5.13% on average, whereas the RA wrap reduces portfolio risk by nearly 14%.

Wrapping around state revenue–triggered commodity programs generates significantly more reduction in portfolio risk. The reduction for APH averages 14%. For RA the reduction averages over 27%, with several Midwestern states achieving at least a one-third reduction in the portfolio standard deviation. Finally, wrapping around a county revenue–triggered commodity program generates the greatest risk reduction. The portfolio standard deviation falls by an average of 20.4% for APH and CRC and 33% for RA.

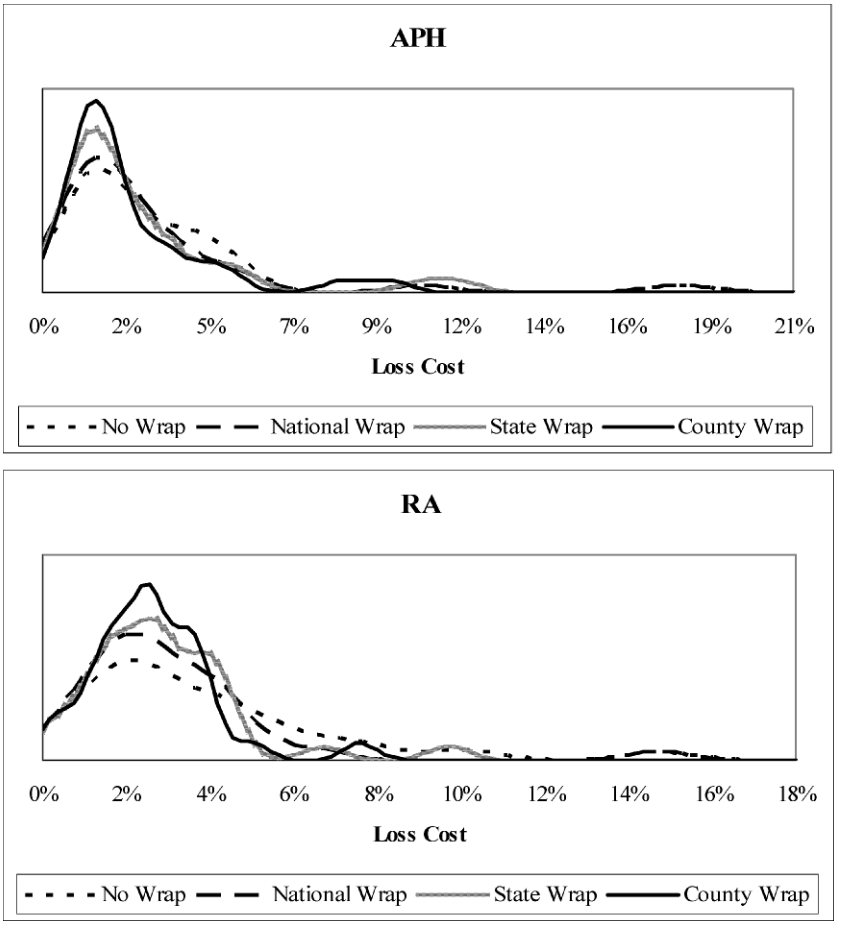

Figure 1. Distribution of Simulated Iowa APH and RA Loss Cost with Alternative Wraps

But again the results vary dramatically across states. The greatest reductions occur in wheat-producing states and in the heart of the Cornbelt.

Figures 1–4 provide further details on the effects of wrapping for Iowa, Texas, North Dakota, and Mississippi. The findings are presented as probability distributions of loss cost. The distributions are generated by applying kernel smoothing to the simulated loss cost outcomes. Recall that the potential for extreme loss events has provided the primary justification for federal involvement in providing reinsurance for federal crop insurance policies. Figures 1–4 allow one to see how wrapping affects the right tail of the loss cost distribution. The CRC results are not included in the figures because they tend to fall between the RA and APH results.

Figure 1 presents loss cost distributions for Iowa. In both the APH and RA scenarios substantial right skewness is observed. This is particularly true of the no-wrap APH scenario. A similar right tail is observed for RA, though it is not so extreme. The state and county wraps substantially reduce, but do not eliminate, the extreme right tails.

The results for Texas are presented in Figure 2. Texas has much higher loss costs than Iowa. The probability distributions of loss cost are also right-skewed, but not as much as in Iowa. For both APH and RA wrapping around a national revenue–triggered commodity program does not significantly reduce the right-skewness of the loss cost distribution. The state and especially the county wrap do much more to reduce the right tail of the loss cost distribution.

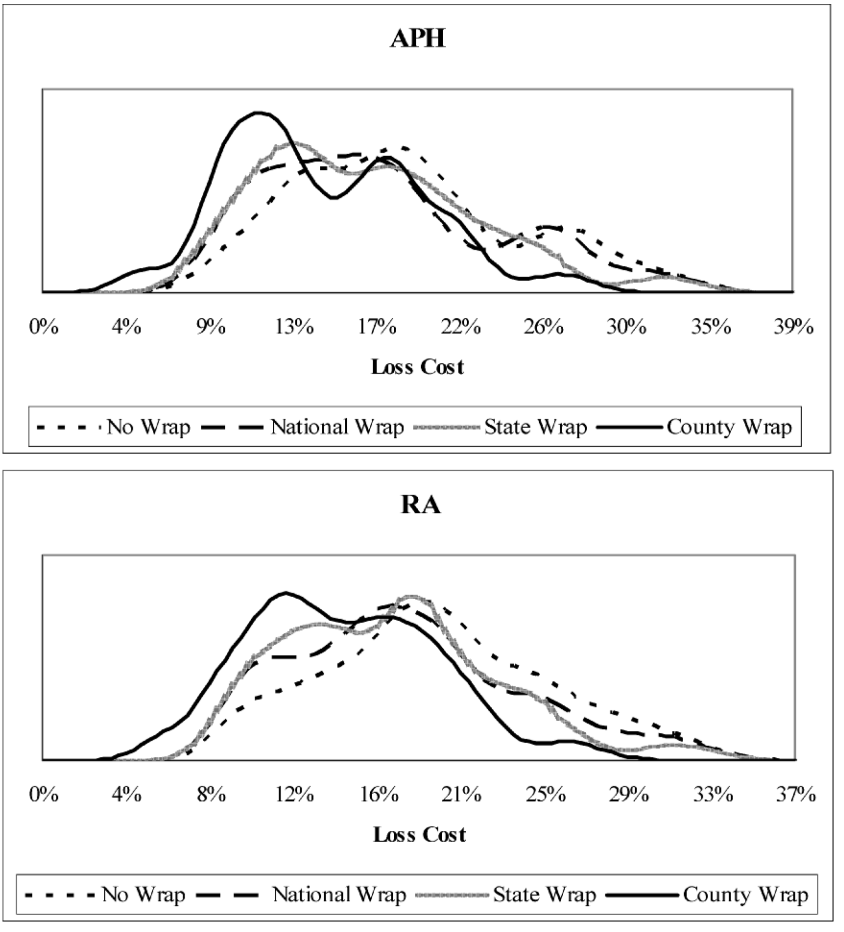

Figure 2. Distribution of Simulated Texas APH and RA Loss Cost with Alternative Wraps

Figures 3 and 4 show the results for Mississippi and North Dakota, respectively. In Mississippi, APH loss cost distributions show little response to wrapping, while RA loss cost distributions show much more response. In contrast, the variability of North Dakota APH and RA loss cost distributions is greatly reduced by state and county wraps.

Conclusions

The concept of wrapping crop insurance around an aggregate commodity program was at the forefront of the farm bill debate in 2007. While it appears at this time that revenue programs are a likely farm bill outcome, wrapping is not. However, budget pressure and a desire to reign in crop insurance A&O costs may cause this issue to be revisited. We would note that this simulation has not focused on the practical implications of modifying the current loss cost–based insurance rating system to accommodate proposed wrapping legislation, which in our opinion can only be evaluated by simulations such as this one.[6] However, the mean effects of wrapping are shown to vary dramatically by region. In general, the reduction in government cost would tend to be greatest in wheat-growing Plains states and least in cotton-producing states.

While wrapping was suggested largely as a cost-savings measure, our results show that

[6] The loss-cost based rating system for APH is based on historical loss cost experience. The revenue insurance programs make distributional assumptions regarding the price risk and price–yield correlation. The relationship of these components and aggregate revenue is not entirely clear.

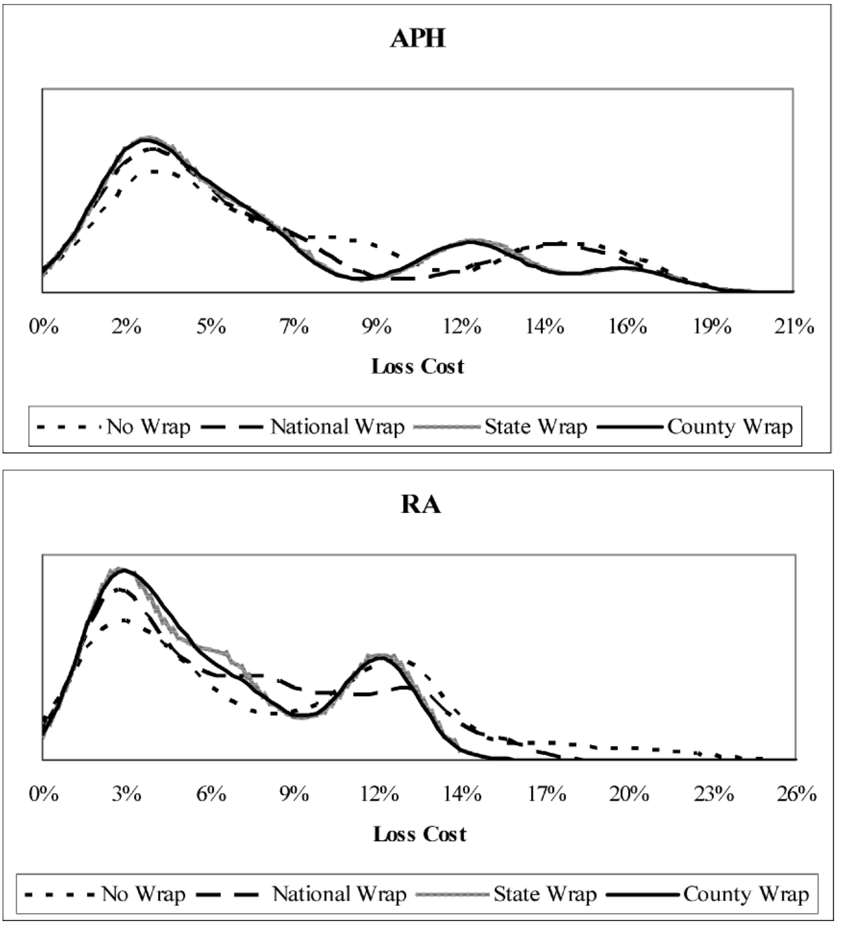

Figure 3. Distribution of Simulated Mississippi APH and RA Loss Cost with Alternative Wraps

there is an effect on the higher moments of the loss-cost distributions as well. As expected, wrapping does remove systemic risk from crop insurance portfolios. In some instances, the standard deviations of the state portfolios considered here were reduced by as much as half. However, the results varied dramatically by state and insurance product. The portfolio risk reduction achieved by wrapping insurance around an area revenue–triggered commodity program was greater for RA than for CRC and greater for CRC than for APH. Further, we find that, in some cases, wrapping substantially reduces the right tail of the loss cost distribution. This is especially true when a state or county revenue–triggered commodity program is used. However, we also find states where wrapping has little effect on the distribution of loss cost.

An implication of these findings is that wrapping crop insurance around an area revenue–triggered commodity program does tend to undermine the primary argument for federal involvement in providing reinsurance. This is particularly true for RA insurance when the underlying commodity program triggers at the state or county level. Thus, if wrapping were instituted, it would, in many respects, duplicate the effects of the current standard reinsurance agreement between the federal government and private crop insurance companies. However, even with wrapping, some state portfolios still exhibit problematic right tails.

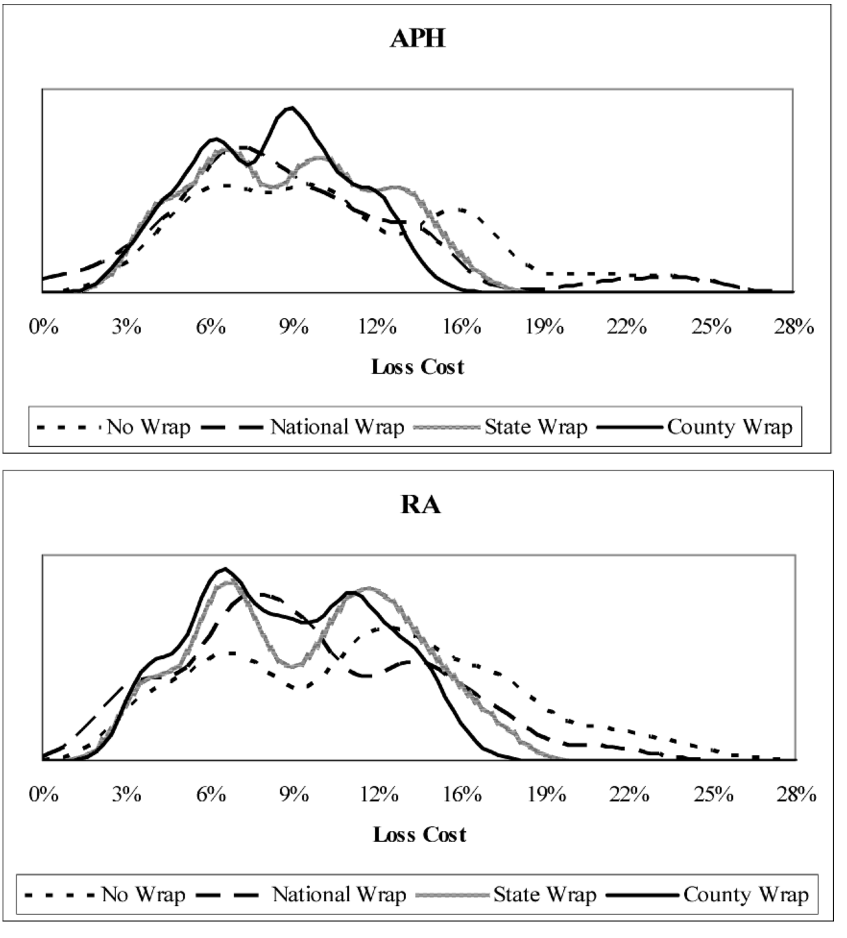

Figure 4. Distribution of Simulated North Dakota APH and RA Loss Cost with Alternative Wraps

If wrapping was instituted, the standard reinsurance agreement would need to be modified to account for the effects of wrapping on insurers' portfolios. In particular, the standard reinsurance agreement should focus on stop-loss protection against events in the extreme right tail of the loss cost distribution while allowing private reinsurance markets to cover the remaining portfolio risk.

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