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# FARM PROGRAMS AND AGRICULTURAL LAND VALUES: THE CASE OF SOUTHERN AGRICULTURE

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# FARM PROGRAMS AND AGRICULTURAL LAND VALUES: THE CASE OF SOUTHERN AGRICULTURE

**Abstract**

Relative estimates of the proportion of agricultural land values generated by farm program payments and farm returns in the southern region are examined, using state-level data for the period 1940 to 2004. Results indicate the contribution of farm program payments to agricultural land values in the southern region has increased during the last three farm bill periods to 65 percent, compared to 22 percent in the other regions.

**JEL classification:**

*Keywords: Agriculture land values; farm program payments; farm returns, Southern. States, 1940-2004.*

# FARM PROGRAMS AND AGRICULTURE LAND VALUE: CASE OF SOUTHERN AGRICULTURE[1]

Recently Shaik, Atwood, and Helmers (2005) presented an extension of the capitalization model, enabling the estimation of the proportion of agricultural land values generated by farm program payments and crop returns. Results from the empirical application of the model to 48 U.S. states from 1940 to 2002 indicate a positive and significant relationship between expected real crop receipts and farm program payments, while the real interest rate is negatively correlated with real agricultural land values. Their conclusions indicate the contributions of farm program payments and crop receipts were 30 and 70 percent, respectively. However, Shaik, Atwood, and Helmers also find the contribution of farm program payments has actually declined from a high range of 30 to 40 percent during the 1938 to 1980 period to about 15 to 20 percent during the subsequent farm bill periods.

This paper examines the contribution of expected farm returns and farm program payments in the southern region and also extends the analysis of Shaik, Atwood, and Helmers to include the most recent farm bill through 2004. The contributions to the southern region are compared to the other regions and the entire U.S. The southern region is comprised of three US production regions—Appalachia, the Delta, and the Southeast—and consists of twelve states[2]. Clearly, some regions in the U.S. are more dependent on government payments than others due to differences in the type of

[1] Acknowledge the comments and suggestions of Corey Miller at Mississippi State University

[2] The twelve states are Arkansas, Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

agriculture, supported commodities, and the effects of program features. Total farm program payments received by the producers and total farm receipts for the South and other regions are presented in table 1. From 1940 to 2004 the southern region received $96.40 billion, which constitutes 17 percent of the total U.S. farm program payments of $557.68 billion. The southern region generated 20 percent of the $12.41 trillion in total U.S. farm receipts for the same period.

Total farm program payments were 3.85 percent of total farm receipts for the southern region from 1940 to 2004. However, the percentage varied across farm bill periods, with a high of 7.5 percent during the 2002 to 2004 period to a low of 1 percent from 1977 to 1980. In comparison, the total farm program payments as a percentage of the total farm receipts was 4.66 percent for other regions from 1940 to 2004. This level was less than 1 percent from 1948 to 1955 and reached a high of 9.25 percent from 1985 to 1989. Given the variations in total farm program payments and total farm receipts, the contribution of expected farm returns and farm program payments to agriculture land values is examined for the southern region. For comparison, the results for the other regions and the U.S. are also presented.

In the next section, a brief discussion of the triangular-structure simultaneous equation income capitalization model is presented followed by the econometric model. Results of the application of the model to empirical state-level data for the southern region are presented along with conclusions. These twelve states form the cross-sectional units and the 1940 to 2004 period forms the time series.

## Extended Income Capitalization Model

Following Shaik, Helmers, and Atwood (2005), the extended income capitalization model that overcomes the identification issue and provides a more accurate estimation of the income capitalization model can be represented as:

$$(1)\qquad \begin{aligned} V &= f\left((c, g, r, risk),\ nf, herfR\right) \\ g &= f\left(c, risk,\ fsize, herfA, FB_j\right) \end{aligned}$$

where $V$ is agricultural land value per acre, $c$ is the expected farm receipts per acre, $g$ is the expected farm program payments per acre, $r$ is the expected real interest rate, $risk$ the expected variability associated with farm receipts per acre, $nf$ is nonfarm employment per acre, $herfR$ is the Herfindahl index of crop and livestock revenue, $herfA$ is the Herfindahl index of program crop acreage and a farm size variable ( $fsize$ ) to account for the wide range of agricultural crop intensity in the U.S. We also include farm bill dummy variables ($FB_j$, where $j$=1, …, 13 for each of the farm bills introduced since 1940).

If the system in equation (1) can be identified, the results of Shaik, Helmers, and Atwood (2005) demonstrate that: (i) the estimated partial elasticities of the agricultural land values with respect to $c$ and $g$ can be used to obtain estimates of the agricultural land value shares contributed by expected farm returns and expected farm program payments; (ii) the sums of these elasticities should be less than or equal to unity; and (iii) the elasticity (and hence value share) estimates are independent of the land rental shares

of farm receipts and farm program payments. As such we do not need to identify or assume land rental shares for farm receipts or farm program payments.

To examine the extended income capitalization model as defined in equation (1), the following pooled triangular-structure simultaneous equation model is proposed:

$$
\begin{aligned}
V_{i,t} &= \alpha_1 + \beta_{1,c}\, c_{i,t} + \alpha_g\, g_{i,t} + \beta_{1,r}\, r_{i,t} + \beta_{1,risk}\, risk_{i,t} + \beta_{1,nf}\, nf_{i,t} + \beta_{1,herfR}\, herfR_{i,t} + \varepsilon_{1,i,t} \\
g_{i,t} &= \alpha_2 + \beta_{2,c}\, c_{i,t} + \beta_{2,risk}\, risk_{i,t} + \beta_{2,fsize}\, fsize_{i,t} + \beta_{2,herfA}\, herfA_{i,t} + \sum_{j=2}^{13} \beta_{2,j}\, FB_j + \varepsilon_{2,i,t}
\end{aligned}
\tag{2}
$$

where $i$ and $t$ represent the cross-section and time series dimension; $V$, $c$, $g$, $r$, $risk$, and $nf$ are defined as before in equation (1).

Next, the contribution of expected farm returns and farm program payments to agricultural land values is estimated by farm bill period. To accomplish this, the farm returns and farm program payments slopes are varied by farm bill period by including farm bill dummy, farm returns, and farm program interaction variables, respectively. This can be represented by re-writing equation (2) as:

$$
\begin{aligned}
V_{i,t} &= \alpha_1 + \sum_{j=1}^{13} \beta_{1,j,c} \left( c_{i,t} * FB_j \right) + \sum_{j=1}^{13} \alpha_{j,g} \left( g_{i,t} * FB_j \right) + \beta_{1,r}\, r_{i,t} + \beta_{1,risk}\, risk_{i,t} \\
&\qquad + \beta_{1,nf}\, nf_{i,t} + \beta_{1,herfR}\, herfR_{i,t} + \varepsilon_{1,i,t} \\
g_{i,t} &= \alpha_2 + \beta_{2,c}\, c_{i,t} + \beta_{2,risk}\, risk_{i,t} + \beta_{2,fsize}\, fsize_{i,t} + \beta_{2,herfA}\, herfA_{i,t} + \sum_{j=2}^{13} \beta_{2,j}\, FB_j + \varepsilon_{2,i,t}
\end{aligned}
\tag{3}
$$

To demonstrate that the sum of expected farm returns and the expected farm program payments elasticities should be less than or equal to unity by farm bill periods, the null hypothesis $\beta_{1,j,c}\, \overline{c}_j + \alpha_{j,g}\, \overline{g}_j = \overline{V}_j$ for $j$=1, …, 13 for each of the major farm bills in system (3) is tested. The variables $\overline{c}$, $\overline{g}$, and $\overline{V}$ represent the mean values of expected farm

returns, expected farm program payments, and real land values during the during the thirteen farm bill periods.

For details on the sources of the data used in the analysis see Shaik, Helmers, and Atwood, 2005. To be consistent with the agricultural land value per acre dependent variable, all the variables are standardized to a per acre basis using acres in farms.

Table 1 provides summary statistics of the variables used in the analysis for the southern region, other regions, and the entire U.S. Average southern agricultural land values of $ 805 per acre were relatively lower than those of other regions and the entire U.S., which were $924 and $894, respectively. During the same time period, expected farm receipts per acre of $237 and risk or variability in expected farm returns per acre) of $35 were lower than for other regions or the entire U.S. In contrast, the farm program payment per acre of $9 was higher in the southern region compared to the $7.50 of other regions and the $7.80 for the entire U.S. Producers across the U.S. faced the same real interest rate. The average farm size of 175 acres in the southern region was small compared to 742 acres in the other regions and the U.S. average of 600 acres per farm. The value of the Herfindahl index of farm revenue for the southern region was 0.211, lower than for other regions, indicating more revenue from diversified crops and livestock in the South. In contrast, the Herfindahl index of program crop acreage with a value of 0.68 was higher for the South than other regions, indicating more specialization of program crop acreage. Finally, the nonfarm employment per acre in the southern region was lower than other regions.

## Empirical Application and Results

A triangular-structure simultaneous equation econometric model is estimated to examine the factors affecting farm land values simultaneously. The model incorporates the counter-cyclical nature of government payments and returns through the use of twelve southern states and 36 other U.S. states for the period 1940 to 2004. Parameter coefficients and partial elasticities for the southern region, other regions, and the entire U.S. are presented in tables 3 and 4, respectively.

Results from table 3 indicate the expected farm returns and farm program payments are positive and significantly related to agricultural land values for each of the thirteen farm bill periods. Expected farm returns are positive and significant, indicating higher returns are expected to increase land values. Expected farm program payments were also positively related to land values, with some exceptions. During the third farm bill period, the farm program payments variable was negative (positive) but not significant for the southern region and the entire U.S (other regions). For the second (eighth) farm bill period, the variable is positive but not significant for southern region, other regions or the U.S (southern region). Farm return risk was negative and significant, implying that higher expected risk lowers the land values. As expected, non-farm employment per acre was positive and significant, meaning the non-farm economy had positively influenced the value of agricultural land. Surprisingly the real interest rate has a positive sign, indicating a direct relationship with agricultural land values in the southern region. The other regions and the U.S. indicate an inverse relationship with the real interest rate but not a significant relationship. The negative significant coefficient for

the Herfindahl index of farm revenue indicates agricultural land values are higher under greater crop enterprise specialization.

Due to the counter-cyclical nature of expected farm program payments and expected farm returns, an inverse relationship is expected between farm returns and farm program payments. In the southern region, ten out of thirteen farm bill periods were negatively related to farm program payments, compared to only six periods in the other regions. The latter relationship indicates farm program payments were not counter-cyclical to farm returns in certain periods and regions. As expected, an increase in variability of farm receipt is estimated to increase farm program payments. In contrast to the U.S. and other regions, the southern region indicates per acre farm program payments tend to be higher in areas with larger farm sizes. Specialization in the program crop acreage seems to lower farm program payments on per acre basis.

To examine the relative effect of farm returns and farm program payments two sets of elasticities are presented. The first set is from the unrestricted model in table 4. The second set of results is from the model where the farm returns and farm program payments elasticities are restricted to sum to unity and are presented in table 5. Using the elasticities from table 4, a 10 percent decrease in expected farm returns would be expected to reduce agricultural land values from 7.0 percent (in the eighth farm bill period) to only 1.8 percent (in the thirteenth farm bill period) in the southern region. In other regions, it is expected to reduce agricultural land values from 3.0 percent (in the fifth farm bill period) to as high as 9.0 percent (in the second farm bill period). A 10 percent decrease in expected farm program payments implies a 1 percent (in the ninth

farm bill period) to 3.6 percent (in the thirteenth farm bill period) reduction in agricultural land values in southern region. In other regions, it is expected to reduce the agricultural land values from 5.4 percent (in the fifth farm bill period) to as low as 0.4 percent (in the third farm bill period). Similar results with respect to other variables in the regression can be obtained by examining the corresponding elasticities.

Also of interest is whether the farm program payment share of land values has changed during different farm bill periods. To examine if the sum of the partial elasticities of agricultural land values with respect to $c$ and $g$ are less than or equal to unity for each of the farm bill periods, the null hypothesis $\beta_{1,j,c}\,\overline{c}_j + \alpha_{j,g}\,\overline{g}_j = \overline{V}_j$ for the $j$=1,..., 13 major farm bill periods was tested. The joint null hypothesis for each individual farm bill period was not rejected. The estimated partial elasticities of farm receipts and farm program payments are presented in table 5. The relative partial elasticity values from the farm bill dummy-farm returns and farm program interaction variables provide estimates of the share of agricultural use land value generated by farm returns and farm program payments from 1938 through up to 2004.

In the southern region, the proportions of agricultural land values attributable to farm program payments and farm returns are estimated at 48 and 52 percent, respectively, during the farm bill period 1940-47. From 1948-1953 and from 1956-64, the average contribution was 10 and 90 percent for farm program payments and farm returns, respectively. During the 1970-1972 farm bill period, farm program payments and farm returns appear to contribute equally 50 percent of agricultural land values. The contribution of farm program payment decreased to 4 percent during the 1977-1980 farm

bill period. In the thirteenth and current farm bill period, 2002-2004, the contribution of farm program payments is 66 percent. while the contribution of farm returns is 34 percent.

In contrast, the proportions of agricultural land values attributable to farm program payments and farm returns are estimated at 42 and 58 percent, respectively, during the 1940-47 farm bill period. The contribution of farm program payments fell to almost five percent during the 1954-55 farm bill period, but rose to 65 percent by the 1965-69 farm bill period,. From the following farm bill period until the current farm bill period, 2002-2004, the contribution of farm program payments to agricultural land values actually fell to 22 percent. Moreover, the contribution of farm returns increased from 35 percent during the 1965-69 farm bill period to 78 percent in the current 2002-2004 farm bill period. While the exact causes of these increases (or declines) in the contribution of farm program payments in the southern (other) region may be due to a combination of farm programs and other events that occurred during the same time periods, the evidence appears to indicate that farm program distortions in land markets have increased (declined) in recent history.

## Conclusions

This paper presents relative estimates of the proportion of agricultural land values generated by farm program payments and farm returns for the southern region, other regions, and the entire U.S. As expected, the results of the empirical application to twelve southern states and 36 other states in the U.S. from 1940 to 2004 indicate a positive and significant relationship for expected real farm receipts and expected farm

program payments. Risk and real interest rates, conversely, are negatively related to real agricultural land values. The estimated proportions of agricultural land values attributable to farm program payments have actually increased in the southern region to 67 percent during the current 2002-2004 farm bill period from 14 percent (1980-1984) or 48 percent (1940-1947). The contribution of farm program payments in the other regions has actually declined to 22 percent during the current 2002-2004 farm bill period. Differential contributions of farm program payments in the south compared to others in the U.S. is due to differences in the type of agriculture, supported commodities, and the effects of program features.

## References

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**Table 1. Total Farm Program Payments ($ Billion) by Farm Bill periods, 1940-2004.**

| Farm Bill Periods | Farm Receipts | | Farm Program Payments | |
|---|---|---|---|---|
| | South | Other | South | Other |
| FB1 (1940-1947) | 217.5 | 980.8 | 9.6 | 36.0 |
| FB2 (1948-1953) | 201.8 | 862.0 | 2.4 | 6.4 |
| FB3 (1954-1955) | 63.7 | 255.5 | 0.7 | 1.9 |
| FB4 (1956-1964) | 297.4 | 1165.3 | 9.3 | 43.1 |
| FB5 (1965-1969) | 184.5 | 714.1 | 13.2 | 53.0 |
| FB6 (1970-1972) | 114.3 | 451.8 | 6.8 | 30.6 |
| FB7 (1973-1976) | 197.4 | 808.1 | 2.5 | 11.1 |
| FB8 (1977-1980) | 197.4 | 793.3 | 2.0 | 14.0 |
| FB9 (1981-1984) | 179.7 | 704.3 | 4.3 | 31.2 |
| FB10 (1985-1989) | 204.1 | 786.1 | 10.7 | 72.7 |
| FB11 (1990-1995) | 256.8 | 951.9 | 10.3 | 53.2 |
| FB12 (1996-2002) | 266.9 | 943.0 | 15.3 | 78.3 |
| FB13 (2003-2004) | 124.6 | 485.7 | 9.3 | 29.8 |

**Table 2. Summary Statistics of the Variables, 1940-2004.**

| Variables | N | Mean | Std | Min | Max |
|---|---|---|---|---|---|
| **All 48 States in US** | | | | | |
| Real land values | 3120 | 894 | 966 | 40 | 7,942 |
| Real interest rates | 3120 | 4.187 | 2.115 | 0.83 | 9.394 |
| Farm returns | 3120 | 285 | 253 | 13 | 1,405 |
| Risk | 3120 | 38 | 38 | 2 | 273 |
| Farm program payments | 3120 | 7.842 | 7.942 | 0.171 | 55.492 |
| Non farm employment | 3120 | 0.378 | 0.994 | 0.002 | 8.14 |
| Herfindahl index of Farm Revenue | 3120 | 0.267 | 0.11 | 0.107 | 0.699 |
| Farm size | 3120 | 600 | 992 | 53 | 6,645 |
| Herfindahl index of program crops | 3120 | 0.522 | 0.282 | 0.164 | 1 |
| **Southern States (Kentucky, North Carolina, Tennessee, Virginia, West Virginia, Arkansas, Louisiana, Mississippi, Alabama, Florida, Georgia and South Carolina)** | | | | | |
| Real land values | 780 | 805 | 499 | 131 | 2,554 |
| Real interest rates | 780 | 4.187 | 2.116 | 0.83 | 9.394 |
| Farm returns | 780 | 237 | 138 | 45 | 823 |
| Risk | 780 | 35 | 29 | 3 | 207 |
| Farm program payments | 780 | 8.998 | 8.475 | 1.015 | 55.492 |
| Non farm employment | 780 | 0.126 | 0.119 | 0.011 | 0.743 |
| Herfindahl index of Farm Revenue | 780 | 0.211 | 0.067 | 0.107 | 0.554 |
| Farm size | 780 | 175 | 77 | 62 | 392 |
| Herfindahl index of program crops | 780 | 0.68 | 0.297 | 0.164 | 0.987 |
| **Other States (Illinois, Indiana, Iowa, Missouri, Ohio, Michigan, Minnesota, Wisconsin, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Kansas, Nebraska, North Dakota, South Dakota, California, Oregon, Washington, Oklahoma, Texas)** | | | | | |
| Real land values | 2340 | 924 | 1,076 | 40 | 7,942 |
| Real interest rates | 2340 | 4.187 | 2.115 | 0.83 | 9.394 |
| Farm returns | 2340 | 301 | 279 | 13 | 1,405 |
| Risk | 2340 | 39 | 40 | 2 | 273 |
| Farm program payments | 2340 | 7.457 | 7.72 | 0.171 | 52.395 |
| Non farm employment | 2340 | 0.462 | 1.133 | 0.002 | 8.14 |
| Herfindahl index of Farm Revenue | 2340 | 0.286 | 0.115 | 0.127 | 0.699 |
| Farm size | 2340 | 742 | 1,109 | 53 | 6,645 |
| Herfindahl index of program crops | 2340 | 0.469 | 0.256 | 0.168 | 1 |

## Table 3. Pooled Results of Extended Income Capitalization with Farm return and Program Payments Slopes

### Real Land Value Equation

| Variables | Parameter Coefficients | | |
|---|---|---|---|
| | **US 48 states** | **Southern States** | **Others States** |
| Intercept | 357.786 | 181.527 | 257.988 |
| Real interest rates | **-4.468** | 4.238 | **-5.265** |
| Farm returns * FB 1 | 1.016 | 0.842 | 1.083 |
| Farm returns * FB 2 | 1.245 | 1.250 | 1.381 |
| Farm returns * FB 3 | 1.257 | 1.621 | 1.369 |
| Farm returns * FB 4 | 0.989 | 1.679 | 1.018 |
| Farm returns * FB 5 | 0.756 | 1.534 | 0.731 |
| Farm returns * FB 6 | 1.051 | 1.287 | 0.993 |
| Farm returns * FB 7 | 1.617 | 2.149 | 1.555 |
| Farm returns * FB 8 | 1.983 | 3.022 | 1.879 |
| Farm returns * FB 9 | 2.158 | 2.691 | 2.076 |
| Farm returns * FB 10 | 1.869 | 1.249 | 1.803 |
| Farm returns * FB 11 | 2.326 | 0.921 | 2.306 |
| Farm returns * FB 12 | 2.665 | 0.872 | 2.673 |
| Farm returns * FB 13 | 3.407 | 0.768 | 3.393 |
| Farm program payments * FB 1 | 14.556 | 11.262 | 24.710 |
| Farm program payments * FB 2 | **5.915** | **9.275** | **11.839** |
| Farm program payments * FB 3 | **-3.120** | **-12.395** | **13.132** |
| Farm program payments * FB 4 | 31.234 | **5.469** | 44.723 |
| Farm program payments * FB 5 | 34.610 | 14.636 | 42.444 |
| Farm program payments * FB 6 | 30.596 | 17.250 | 41.974 |
| Farm program payments * FB 7 | 39.208 | 15.447 | 53.321 |
| Farm program payments * FB 8 | 128.979 | **9.189** | 165.546 |
| Farm program payments * FB 9 | 109.808 | 39.031 | 128.847 |
| Farm program payments * FB 10 | 19.855 | 16.079 | 27.708 |
| Farm program payments * FB 11 | 13.758 | 14.266 | 22.538 |
| Farm program payments * FB 12 | 13.055 | 19.923 | 22.940 |
| Farm program payments * FB 13 | 10.801 | 21.282 | 18.788 |
| Risk | -2.368 | -1.395 | -2.851 |
| Non farm employment | 0.378 | 2.070 | 0.395 |
| Herfindahl index of Farm Revenue | -777.139 | -482.960 | -637.468 |

### Farm Program Payment Equation

| Variables | Parameter Coefficients | | |
|---|---|---|---|
| | **US 48 states** | **Southern States** | **Others States** |
| Intercept | 12.557 | 9.155 | 12.065 |
| Farm returns * FB 1 | -0.007 | -0.021 | **-0.001** |
| Farm returns * FB 2 | -0.011 | -0.047 | **-0.004** |
| Farm returns * FB 3 | -0.018 | -0.052 | -0.013 |
| Farm returns * FB 4 | -0.011 | -0.036 | -0.007 |
| Farm returns * FB 5 | 0.002 | -0.010 | 0.005 |
| Farm returns * FB 6 | 0.006 | 0.015 | 0.006 |
| Farm returns * FB 7 | **-0.001** | -0.009 | **0.001** |
| Farm returns * FB 8 | -0.010 | -0.031 | -0.007 |
| Farm returns * FB 9 | -0.010 | -0.031 | -0.007 |
| Farm returns * FB 10 | 0.003 | -0.011 | 0.006 |
| Farm returns * FB 11 | 0.008 | **0.002** | 0.009 |
| Farm returns * FB 12 | 0.005 | **-0.001** | 0.005 |
| Farm returns * FB 13 | 0.022 | 0.028 | 0.021 |
| Risk | 0.021 | 0.063 | **0.009** |
| Farm size | -0.002 | 0.025 | -0.002 |
| Herfindahl index of acres | -7.618 | -5.204 | -8.723 |

*Bolded parameter coefficients are the insignificant variables*

## Table 4. Elasticities of the Extended Income Capitalization Model

**Real Land Value Equation**

| Variables | US 48 states | Southern States | Others States |
|---|---|---|---|
| Intercept | | | |
| Real interest rates | -0.021 | 0.022 | -0.024 |
| Farm returns * FB 1 | 0.505 | 0.361 | 0.559 |
| Farm returns * FB 2 | 0.769 | 0.633 | 0.893 |
| Farm returns * FB 3 | 0.716 | 0.739 | 0.823 |
| Farm returns * FB 4 | 0.442 | 0.582 | 0.486 |
| Farm returns * FB 5 | 0.288 | 0.465 | 0.297 |
| Farm returns * FB 6 | 0.356 | 0.350 | 0.357 |
| Farm returns * FB 7 | 0.484 | 0.537 | 0.490 |
| Farm returns * FB 8 | 0.516 | 0.707 | 0.504 |
| Farm returns * FB 9 | 0.551 | 0.621 | 0.546 |
| Farm returns * FB 10 | 0.585 | 0.375 | 0.572 |
| Farm returns * FB 11 | 0.667 | 0.285 | 0.648 |
| Farm returns * FB 12 | 0.689 | 0.256 | 0.666 |
| Farm returns * FB 13 | 0.706 | 0.185 | 0.673 |
| Farm program payments * FB 1 | 0.274 | 0.331 | 0.397 |
| Farm program payments * FB 2 | **0.059** | **0.090** | **0.120** |
| Farm program payments * FB 3 | **-0.012** | **-0.069** | **0.044** |
| Farm program payments * FB 4 | 0.215 | **0.047** | 0.284 |
| Farm program payments * FB 5 | 0.455 | 0.208 | 0.543 |
| Farm program payments * FB 6 | 0.434 | 0.344 | 0.520 |
| Farm program payments * FB 7 | 0.332 | 0.174 | 0.405 |
| Farm program payments * FB 8 | 0.323 | **0.027** | 0.391 |
| Farm program payments * FB 9 | 0.278 | 0.099 | 0.326 |
| Farm program payments * FB 10 | 0.194 | 0.164 | 0.267 |
| Farm program payments * FB 11 | 0.151 | 0.203 | 0.228 |
| Farm program payments * FB 12 | 0.102 | 0.223 | 0.158 |
| Farm program payments * FB 13 | 0.124 | 0.368 | 0.188 |
| Risk | -0.101 | -0.061 | -0.120 |
| Non farm employment | 0.000 | 0.000 | 0.000 |
| Herfindahl index of Farm Revenue | -0.232 | -0.127 | -0.197 |

**Farm Program Payment Equation**

| Variables | US 48 states | Southern States | Others States |
|---|---|---|---|
| Intercept | | | |
| Farm returns * FB 1 | -0.173 | -0.311 | **-0.044** |
| Farm returns * FB 2 | -0.659 | -2.442 | **-0.276** |
| Farm returns * FB 3 | -2.700 | -4.270 | -2.284 |
| Farm returns * FB 4 | -0.726 | -1.468 | -0.548 |
| Farm returns * FB 5 | 0.072 | -0.212 | 0.151 |
| Farm returns * FB 6 | 0.149 | 0.201 | 0.186 |
| Farm returns * FB 7 | **-0.027** | -0.190 | **0.048** |
| Farm returns * FB 8 | -1.060 | -2.431 | -0.761 |
| Farm returns * FB 9 | -1.034 | -2.793 | -0.697 |
| Farm returns * FB 10 | 0.103 | -0.325 | 0.187 |
| Farm returns * FB 11 | 0.197 | **0.045** | 0.243 |
| Farm returns * FB 12 | 0.153 | **-0.017** | 0.195 |
| Farm returns * FB 13 | 0.402 | 0.384 | 0.416 |
| Risk | 0.101 | 0.246 | **0.045** |
| Farm size | -0.157 | 0.482 | -0.172 |
| Herfindahl index of acres | -0.507 | -0.393 | -0.548 |

*Bolded parameter coefficients are the insignificant variables*

**Table 5. Shares of Farm Returns and Farm Program Payments by Farm Bill Periods**

| Farm Bill Periods | Share of Farm Returns | | | Share of Farm Program Payments | | |
|---|---|---|---|---|---|---|
| | US 48 states | Southern States | Others States | US 48 states | Southern States | Others States |
| FB 1 (1940 - 1947) | 0.648 | 0.521 | 0.585 | 0.352 | 0.479 | 0.415 |
| FB 2 (1948 - 1953) | **0.928** | **0.875** | **0.882** | **0.072** | **0.125** | **0.118** |
| FB 3 (1954 - 1955) | **1.017** | **1.103** | **0.949** | **-0.017** | **-0.103** | **0.051** |
| FB 4 (1956 - 1964) | 0.673 | 0.925 | 0.631 | 0.327 | 0.075 | 0.369 |
| FB 5 (1965 - 1969) | 0.388 | 0.691 | 0.354 | 0.612 | 0.309 | 0.646 |
| FB 6 (1970 - 1972) | 0.450 | 0.504 | 0.407 | 0.550 | 0.496 | 0.593 |
| FB 7 (1973 - 1976) | 0.593 | 0.755 | 0.548 | 0.407 | 0.245 | 0.452 |
| FB 8 (1977 - 1980) | 0.615 | 0.963 | 0.563 | 0.385 | 0.037 | 0.437 |
| FB 9 (1981 - 1984) | 0.665 | 0.863 | 0.627 | 0.335 | 0.137 | 0.373 |
| FB 10 (1985 - 1989) | 0.751 | 0.696 | 0.682 | 0.249 | 0.304 | 0.318 |
| FB 11 (1990 - 1995) | 0.816 | 0.583 | 0.740 | 0.184 | 0.417 | 0.260 |
| FB 12 (1996 - 2002) | 0.871 | 0.535 | 0.808 | 0.129 | 0.465 | 0.192 |
| FB 13 (2002 - 2004) | 0.850 | 0.335 | 0.781 | 0.150 | 0.665 | 0.219 |

*Bolded parameter coefficients are the insignificant variables*