

Analyzing Producer Preferences for Counter-Cyclical Government Payments*

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Abstract:

A dynamic-stochastic model is developed to evaluate preferences among alternative counter-cyclical payment programs for representative farms producing corn and soybeans in Iowa and cotton and soybeans in Mississippi. These programs are found to not necessarily be preferred to existing government programs.

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Analyzing Producer Preferences for Counter-Cyclical Government Payments

The Federal Agriculture Improvement and Reform (FAIR) Act of 1996 became law at a time when farm commodity prices were at their highest level in twenty years. The decades old system of price supports and deficiency payments was replaced with fixed production flexibility contract (PFC) payments scheduled through 2002. These decoupled PFC payments were designed to decline over the six-year life of the FAIR Act as a prelude to lower government payment levels. Within two years, however, the high prices—which most observers believe were a key to the passage of the FAIR Act—fell sharply, eventually plunging to levels not anticipated by many advocates of the current farm law. Congress responded to the decline in prices by approving four *ad hoc* emergency assistance packages between October 1998 and October 2000, each providing billions of dollars in supplemental assistance.

Although the FAIR Act retains a substantial counter-cyclical component in the form of the marketing loan program, which provides producers with loan deficiency payments (LDPs) when national market prices fall below loan rates, the FAIR Act's detractors contend that a counter-cyclical alternative to PFC payments would be more desirable. These critics view the inability of the fixed PFC payments to respond to changes in the farm economy as one of the foremost weaknesses of the FAIR Act.

Most proposed counter-cyclical alternatives base outlays on a measure of shortfalls in farm revenue. Rep. Charles Stenholm (D-Texas), the ranking member of the House Agriculture Committee, introduced one of the first such programs in Congress in August of 1999. Known as Supplemental Income Payments for Producers (SIPP), this program would have provided producers with payments when the per-acre national gross revenue of an eligible crop is less than 95 percent of its previous five-year average (U.S. Congress, House 1999, H7884). SIPP defines

national gross revenue as the product of the total United States production for a commodity and the higher of its season average price or loan rate. The total per-acre payment to producers for a particular commodity would be equal to the positive difference between 95 percent of the previous five-year moving average of national gross revenue per acre and the current crop year's national gross revenue per acre.

SIPP intended to provide producers with program payments during periods of low market revenue. Although SIPP failed to win approval in Congress, similar counter-cyclical payment programs are being discussed as potential components of the next farm bill scheduled for 2002. Advocates of SIPP and other subsequent counter-cyclical proposals implicitly assume producers prefer payments based on income variability to the fixed PFC payments of the FAIR Act.

This paper provides an empirical evaluation of whether producers have a preference for payments from a SIPP-type program relative to PFC payments. Our approach involves a nonparametric bootstrapping model that simulates market-based farm revenue for representative farms in Iowa and Mississippi over a five-year program period, 2000-2004. PFC payments, LDPs, and possible SIPP-type payments are added to market revenue to determine income, ending wealth, and producer welfare. Most studies that have modeled government payments have ignored price-yield correlations and implicitly assumed risk neutrality on the part of producers. Yet, Glauber and Miranda (1996) find that the varying results across numerous studies about the effects of price stabilization programs on individual farm-level revenue variability are due to the omission of production variability and/or correlation between yield and price. Because systemic factors often cause crop losses to be widespread, many individual yields tend to be positively correlated with aggregate yields and thereby negatively correlated with

price. This correlation creates a “natural hedge” that can provide a producer with protection from changes in yield, as low (high) aggregate yields will be offset by high (low) prices. Price-yield correlations are incorporated into the analysis reported herein, and provide a basis for examining regional differences in policy preferences. Furthermore, producers in this study are assumed to be slightly risk averse. The assumption of risk aversion is consistent with producers’ behavior reflected in the widespread purchase and use of instruments such as unsubsidized crop-hail insurance, forward contracting, and futures and options.

The remainder of this paper consists of three sections. In the next section we outline our dynamic-stochastic simulation model. We then present the results of this model for a representative Iowa farm producing corn or soybeans and a representative Mississippi farm producing cotton or soybeans. The results indicate that whether a producer benefits more from the PFC payment program or a SIPP-type payment program depends on location, what crop or crops are produced, the level at which fixed payments or counter-cyclical payment triggers are set, and whether the current marketing loan program remains in place. We state our conclusions in a final section of the paper, emphasizing the influence of price-yield correlations on our results.

Model

The model developed to assess policy preferences builds on the models of Atwood, Baquet, and Watts (1997) and Coble et al. (1999) that simulate revenue for the purposes of rating an insurance contract. Atwood, Baquet, and Watts design a rating procedure for the Income Protection (IP) product (a single-crop revenue insurance product), while the rating procedure proposed by Coble et al. is for a revenue insurance product for multiple crops. In both cases, rates are assessed using non-parametric bootstrapping procedures. Although the non-parametric

approach is less efficient if the underlying data distribution is known, it avoids making distributional assumptions that could lead to biased and inconsistent estimates when distributions are unknown. Coble et al. conclude the non-parametric approach is “a more robust estimator capable of addressing a variety of empirical data.” In particular, a non-parametric distribution is useful in combining multiple random variables, as for a farm facing multiple sources of risk.

Simulated Market Revenue

We assume farm-level market revenue variability is determined by two location-specific random components: county yield and farm deviations from the county yield. Farm-level market revenue variability is also dependent on the random component of national market prices, which in turn is dependent on variability in national yields and other stochastic factors. Under LDPs and counter-cyclical payment programs, national yields may also affect government payment levels.

To estimate the random components of national and county yields, data from 1974 through 1999 from the National Agricultural Statistics Service (NASS) of the United States Department of Agriculture (USDA) were used to fit a linear trend regression

$$(1) \quad Y_{it} = \alpha_{i0} + \alpha_{i1}t + \varepsilon_{it}^Y$$

where t is year, i is crop, and Y_{it} is national ($Y_{it} \equiv N_{it}$) or county yield ($Y_{it} \equiv C_{it}^j$) for a specific location j . For each national or county regression, a matrix of residuals, ε^Y , with t rows and i columns, is captured with the residuals expressed as a percentage of the predicted value. The residuals are used to bootstrap around the predicted yield, \hat{Y}_{it} . In each iteration of the model, the simulated yields, \tilde{Y}_{it} , are calculated as

$$(2) \quad \tilde{Y}_{it} = \hat{Y}_{it} (1 + \varepsilon_{it}^Y) \quad \forall i, t, Y = N, C^j.$$

Residuals are expressed in percentage terms to correct for any potential heteroskedasticity that may be present in the raw yield data. To account for common events affecting yields, the residuals for each crop are drawn for the same year by randomly selecting the k th row from the matrix of residuals.

Farm yield deviations from county yield are the second location-specific random component of farm-level market revenue. The estimation of farm yield deviations is different from that of county and national yields. Farm yield data for the relevant crops and counties were obtained from the Risk Management Agency (RMA) of the USDA in the form of actual production history (APH) yields from 1989 to 1997. APH records have no more than ten years of farm yield data, and a lower limit of six years of yield data was imposed for this study. Farm yield is assumed conditioned on county yield for all years where both farm and county yield data are available. Farm yield for any given location is found by

$$(3) \quad f_{it} = C_{it}^j + \varepsilon_{it}^f$$

where f_{it} is the farm yield of crop i in year t . The matrix of residuals ε^f remains in absolute terms since there is no *a priori* reason to expect heteroskedasticity. Inherent correlations between farm yield deviations across crops are maintained in the model because the environmental factors that affect the yield of one crop on a particular farm may also affect the yield of the other crops on the same farm. Simulated farm yields, conditioned on the simulated county yield, are

$$(4) \quad \tilde{f}_{it} = \tilde{C}_{it}^j + \varepsilon_{it}^f \quad \forall i, t.$$

Crop prices, the third random component of farm-level market revenue, are determined on a national basis. Futures prices (the average closing price on the harvest contract during the

month prior to expiration) are used to approximate the market price that a producer would receive at harvest.

Price determination in the simulation proceeds as follows. First, the prior year's harvest price becomes the predicted value for the current year's futures price at planting:

$$(5) \quad P_{it}^0 = P_{i,t-1}^1 + \varepsilon_{it}^{P^0}$$

where P_{it}^0 is the futures price at planting for crop i in year t , and $P_{i,t-1}^1$ is the futures price of crop i at harvest in $t-1$. The matrix of residuals ε^{P^0} consists of t rows and i columns with the residuals expressed in percentage terms. By bootstrapping from ε^{P^0} the futures price at planting is simulated as a random walk around $P_{i,t-1}^1$

$$(6) \quad \tilde{P}_{it}^0 = P_{i,t-1}^1 (1 + \varepsilon_{it}^{P^0}) \forall i, t.$$

These residuals are also drawn together so that each crop has residuals drawn from the same time period. Futures prices at planting are estimated as the average closing price of the harvest contract during the month of April. The harvest contracts for corn and cotton are based on the month of December while the harvest contract for soybeans is based on November.

The price at harvest is assumed to be a function of the futures price at planting conditioned on the ratio of simulated national yield to predicted national yield (Coble et al., Atwood, Baquet, and Watts). This price relationship is expressed by the equation

$$(7) \quad \frac{P_{it}^1}{P_{it}^0} = \gamma_{i0} + \gamma_{i1} \left(\frac{\tilde{N}_{it}}{\hat{N}_{it}} \right) + \varepsilon_{it}^P$$

where the residuals are captured in the t by i matrix ε_{it}^P . The predicted harvest price, conditioned on the ratio of simulated national yield to predicted national yield, is

$$(8) \quad \hat{P}_{it}^1 = P_{it}^0 \left(\gamma_{i0} + \gamma_{i1} \left(\frac{\tilde{N}_{it}}{\hat{N}_{it}} \right) \right).$$

Bootstrapping from ε_{it}^P around the predicted value of the harvest price generates the simulated harvest price

$$(9) \quad \tilde{P}_{it}^1 = P_{it}^0 \left(\gamma_{i0} + \gamma_{i1} \left(\frac{\tilde{N}_{it}}{\hat{N}_{it}} \right) + \varepsilon_{it}^P \right) \forall i, t.$$

Again, the residuals for each crop are drawn together.

The total simulated net market revenue for a representative farm is found by summing the simulated net market revenue for each crop using (4) and (9):

$$(10) \quad \tilde{Mk}t_i^f = \sum_i A_i \tilde{P}_{it}^1 \tilde{f}_{it} - A_i v_i^f$$

where A_i is acres of crop i and v_i^f is per-acre non-stochastic production costs of crop i . The per-acre production costs of each crop are based on enterprise budgets obtained from the extension service in each state.

Revenue Scenarios

Four basic revenue scenarios are modeled for each farm over the simulation period 2000-2004: 1) simple market revenue only with no government program payments of any kind; 2) a FAIR Act program consisting of the sum of market revenue, LDPs, and annual PFC payments for program crops; 3) a national SIPP program consisting of the sum of market revenue, LDPs, and a supplemental income payment determined by national gross revenue relative to a specified historical base; and 4) a county-level SIPP program that includes the same components as the national SIPP program except national gross revenue is replaced by county gross revenue.

Although the current farm bill is not scheduled to expire until 2002, beginning the analysis in 2000 allows initialization of the simulation models using actual prices and regional yields rather

than estimates of these variables. Because LDPs provide some counter-cyclical protection under the FAIR Act, and complement the counter-cyclical payments of SIPP-type programs, we also consider scenarios in which the marketing loan program is eliminated while PFC and SIPP payments are retained. We evaluate the impact of the alternative payment programs under two fixed payment rates and two trigger levels for counter-cyclical payments.

Data on PFC payment rates were obtained from the Economic Research Service (ERS) of the USDA (Nelson and Schertz 1996). The PFC payments received by a representative farm are non-stochastic throughout the 5-year period being simulated. In a particular year they are determined by the equation

$$(11) \quad PFC_{it} = \sum_i .85(C_{i,1995}^j A_i G_i)$$

where PFC_{it} is the PFC payment for crop i , $C_{i,1995}^j$ is the average county program yield for crop i in 1995, and G_i is the per-unit PFC payment rate for crop i . The average county program yield is used to estimate the farm program yield since a representative farm is being modeled. Following the provisions of the 1996 FAIR Act, annual PFC payments are limited to \$40,000 per farm entity.

Simulated payments are calculated for both the highest and lowest PFC payment rates authorized under the FAIR Act. That is, we use the highest (lowest) PFC rate available for a crop over the six-year life of the FAIR Act for each of the five program years being simulated. These legislated values provide one set of bounds on the range of PFC payments that might be provided in future farm bills, although with the emergency assistance Congress has provided since 1998, a higher range of PFC payments would also be reasonable to consider.

The equation for calculating national- or county-level SIPP payments in a given year is

$$(12) \quad SIPP_{it} = \sum_i \max \left[0, \left(\frac{RT * \left(\frac{1}{5} \sum_{t=-4}^0 \max[LR_i, P^1_{it}] Y_{it} \right) - \max[LR_i, \tilde{P}^1_{it}] \tilde{Y}_{it}}{\tilde{Y}_{it}} \right) \tilde{f}_{it} A_i \right]$$

where $SIPP_{it}$ is the national SIPP payment for crop i in year t , RT is gross revenue trigger, and all other variables are as previously defined.¹ Two values for RT are considered, 95 percent as originally proposed by Rep. Stenholm, and a lower level of 90 percent.

Equation (12) determines national or county gross revenue per acre by taking the higher of harvest price and the loan rate and multiplying it by the corresponding per-acre yield. It then computes the difference between 90 or 95 percent of the five-year average of national (county) gross revenue and the national (county) gross revenue in year t , and converts this amount to a per-unit basis by dividing through by the national (county) per-acre yield in year t . If the amount in brackets is positive, it is multiplied by the representative farm's total production of crop i to determine the producer's total SIPP payment for the crop. No annual payment limits for SIPP were specified in the legislation that was introduced. However, to facilitate comparison, annual simulated SIPP payments, like PFC payments, are limited to \$40,000 annually.

Finally, LDPs for each crop i are calculated as

$$(13) \quad LDP_{it} = \max[0, (LR_i - \tilde{P}^1_{it}) \tilde{f}_{it} A_i]$$

¹ As noted earlier, the proposed SIPP legislation would calculate national gross revenue for a commodity based on the higher of the season average price or the loan rate. But USDA statistics on season average price reflect prices during the marketing season—not the growing season. Thus, season average prices cannot be calculated until approximately nine months after harvest. It seems unlikely that this would be politically feasible so we substitute harvest-time market price for season average price when calculating SIPP payments.

where LR_i is the loan rate for crop i . Thus, an LDP is equal to the product of simulated farm yield per acre and the total number of acres multiplied by the positive difference between the loan rate and the simulated market price at harvest. LDPs may equal zero in some crop years. LDPs are limited to \$75,000 annually for each farm entity.²

Certainty Equivalents of Ending Wealth

The welfare of producers under the four scenarios is measured by certainty equivalents based on the constant absolute risk aversion (CARA) utility function

$$(14) \quad U = 1 - \exp(-cW), c > 0$$

where c is the coefficient of absolute risk aversion³. Each representative farm in this study is assumed to have an initial wealth of \$1,000,000. Furthermore, we assume producers are slightly risk averse, reflected in the value $c = 0.000001$. The certainty equivalent for (14) is

$$(15) \quad CE_c = \frac{\ln(1-U)}{-c}$$

where CE_c is the certainty equivalent associated with c .

Once the market revenue and government payments have been simulated for the first year, this amount is added to the initial wealth to calculate the first year's ending wealth. The ending wealth in the first year becomes the initial wealth for the next year, and the process is applied to each of the five years in the simulation.

Because we use a dynamic model, the calculation of expected utilities incorporates time preference. Following the recommendation of Hardaker, Huirne, and Anderson (1997), the

² For simplicity the representative farm is assumed to constitute one farm entity under USDA regulations.

³ One reason for using a CARA utility function is that certainty equivalents can be calculated even when extensive resampling results in negative ending wealths in some cases. CARA becomes useful because meaningful certainty equivalents can still be calculated from these utilities of ending wealth.

expected present value of the utilities from individual period income flows is discounted using a constant time preference factor. Producers are assumed to establish program preferences based on the certainty equivalent of the present value of expected utility of ending wealth over the five-year program period. The expected present value of the utilities is

$$(16) \quad E(PV(U)) = \frac{E(U)}{1.05^t}$$

with an annual discount rate of five percent. Once the expected utilities of wealth in each year have been discounted, certainty equivalents can be calculated for each revenue scenario for each representative farm. By taking the mean of the expected present value of utilities over the five program years, a certainty equivalent can be calculated as

$$(17) \quad CE_{sc} = \frac{\ln(1 - \overline{E(PV(U))})}{-c}$$

where $\overline{E(PV(U))}$ is the mean of the discounted expected utilities of wealth over the five program years.

The certainty equivalent calculated above represents the amount of money a producer would accept to avoid the risk present in a particular revenue scenario. The revenue scenarios that include government payments would be expected to have higher certainty equivalents than simple market revenue with no government payments because the government payments increase income and/or mitigate some of a producer's risk.

Results

Two farms are simulated in the analysis—a representative Iowa farm and a representative Mississippi farm. Both farms are assumed to produce a total of 1,000 acres from one of two crops. The Iowa farm, in Cass County in the southwestern part of the state, produces corn or soybeans. The Mississippi farm, located in Sunflower County in the Delta region of the state,

produces cotton or soybeans. The county program yield for use in the calculation of PFC payments made for the cotton and corn crops grown on each respective farm was obtained for Sunflower County, Mississippi, from the Farm Service Agency (FSA) field office and for Cass County, Iowa, from the county extension office.

Table 1 presents correlations between the yield of each crop of each representative farm and the respective county yields, national yields, and harvest price. Farm-level yields are more highly correlated with county yields than national yields for each crop in both locations. Iowa corn yields are negatively correlated with harvest prices, while Mississippi cotton yields are essentially independent of harvest prices. Soybean yields in both locations have similar negative correlations with harvest prices. The farm-level yield for corn in Iowa is more highly correlated with the national and particularly the county yield than is cotton in Mississippi. This relationship indicates that producers growing corn in Cass County, Iowa, are subject to greater systemic risk than producers of cotton in Sunflower County, Mississippi. Thus, the farm-level risk for the representative farm growing cotton in Mississippi should be greater than that of the representative farm growing corn in Iowa. This conclusion follows the relationship between aggregate and disaggregate revenues suggested by Glauber and Miranda (1996).

Based on Table 1, if the payments have the same expected monetary value, a risk averse producer would be expected to prefer SIPP payments more than PFC payments because of the reduction in the variability of returns. However, the expected monetary values of the two payment programs are likely to differ.

Certainty Equivalents Under FAIR and SIPP

Table 2 presents certainty equivalents for the mean present value of the expected utility of ending wealth derived from market revenue and the marginal contributions to these certainty

equivalents from LDPs, PFC payments, and national-level SIPP payments. There are substantial additions to certainty equivalents under the government programs: producers are better off under any government program than facing the market alone. The welfare of the representative Mississippi cotton producer is generally improved more from government payments than is the welfare of the representative Iowa corn producer. The LDPs for soybeans benefit the representative Iowa farm somewhat more, which is likely due to the higher expected yield for Iowa soybeans relative to Mississippi soybeans. Relative to market revenue only, LDPs for cotton increase the certainty equivalent for the Mississippi farm by 16.7 percent. The analogous comparison for corn shows an increase in the certainty equivalent for the Iowa farm of 6.8 percent. LDPs raise certainty equivalents for soybeans by 5.7 and 6.1 percent in Mississippi and Iowa, respectively.

PFC payments for cotton made at the lowest annual payment rate under the FAIR Act increase the certainty equivalent for the Mississippi farm by 8.8 percent at the margin, when added to the increase from LDPs. PFC payments for corn at the lowest rate marginally increase the certainty equivalent for the Iowa farm by 4.2 percent. Corresponding increases to certainty equivalents from PFC payments at the highest rate are 11.3 percent for cotton and 7.1 percent for corn. National-level SIPP payments received in addition to LDPs increase the certainty equivalent for cotton by 2.1 and 3.5 percent at the 90 and 95 percent trigger levels, respectively. Increases to the certainty equivalent for corn from national level SIPP payments are 1.3 and 2.2 percent at the respective triggers. In contrast to LDPs, the marginal effect of SIPP payments on certainty equivalents for soybeans benefits the Mississippi farm slightly more than the Iowa farm in both absolute and relative terms. Except for the highest PFC payments for corn, the marginal effects of PFC and SIPP payments in all cases are smaller than the effects of LDPs.

Producers on both farms prefer PFC payments to SIPP payments if only program crops are grown with LDPs in place⁴. If only soybeans are produced, SIPP is preferred because soybeans are not a program crop receiving PFC payments. Comparing the lowest PFC payment rate to national-level SIPP payments at the 90 percent trigger level, the Mississippi farm producing cotton has a slightly stronger preference for the PFC payment than does the Iowa farm producing corn, but this difference does not exist at the highest PFC payment rate and national-level SIPP payments at the 95 percent trigger level.

SIPP payments are triggered by shortfalls in the current year's national gross revenue compared to its moving average for the previous five years. SIPP payments are sensitive to this choice of baseline as well as to the trigger level, as demonstrated in Table 3. When the five-year moving average of revenue from 1995-99 is replaced by expected revenue for 2000, it reduces the marginal effect of SIPP payments. For soybeans, national-level SIPP payments at the 90 percent trigger level have essentially no effect on certainty equivalents above LDPs.

Table 3 also includes SIPP payments based on county gross revenue instead of national gross revenue. For a given trigger level, county-level SIPP payments produce substantially higher marginal effects than national-level SIPP payments for Mississippi crops in all cases. These higher marginal effects are due to the differences in correlations between farm yields and county yields and farm yields and national yields. Farm yields are more highly correlated with county yields, so that shortfalls in county gross revenue are more likely to be associated with shortfalls in farm revenue leading to greater marginal effects for county-level SIPP payments. While the marginal effects of county-level SIPP payments for Iowa crops increase when the

⁴ This study does not model the *ad hoc* emergency assistance payments made by Congress in the latter years of the FAIR Act, which if included would increase the value of the program to producers.

baseline is initialized using expected revenue for 2000, these marginal effects are smaller than those of the county-level SIPP payments for Mississippi crops. The smaller marginal effects are due to the relative magnitude of the difference between the respective correlations of farm yield and national yield and farm yield and county yield. For the representative Iowa farm this difference is 0.15 for corn and 0.21 for soybeans, and for the representative Mississippi farm it is 0.38 for cotton and 0.32 for soybeans. Thus, the Mississippi farm benefits more than the Iowa farm from county-level SIPP payments. Indeed, because of an anomaly present in the actual historical data, the dominance of the marginal effects of county-level SIPP payments is absent for Iowa crops when the 1995-1999 baseline is utilized. Such an anomaly is more likely to occur when the difference between the correlation of farm and regional revenue and the correlation between farm and national revenue is small (as it is for Iowa soybeans).

Table 4 presents the marginal effects of national-level SIPP payments without LDPs, which can be compared to the results in Table 2. In each case, the marginal effects of SIPP payments increase considerably. Given a choice between LDPs and SIPP, the Mississippi farm would prefer to receive LDPs for cotton and soybeans to national-level SIPP payments at either trigger level. The Iowa farm would prefer national-level SIPP payments at a 95 percent trigger level to LDPs, but not at a 90 percent trigger level. This relationship indicates that, due to the correlation issues, SIPP functions better in Iowa than in Mississippi.

In the models above, prices are initialized at the very low levels present at the end of 1999. Table 5 presents the marginal effects of government payments with market prices initially set 20 percent higher. Clearly, higher market prices increase market revenues and decrease LDPs and SIPP payments. Given a choice between LDPs and SIPP, the Iowa farm prefers LDPs to national-level SIPP payments at the 90 percent trigger, but not at the 95 percent trigger. The

Mississippi farm facing the same decision would prefer LDPs to SIPP payments for cotton at both triggers and soybeans at the 90 percent trigger, but not the 95 percent trigger. The higher prices make the national-level SIPP more attractive relative to LDPs.

Higher market prices affect the extent to which LDPs substitute for SIPP payments. The ratio of the marginal effects of SIPP payments to those of LDPs is higher when the market prices are higher. Therefore, higher market prices make SIPP a better substitute for LDPs. Intuitively, this result is expected—LDPs are counter-cyclical with prices, while SIPP payments are counter-cyclical with revenue. Higher prices would reduce the likelihood of receiving LDPs relative to SIPP payments.

Conclusions

Design of government support programs remains a challenge in farm policy. This paper has presented the results of a nonparametric dynamic simulation model to evaluate preferences among alternative government payment programs for representative farms producing corn and soybeans in Iowa and cotton and soybeans in Mississippi. Loan rates were parameterized at the levels legislated in the 1996 FAIR Act and PFC payments were considered at both the highest and lowest annual rates provided by this legislation. Supporters of counter-cyclical SIPP payments based on shortfalls in annual gross revenue contend this support would be preferable to fixed PFC payments. We consider counter-cyclical payments based on both national-level and county-level revenue and with payment triggers of 95 percent of the previous five-year moving average of gross revenue (as proposed by the first SIPP program in 1999) and 90 percent. Our simulation model incorporates yield price correlations often neglected in analysis of farm program effects and assumes slight risk aversion on the part of producers. The analysis provides a basis for evaluating commodity and regional differences in preferences among policy options.

Our simulation results offer a number of useful insights about farm support policies. First, compared to initially assumed wealth, revenue without government payments leads to a sharp decline in the certainty equivalent of ending wealth for the Mississippi farm and a small decline for the Iowa farm. LDPs legislated in the FAIR Act provide a substantial counter-cyclical support option, increasing certainty equivalents from 5.7 percent (for Mississippi soybeans) to 16.7 percent (for cotton). PFC payments in addition to LDPs also contribute substantially to certainty equivalents of cotton and corn producers, but less than the LDPs themselves in all but one instance. National-level SIPP payments in conjunction with LDPs make a smaller contribution to certainty equivalents than PFC payments for cotton and corn. The marginal contribution of SIPP-type payments generally increases when based on county gross revenue rather than national gross revenue; this is especially so for cotton, where farm yields are more highly correlated with county yields than with national yields. Similarly, the marginal value of counter-cyclical SIPP payments increases when they are considered as an alternative to LDPs instead of a supplement. For corn and soybeans in Iowa, a location with relatively high correlations in national yields and prices, national-level SIPP is a close substitute for LDPs, but national-level SIPP payments provide less support on a certainty equivalent basis than traditional LDPs in Mississippi, especially for cotton. From these diverse results, one concludes that the general claim that producers would prefer counter-cyclical payments to PFC payments is subject to overstatement, at least for the support and stabilization levels built into the FAIR Act and the original SIPP proposal of Rep. Stenholm.

Our results also demonstrate that policy options can affect regions differently, and that these differences are influenced by respective price and yield correlations. First, the corn yield of the Iowa farm is more highly correlated with its corresponding national and county yield than

is the cotton yield of the Mississippi farm. Second, the corn yield of the Iowa farm is also negatively correlated with harvest price while the cotton yield of the Mississippi farm is basically independent of the harvest price. These correlations imply that the Iowa farm's revenue from corn is more highly correlated with the national and county revenue than is the Mississippi farm's revenue from cotton, and explain why the Mississippi farm has a stronger preference for PFC payments than does the Iowa farm. Since the Mississippi farm's cotton revenue is relatively less correlated with respective national and county revenue than is the Iowa farm's corn revenue, it is less likely to receive cotton SIPP payments than the Iowa farm corn SIPP payments. For soybeans, a crop produced on both farms, the differences between the correlations of each farm are smaller, which explains why there is less difference in the extent of the preference for SIPP payments for soybeans.

Correlations also explain the relative differences between national- and county-level SIPP payments on both farms. The Mississippi farm prefers SIPP based on county gross revenue to SIPP based on national gross revenue relatively more than does the Iowa farm. The greater relative difference between the farm yield-national yield correlation and the farm yield-county yield correlation on the respective farms accounts for this difference in preferences.

The dynamic-stochastic model developed herein endogenizes these price-yield correlations across different levels of aggregation as well as cross-crop yield correlations and price correlations. The results of this study demonstrate the fundamental importance of including yield and price correlations when analyzing individual preferences for different farm programs and the effect of regional differences on these preferences. Farm-level analysis of developing 2002 farm bill alternatives like SIPP requires more than static models to suitably integrate these essential factors.

Table 1: Implicit correlation between farm-level yields and other stochastic variables

Crop	Correlation with county yield	Correlation with national yield	Correlation with harvest price
Mississippi			
Cotton	0.78	0.40	-0.01
Soybeans	0.73	0.41	-0.20
Iowa			
Corn	0.86	0.71	-0.41
Soybeans	0.69	0.48	-0.24

Table 2: Certainty equivalents of mean present value of expected utility of ending wealth over a five-year program period with the SIPP 5-year revenue moving average initialized using actual historical data for 1995-99.

Crop	Market revenue minus variable costs with no government payments (\$)	<i>Marginal effect</i> of LDPs (\$)	<i>Marginal effect</i> of PFC payments with LDPs in place (\$)		<i>Marginal effect</i> of SIPP payments triggered at national level with LDPs in place (\$)	
			Lowest annual payment rate under FAIR	Highest annual payment rate under FAIR	90%	95%
Sunflower County, Mississippi						
All cotton	633,789	106,108	65,200	83,310	15,333	25,657
All soybeans	840,797	49,611	0	0	8,912	18,417
Cass County, Iowa						
All corn	901,135	61,252	40,079	68,292	12,572	20,836
All soybeans	969,542	59,280	0	0	8,258	16,335

Note: Assumes 1,000 acres, $c = 0.000001$, initial wealth = \$1,000,000, and discount rate = 5 percent. LDPs are limited to \$75,000 annually. PFC and SIPP payments are limited to \$40,000 annually.

Table 3: Marginal effects of alternative SIPP scenarios on certainty equivalents of mean present value of expected utility of ending wealth over a five-year program period assuming LDPs are in place.

Crop	LDPs + SIPP 5-year revenue moving average initialized with actual historical data for 1995-99 (\$)				LDPs + SIPP 5-year revenue moving average initialized at expected revenue for 2000 (\$)			
	Triggered at national level		Triggered at county level		Triggered at national level		Triggered at county level	
	90%	95%	90%	95%	90%	95%	90%	95%
Sunflower County, Mississippi								
Cotton	15,333	25,657	31,020	40,695	5,247	8,801	12,393	15,092
Soybeans	8,912	18,417	18,273	24,569	151	1,337	5,083	8,075
Cass County, Iowa								
Corn	12,572	20,836	16,187	20,685	3,313	5,270	10,591	13,701
Soybeans	8,258	16,335	8,459	14,136	29	507	1,825	2,943

Note: Assumes 1,000 acres, $c = 0.000001$, initial wealth = \$1,000,000, and discount rate = 5 percent. LDPs are limited to \$75,000 annually. PFC and SIPP payments are limited to \$40,000 annually.

Table 4: Certainty equivalents of mean present value of expected utility of ending wealth over a five-year program period assuming a SIPP program without a *marketing loan program*.

Crop	Market revenue minus variable costs with no government payments (\$)	<i>Marginal effect</i> of SIPP payments triggered at national level with <i>no LDPs</i> in place (\$)	
		90%	95%
Sunflower County, Mississippi			
All cotton	633,789	56,168	61,053
All soybeans	840,797	40,332	47,284
Cass County, Iowa			
All corn	901,135	55,741	71,603
All soybeans	969,542	50,119	62,728

Note: Assumes 1,000 acres, $c = 0.000001$, initial wealth = \$1,000,000, and discount rate = 5 percent. LDPs are limited to \$75,000 annually. SIPP payments are limited to \$40,000 annually.

Table 5: Certainty equivalents of mean present value of expected utility of ending wealth over a five-year program period assuming a SIPP program with and without a *marketing loan program* and with initial market prices set 20 percent higher.

Crop	Market revenue minus variable costs with no government payments (\$)	<i>Marginal effect of LDPs (\$)</i>	<i>Marginal effect of SIPP payments triggered at national level with LDPs in place (\$)</i>		<i>Marginal effect of SIPP payments triggered at national level with no LDPs in place (\$)</i>	
			90%	95%	90%	95%
Sunflower County, Mississippi						
All cotton	796,512	63,296	12,894	17,204	33,974	40,093
All soybeans	892,363	27,208	4,284	10,852	22,404	28,550
Cass County, Iowa						
All corn	987,227	32,164	6,904	14,269	26,738	37,288
All soybeans	1,035,468	33,100	4,333	10,231	26,667	35,351

Note: Assumes 1,000 acres, $c = 0.000001$, initial wealth = \$1,000,000, and discount rate = 5 percent. LDPs are limited to \$75,000 annually. SIPP payments are limited to \$40,000 annually.

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