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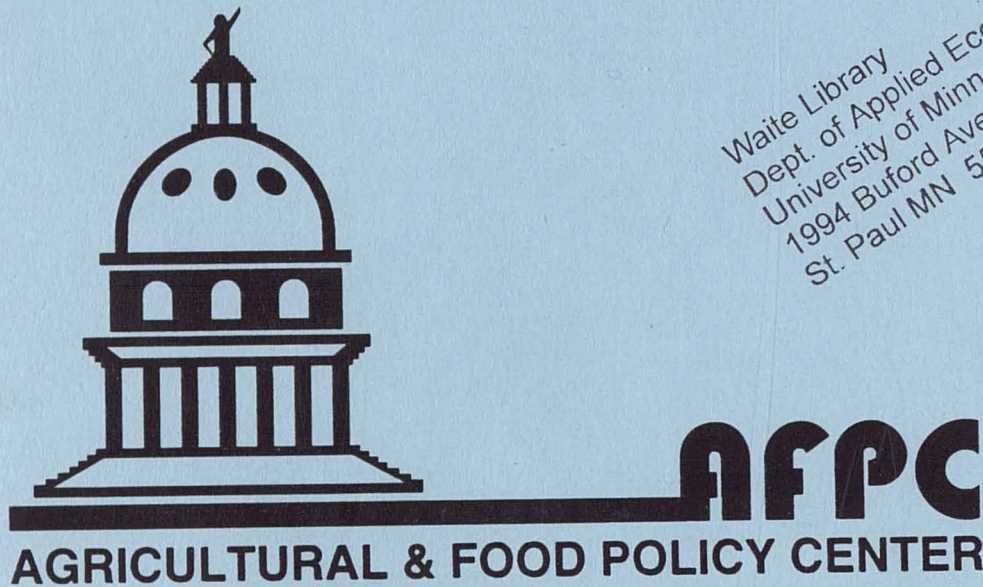
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EVALUATING THE EQUITABILITY OF FARM PROGRAM BENEFIT DISTRIBUTION ACROSS COMMODITIES

AFPC Working Paper 95-2

February 1995



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EVALUATING THE EQUITABILITY OF FARM PROGRAM BENEFIT DISTRIBUTION ACROSS COMMODITIES¹

Budget considerations have, and will likely continue, to play a major role in farm program development and implementation. With budget caps (maximums) by area of committee jurisdiction, if government increases expenditures in one area, it must offset, or find an equal budget reduction in another area. This philosophy has tended to pit special interest groups against one another, not only across supported agricultural commodities, but within regions of production. Congresspersons want to know who is getting more than "their share" as a means of identifying where to cut with least pain. Likewise, commodity groups want to maintain their share of government expenditures relative to other supported commodities. However, measuring the equity of farm program benefits is complex.

In a sector-wide study conducted in 1992, Chang, et.al. found that current farm programs increase producer returns, induce excess production, and depress consumer market prices, resulting in increased consumption in both the domestic and export markets. The Chang, et.al. study also found that commodity-specific program revisions affect the entire agricultural sector as well as the distribution of farm program benefits among interest groups.

Changes in the farm bill are heavily influenced by the political power of farm interest groups, with commodity-specific organizations playing a primary role. These groups, as well as policymakers themselves, have a vested interest in understanding the economic impacts of farm program decisions on the allocation of increasingly limited resources. However, the

¹This was a presented paper at the American Agricultural Economics Association Annual Meeting in San Diego, CA, August, 1994.

issue of how well the political process has performed in achieving equitability in this allocation has received little attention.

Of primary concern to policymakers is whether or not the allocation of benefits are equitable in meeting farm program objectives. For example, by changing the policy instruments such as the target price, loan rate or acreage reduction percentage, farmers production decisions will likely change as a result of the anticipated impacts on income. The implication is that producers will shift to the production of more lucrative commodities, which are usually the more generously supported crops.

Past research has primarily focused on the equitable distribution of farm program benefits relative to farm size, regardless of the commodity produced. Studies by Bonnen (1968) and Schultze (1971) concluded that, during the 1960's, most of the benefits from farm programs went to the largest farms. In a 1981 study, Lin, Johnson, and Calvin supported earlier findings that large-scale agriculture receives a disproportionate share of farm program benefits despite significant changes in farm program policy during the 1970's.

The objective of this paper is to examine whether farm program benefits are equitably distributed across program commodities. Specifically, this paper compares the relative farm program benefits for corn, wheat, rice, upland cotton, and barley over the 1984 to 1992 period. In 1993, corn, wheat, rice, upland cotton, and barley were planted on 50 percent (170 million acres) of total U.S. crop acreage. For fiscal years 1991-93, the programs for these five crops accounted for over 60 percent of net CCC outlays.

Data Sources

Before outlining the methodology, it will be useful to describe the data used for this analysis. The US Department of Agriculture, Agricultural Stabilization and Conservation Service Commodity Fact Sheets were the source for acreage reduction percentages (ARP), deficiency payment rates (DP), average market prices (MP), normal flex acreage percentages (NFA), and target prices (TP). Actual crop yields (AY), variable cash expenses (VCE), total cash expenses (TCE), and total economic costs (TEC) were reported by US Department of Agriculture, Economic Research Service, Economic Indicators of the Farm Sector. The cottonseed price (CSP) was reported by the US Department of Agriculture World Cotton Situation. US Department of Agriculture, Agricultural Stabilization and Conservation Service Press Releases provided farm program yields (FPY) and program acres (PR). US Department of Agriculture, Economic Research Service, Situation and Outlook was the source for marketing loan payments (MLP). Maintenance of set-aside acres (MA) is set at 20 dollars per acre across all commodities.

Methodology

Equity means different things to different people. In the context of this paper, equity deals with how one commodity has fared compared to others in terms of government benefits. In an effort to achieve objectivity when applying economic principles to the issue of equity, four general methods of addressing the equity of benefits across commodities were developed. Each method uses a different degree of complexity in measuring relative benefits.

Target Price Relative to Production Costs

This method, in effect, is a naive income security or enhancement measure of the percent of production costs covered by the target price. Three cost-of-production estimates, variable cash expenses, total cash expenses, and total economic costs were used to measure target price coverage. Variable cash expenses include seed, fertilizer, chemicals, hired labor, repairs, fuel, and other miscellaneous expenses. Total cash expenses adds cash farm overhead, taxes, insurance, and interest to variable cash expenses. Total economic costs include variable costs and full ownership costs, including capital replacement, returns to capital, and returns to land. Per unit costs were calculated using actual harvested yields. The three equity measures calculated for this method are:

- Target price divided by variable cash expenses
- Target price divided by total cash expenses
- Target price divided by total economic costs

The primary weakness of this method is that it fails to fully capture the costs and benefits derived from other program provisions such as acreage reduction requirements. A crop having a higher acreage reduction requirement may warrant increased direct subsidies as an incentive for participation. Alternately, a higher target price may, at least from a budget perspective, require higher levels of acreage reduction. Furthermore, set aside acres also entail some maintenance expenses.

Effective Total Revenue Relative to Production Costs

A ratio of the farmers total revenue to production costs may provide a more accurate measure of relative benefits across commodities. To eliminate the problems previously discussed, total revenues and costs are adjusted to consider acreage reduction rates,

maintenance cost of idle acres, and marketing loan benefits. The result addresses the equity issue by providing an *effective* measure of total revenue relative to production costs. For example, a modest target price with a low acreage reduction requirement may comprise more farm program benefits than a high target price with a high acreage reduction requirement.

The concept of effective return as a policy variable was introduced by Houck, et.al. in 1976. The Houck, et.al. study calculated an effective announced loan rate, target price, and diversion payment as well as introduced a similar measure for the support price. In 1989, McIntosh applied the methods introduced in Houck, et.al. to generate an extensive database of effective support prices and diversion payments. Both the Houck, et.al. and McIntosh studies recognized the difficulty in generating an effective returns policy variable. This difficulty is primarily due to frequent changes in government farm programs, requiring the analysts to develop methods that apply to the prevailing policies.

For this method, three measures of relative farm program benefits using effective variable cash expenses (EVCE), effective total cash expenses (ETCE), and effective total economic costs (ETEC) are estimated. The numerator of each equation multiplies the deficiency payment rate (DP) by farm program yield (FPY) to arrive at a deficiency payment which is adjusted for acreage reduction requirements (1-ARP-NFA). This adjusted deficiency payment is then added to the market portion of revenue, which is also adjusted for acreage reduction requirements, to arrive at an effective total revenue (ETR). The denominator for each equation is comprised of the respective cost element adjusted for acreage reduction requirements plus the maintenance costs on the set-aside, forming an effective measure for costs.

For rice and cotton, $[(MLP)/(((PR)*(1-ARP))*(AY))]$ is added to effective revenues to account for the marketing loan payments beginning in 1985 for rice and 1986 for cotton. For cotton, $(((1.67*AY)/2000))*(CSP)$ is added to effective total revenue to account for market revenue earned from cottonseed sales.

The three equations are:

- Effective total revenue divided by effective variable cash expenses:

$$\frac{(((DP*FPY)*(1-ARP-NFA))+((MP*AY)*(1-ARP)))}{(((VCE)*(1-ARP))+((MA*ARP)))}$$

- Effective total revenue divided by effective total cash expenses:

$$\frac{(((DP*FPY)*(1-ARP-NFA))+((MP*AY)*(1-ARP)))}{(((TCE)*(1-ARP))+((MA*ARP)))}$$

- Effective total revenue divided by effective total economic costs:

$$\frac{(((DP*FPY)*(1-ARP-NFA))+((MP*AY)*(1-ARP)))}{(((VCE)*(1-ARP))+((MA*ARP))+((TEC-VCE)))}$$

Government Dependence

The proportion of government revenue (GR) relative to production costs separates the farm program and market portions of total revenue. The only difference from the previous method is that the numerator only includes the government payment portion of effective total revenue previously calculated. This measure reflects the degree of farm program dependence to market dependence by crop.

Alternatively, it can be thought of as an indicator of the relative political influence of commodity groups on the ability to extract economic rents. Again, three general measures of relative farm program benefits using effective variable cash expenses, effective total cash expenses, and effective total economic costs are estimated. They are:

- Government revenue divided by effective variable cash expenses:

$$\frac{[(DP*FPY)*(1-ARP-NFA)]}{[((VCE)*(1-ARP))+(MA*ARP)]}$$

- Government revenue divided by effective total cash expenses:

$$\frac{[(DP*FPY)*(1-ARP-NFA)]}{[((TCE)*(1-ARP))+(MA*ARP)]}$$

- Government revenue divided by effective total economic costs:

$$\frac{[(DP*FPY)*(1-ARP-NFA)]}{[((VCE)*(1-ARP))+(MA*ARP)+(TEC-VCE)]}$$

Participation Rates

An alternative measure of relative benefits is the rate of participation in farm programs. This proposition suggests that if a larger proportion of farmers sign up for a particular program crop, it must indicate that they receive more program benefits relative to a crop where participation is lower. Due to the different land types across the U.S. however, this measure may not mean as much. However, to the extent that there are pressures on producers to participate year after year, participation rates may be more stable than any of the other measures.

Results

The results of this analysis are presented in Table 1 and in Figures 1-10. To lessen the impact of shocks, such as extreme weather conditions, the results shown here are based on a 3-year moving average taken from individual year calculations for 1982-92. By reducing the distortions created by extreme weather conditions, a more accurate reflection of the relative benefits for each crop is achieved.

Target Price Relative to Production Costs

Figure 1 indicates that wheat has had the highest level of program benefits relative to variable cash expenses over the 1984-1992 study period. Corn follows closely behind wheat throughout the period, particularly after enactment of the 1985 farm bill. With the enactment of the 1985 farm bill, target prices were reduced each year and the Secretary of Agriculture was given flexibility to adjust loan rates and acreage reduction requirements based on stocks-to-use ratios. Although the target price for both wheat and corn declined after 1986, variable cash expenses rose at a slightly higher rate than for corn, narrowing their relative position.

After 1986, the target price for both rice and cotton declined as well, while variable cash expenses steadily increased over the period. Rice is third overall, followed closely by barley. Cotton has the lowest target price relative to variable cash expenses over the entire study period. Even with the addition of marketing loan benefits for rice in 1985 and cotton in 1986, neither crop improves its position relative to wheat or corn.

When using total cash expenses as the denominator, wheat receives the highest program benefits in 1984 only (Figure 2). Beginning in 1985, and continuing in subsequent years, corn leads wheat and rice, followed by cotton and barley. For wheat, the additional cash expenses rise at a faster rate than those for corn, placing the relative benefits of both crops in close proximity throughout the period.

The target price to total economic costs ratio results in a significant change in the relative positions for rice and wheat (Figure 3). Rice, under this measure, receives the highest benefit for all years, followed by corn and then wheat, although their rankings are close in

1992. Cotton, although remaining close to wheat from 1984 and 1989, fell to the fourth position after 1986. Barley is below all other crops throughout the period.

Effective Total Revenue Relative to Production Costs

Taking acreage reduction requirements and marketing loan benefits into consideration, the ratio of effective total revenue to effective variable cash expenses indicates that wheat and corn benefits remain in a favorable position relative to cotton, barley, and rice (Figure 4). Rice and cotton reverse positions, with rice receiving a lower benefit relative to cotton, over the entire study period. Barley maintains the third position until 1988. Barley falls to the lowest position in 1990 before recovering sharply to a level just below corn in 1992.

Effective total revenue relative to effective total cash expenses indicates the frequent switching of relative benefits for all crops over the study period (Figure 5). The relative position for corn improved, remaining above wheat for each year after 1988. Rice improved relative to cotton. Barley however, maintains the lowest position.

Calculating the relation of effective total revenue to effective total economic costs illustrates a pronounced difference from a simple comparison of the target price with the unit cost of production. Rice and cotton are virtually even and have the highest relative benefits in 1984-85 (Figure 6). Rice, in fact, moves to the highest position in 1989 before falling behind corn in 1990. As the 1990 farm legislation is phased in beginning in 1991 and 1992, corn, wheat, and rice receive comparable benefits with cotton falling. In other words, cotton receives the lowest effective benefits under the 1990 farm bill compared to corn, wheat, barley, and rice whether measured by the relationship of the target price to production costs or effective revenue. Barley receives the lowest level of relative benefits throughout the period.

Government Dependence

This method is useful to see what portion of production costs are covered by direct government payments. For the ratio of government revenue to effective variable cash expenses, rice alternates with wheat for the highest relative benefits (Figure 7). Cotton is between wheat and corn from 1984 until 1986 when it falls below corn for the remaining years. Between 1985 and 1992, barley alternates with cotton for the lowest position, ending up slightly behind corn.

Comparing government revenue to effective total cash expenses, rice and wheat continue to switch position from year to year (Figure 8). Corn and cotton receive lower benefits, followed by barley. The government revenue portion of effective total economic costs is highest in all years for rice which, in 1988, recovers 43.4 percent of its total economic costs from government revenue (Figure 9). Wheat, cotton, and corn follow but exchange relative positions throughout the period. In the final three years of the analysis, wheat is second followed by corn and then cotton. Barley holds the lowest position for all except the first two years.

Participation Rates

Rice led in participation for every year except 1986 (Figure 10). After falling from 84.6 percent in 1984 to 81.9 percent in 1986, rice participation increased to 96.4 percent in 1992. It stands to reason that land typically used to grow rice has few other crop alternatives. Cotton was typically second in participation ahead of wheat and corn. In 1984, cotton had a participation rate of 69.5 percent before climbing to 91.6 percent in 1986. After 1986, cotton participation declined yearly to 84.1 percent in 1992. Wheat and corn switch position

throughout the period. In 1992, wheat was third with corn participation fourth. Barley had the lowest level of participation rate over the entire study period.

Conclusions

The results of this study suggest that no single measure of equity in the share of benefits across commodities yields consistent results. At the same time, however, it indicates the importance of effective benefits in considering the issue of who benefits most from farm programs.

When comparing the target price relative to variable cash expenses and effective total revenue to effective variable cash expenses, wheat appears to receive the highest level of program benefits. When total cash expenses are substituted for variable cash expenses in the respective analyses, corn takes the highest position with wheat and rice remaining in close proximity. When total economic costs are used in these relationships, rice and corn are in close proximity and hold the highest positions in most years. When government revenues are separated from effective total revenue, rice receives the most benefit from farm programs. Wheat is typically second. Over the same period, rice had the highest participation rate followed by cotton, wheat, and then corn.

The implication that can be drawn from this study is that equity, even when measured in a benefit/cost context, can be easily distorted depending on the measure used. Special interest groups, analyst, and policymakers should carefully consider which measure of program benefits is used as the basis of their value judgements. In some cases, the relevant consideration may be whether the farmer can cover variable cash costs. In other cases, the key consideration may involve the ability to cover total economic costs.

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Table 1. Relative Farm Program Benefits Across Program Commodities, 1984-1992.^a

	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
<i>CORN</i>									
TP to VCE	2.157	2.256	2.660	2.877	2.674	2.502	2.282	2.359	2.433
TP to TCE	1.363	1.476	1.824	2.076	1.976	1.883	1.731	1.791	1.837
TP to TEC	1.037	1.087	1.286	1.408	1.290	1.183	1.060	1.090	1.116
ETR to EVCE	2.239	2.228	2.434	2.579	2.456	2.423	2.265	2.329	2.333
ETR to ETCE	1.422	1.460	1.672	1.873	1.830	1.836	1.726	1.773	1.765
ETR to ETEC	1.027	1.022	1.103	1.163	1.072	1.050	0.984	1.027	1.031
GR to EVCE	0.149	0.232	0.546	0.746	0.724	0.561	0.380	0.370	0.377
GR to ETCE	0.095	0.154	0.384	0.546	0.537	0.424	0.290	0.282	0.286
GR to ETEC	0.066	0.105	0.248	0.334	0.318	0.243	0.165	0.163	0.167
<i>WHEAT</i>									
TP to VCE	2.740	2.828	2.775	2.890	2.798	2.555	2.364	2.402	2.716
TP to TCE	1.625	1.621	1.669	1.814	1.845	1.697	1.580	1.605	1.779
TP to TEC	1.043	1.073	1.083	1.133	1.086	1.010	0.964	1.019	1.135
ETR to EVCE	2.615	2.608	2.645	2.731	2.693	2.428	2.284	2.334	2.610
ETR to ETCE	1.587	1.535	1.645	1.779	1.842	1.665	1.555	1.576	1.724
ETR to ETEC	0.918	0.905	0.936	0.962	0.928	0.867	0.876	0.948	1.052
GR to EVCE	0.442	0.573	0.904	1.119	1.034	0.638	0.488	0.568	0.648
GR to ETCE	0.266	0.336	0.579	0.742	0.708	0.433	0.328	0.379	0.428
GR to ETEC	0.154	0.199	0.323	0.396	0.362	0.219	0.188	0.229	0.261
<i>RICE</i>									
TP to VCE	1.993	2.157	2.299	2.316	2.214	2.082	1.933	1.888	1.873
TP to TCE	1.500	1.622	1.768	1.842	1.825	1.736	1.613	1.574	1.557
TP to TEC	1.202	1.265	1.411	1.478	1.443	1.298	1.180	1.162	1.170
ETR to EVCE	1.953	2.018	1.887	1.886	1.869	1.981	1.851	1.784	1.721
ETR to ETCE	1.475	1.523	1.448	1.508	1.551	1.658	1.548	1.490	1.431
ETR to ETEC	1.085	1.079	1.015	1.049	1.054	1.084	1.016	1.020	1.039
GR to EVCE	0.543	0.631	0.738	0.769	0.766	0.680	0.633	0.530	0.526
GR to ETCE	0.410	0.476	0.571	0.616	0.634	0.569	0.529	0.443	0.437
GR to ETEC	0.299	0.336	0.402	0.431	0.434	0.373	0.348	0.301	0.316

Table 1. (cont.)

	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
COTTON									
TP to VCE	1.714	1.819	1.856	1.932	1.861	1.811	1.644	1.640	1.741
TP to TCE	1.242	1.340	1.375	1.473	1.435	1.425	1.292	1.285	1.359
TP to TEC	1.013	1.082	1.092	1.105	1.028	0.990	0.891	0.880	0.929
ETR to EVCE	1.985	2.059	2.032	2.114	2.070	2.047	1.910	1.813	1.846
ETR to ETCE	1.445	1.522	1.513	1.618	1.602	1.616	1.504	1.423	1.443
ETR to ETEC	1.071	1.108	1.071	1.079	1.030	1.005	0.953	0.905	0.943
GR to EVCE	0.369	0.450	0.576	0.554	0.507	0.376	0.298	0.212	0.237
GR to ETCE	0.269	0.334	0.429	0.421	0.389	0.297	0.235	0.166	0.186
GR to ETEC	0.199	0.243	0.302	0.284	0.253	0.186	0.150	0.105	0.121
BARLEY									
TP to VCE	1.714	1.819	1.856	1.932	1.861	1.811	1.644	1.640	1.741
TP to TCE	1.242	1.340	1.375	1.473	1.435	1.425	1.292	1.285	1.359
TP to TEC	1.013	1.082	1.092	1.105	1.028	0.990	0.891	0.880	0.929
ETR to EVCE	1.985	2.059	2.032	2.114	2.070	2.047	1.910	1.813	1.846
ETR to ETCE	1.445	1.522	1.513	1.618	1.602	1.616	1.504	1.423	1.443
ETR to ETEC	1.071	1.108	1.071	1.079	1.030	1.005	0.953	0.905	0.943
GR to EVCE	0.369	0.450	0.576	0.554	0.507	0.376	0.298	0.212	0.237
GR to ETCE	0.269	0.334	0.429	0.421	0.389	0.297	0.235	0.166	0.186
GR to ETEC	0.199	0.243	0.302	0.284	0.253	0.186	0.150	0.105	0.121
TP	Target price								
VCE	Variable cash expenses								
TCE	Total cash expenses								
TEC	Total economic costs								
ETR	Effective total revenue								
EVCE	Effective variable cash expenses								
ETCE	Effective total cash expenses								
ETEC	Effective total economic costs								
GR	Government revenue								

*To correct for shocks such as extreme weather, the relative benefits above are based on a 3-year moving average taken from individual year calculations for 1982-1992.

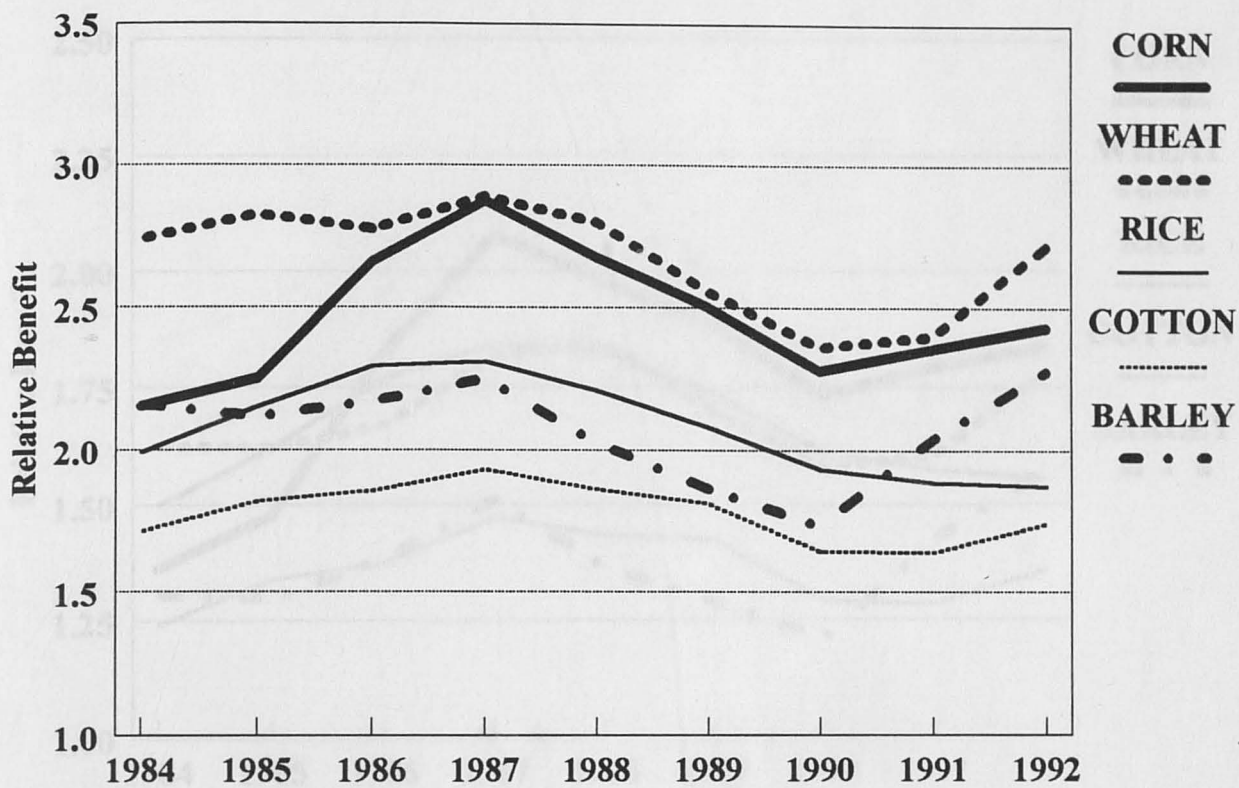


Figure 1. Comparison of the target price to variable cash expenses, 3-year moving average

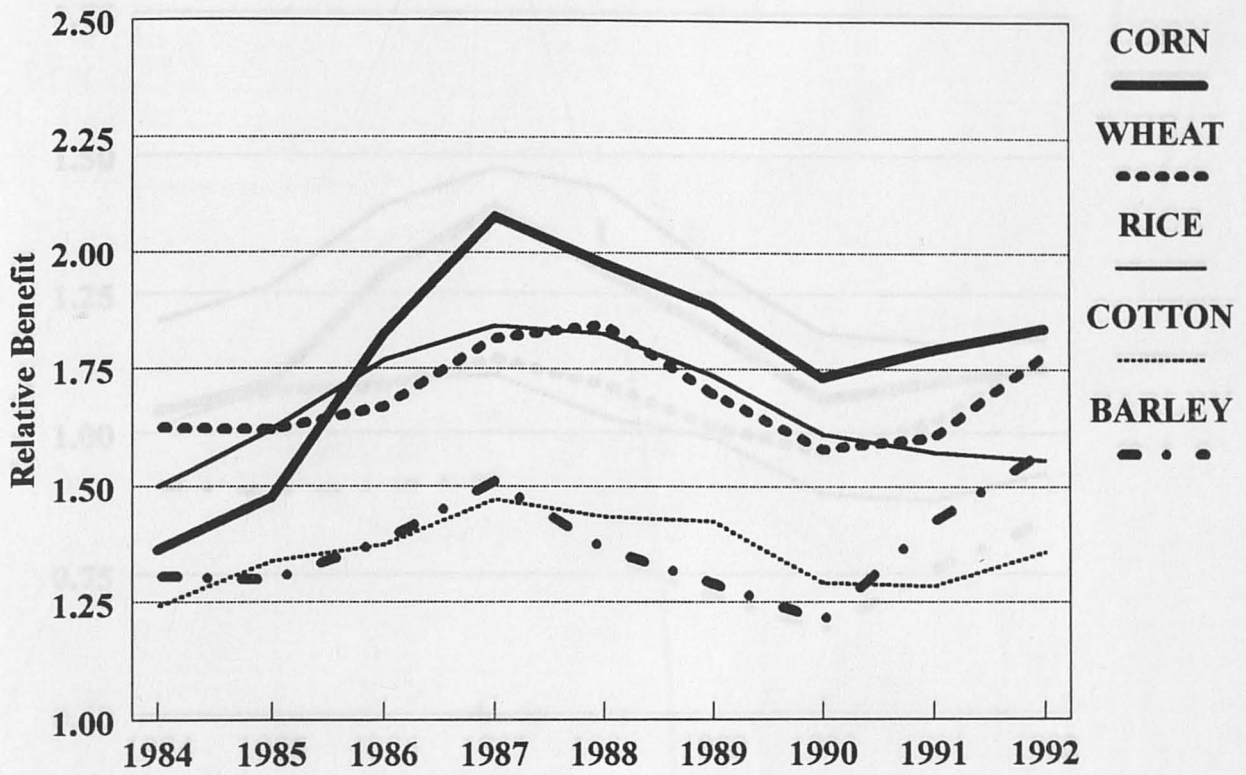


Figure 2. Comparison of the target price to total cash expenses, 3-year moving average

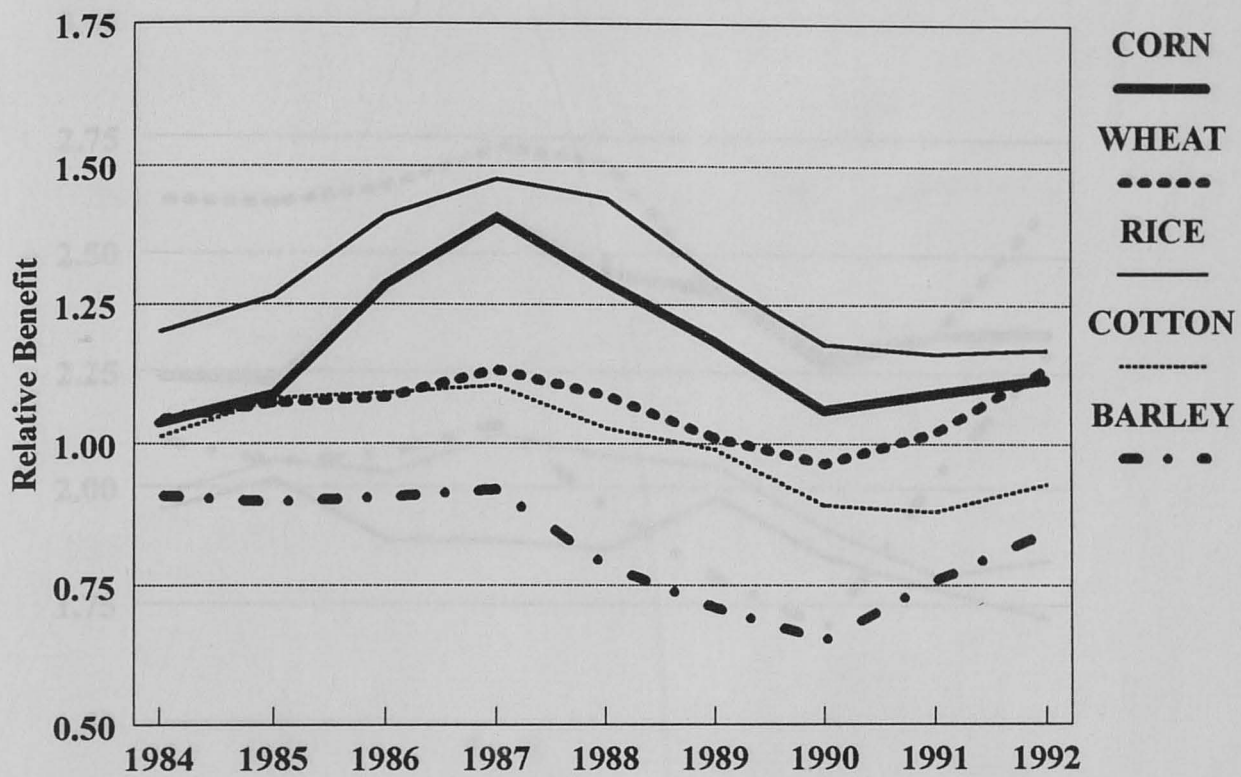


Figure 3. Comparison of the target price to total economic costs, 3-year moving average

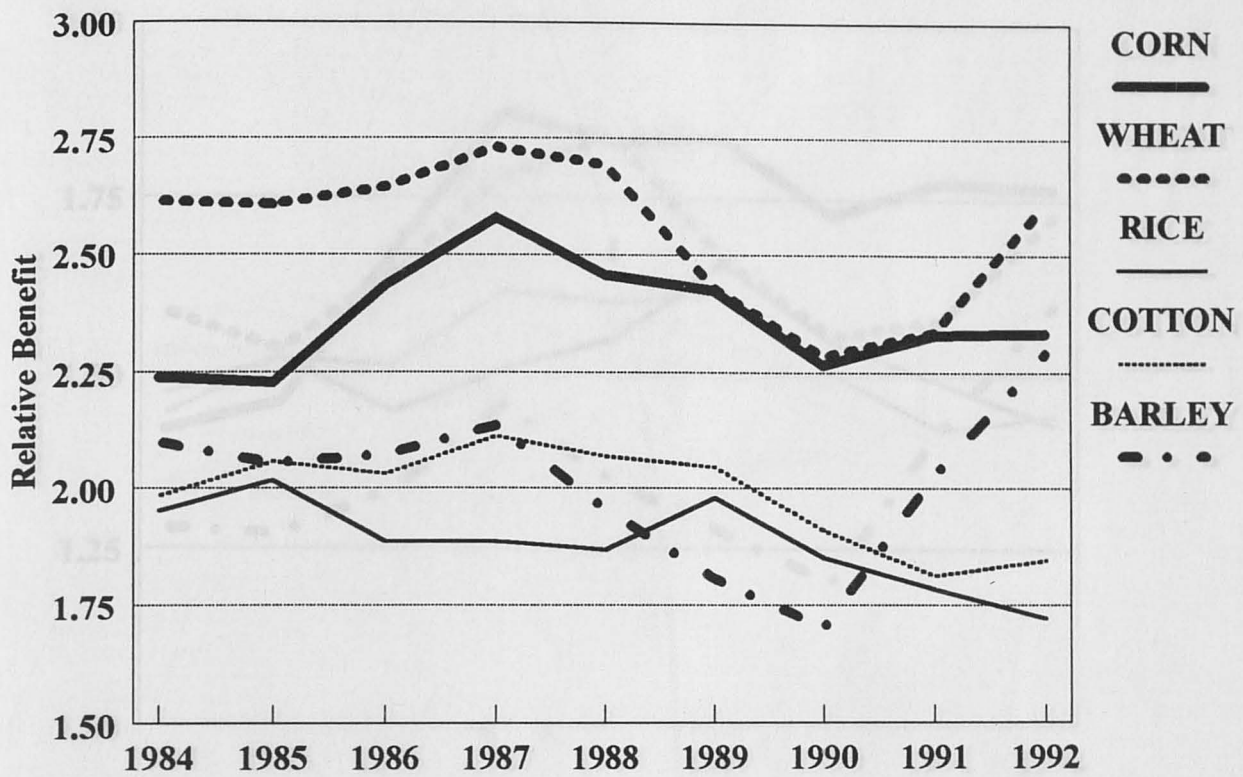


Figure 4. Comparison of effective total revenue to effective variable cash expenses, 3-year moving average

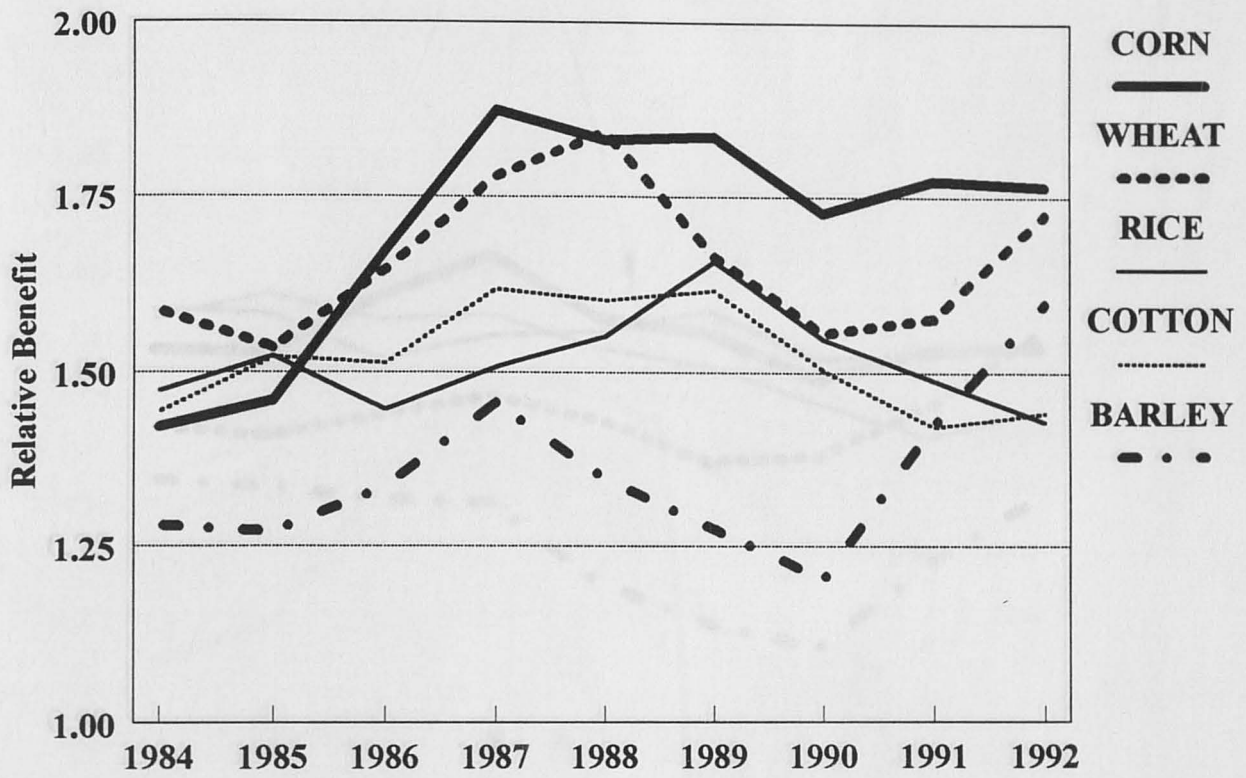


Figure 5. Comparison of effective total revenue to effective total cash expenses, 3-year moving average

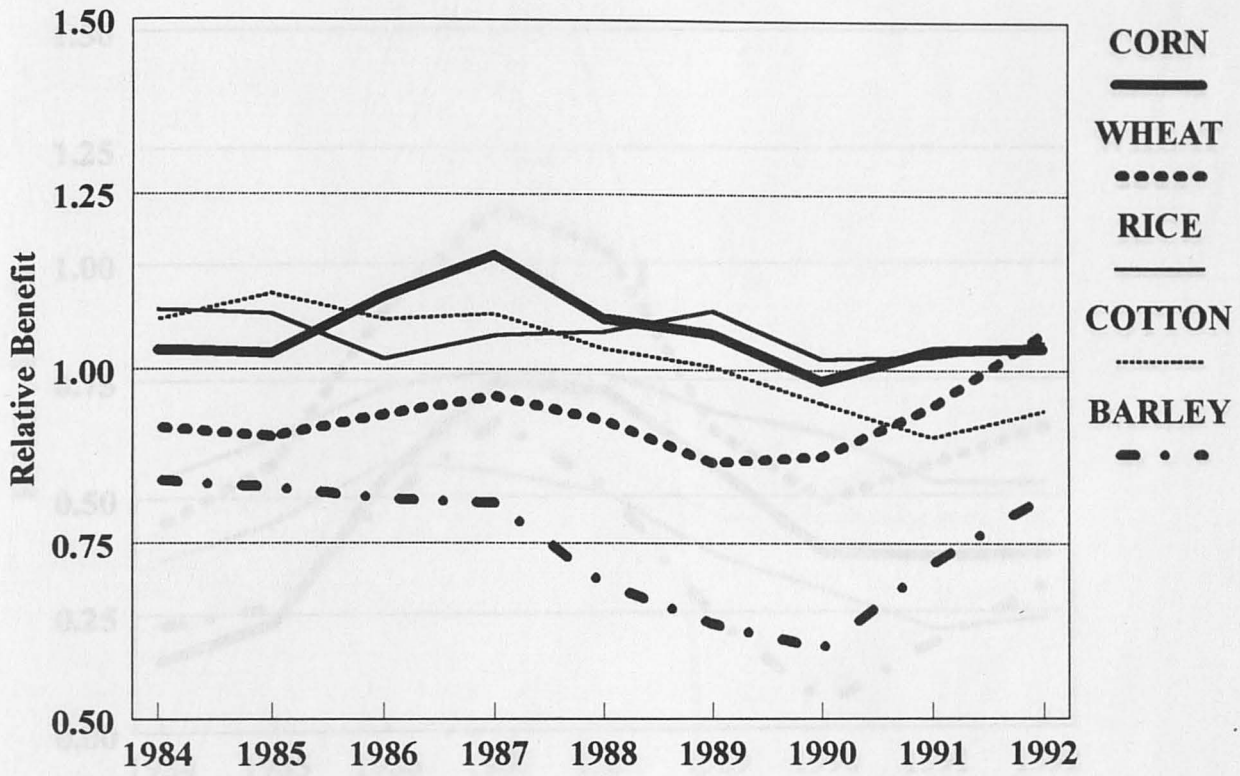


Figure 6. Comparison of effective total revenue to effective total economic costs, 3-year moving average

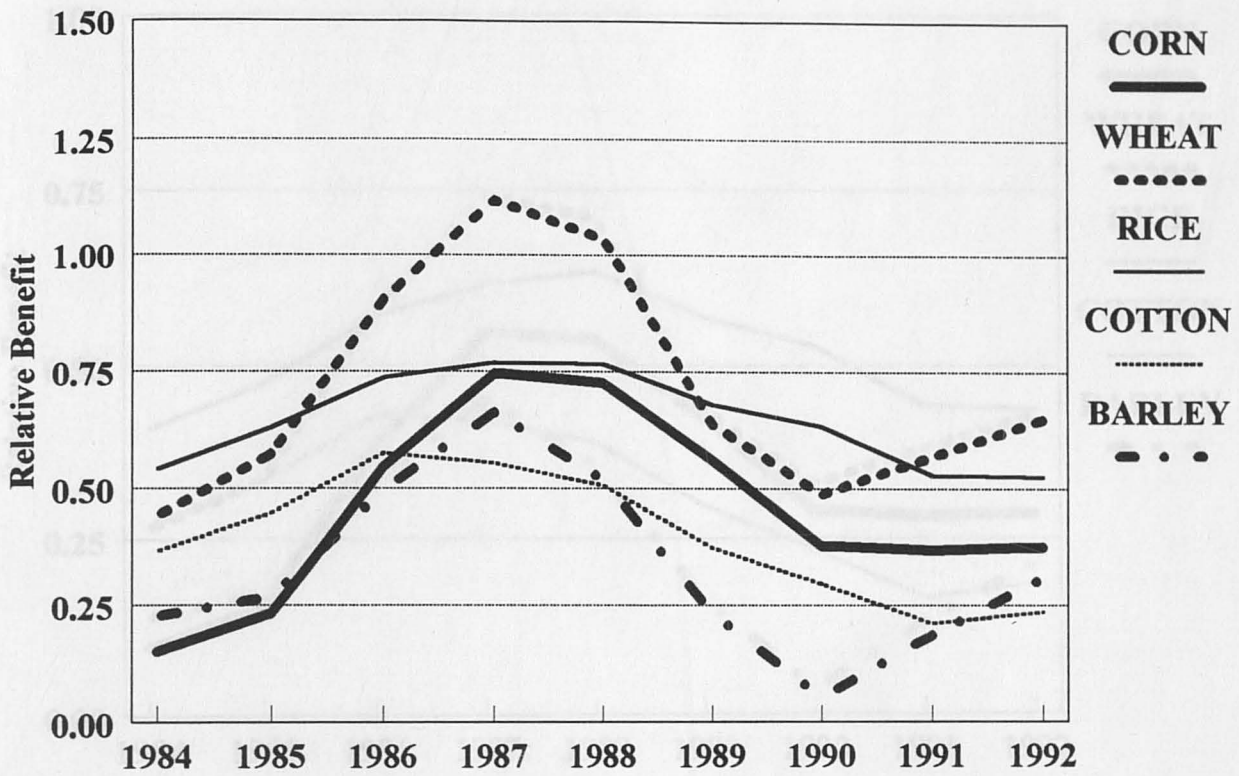


Figure 7. Comparison of government revenue to effective variable cash expenses, 3-year moving average

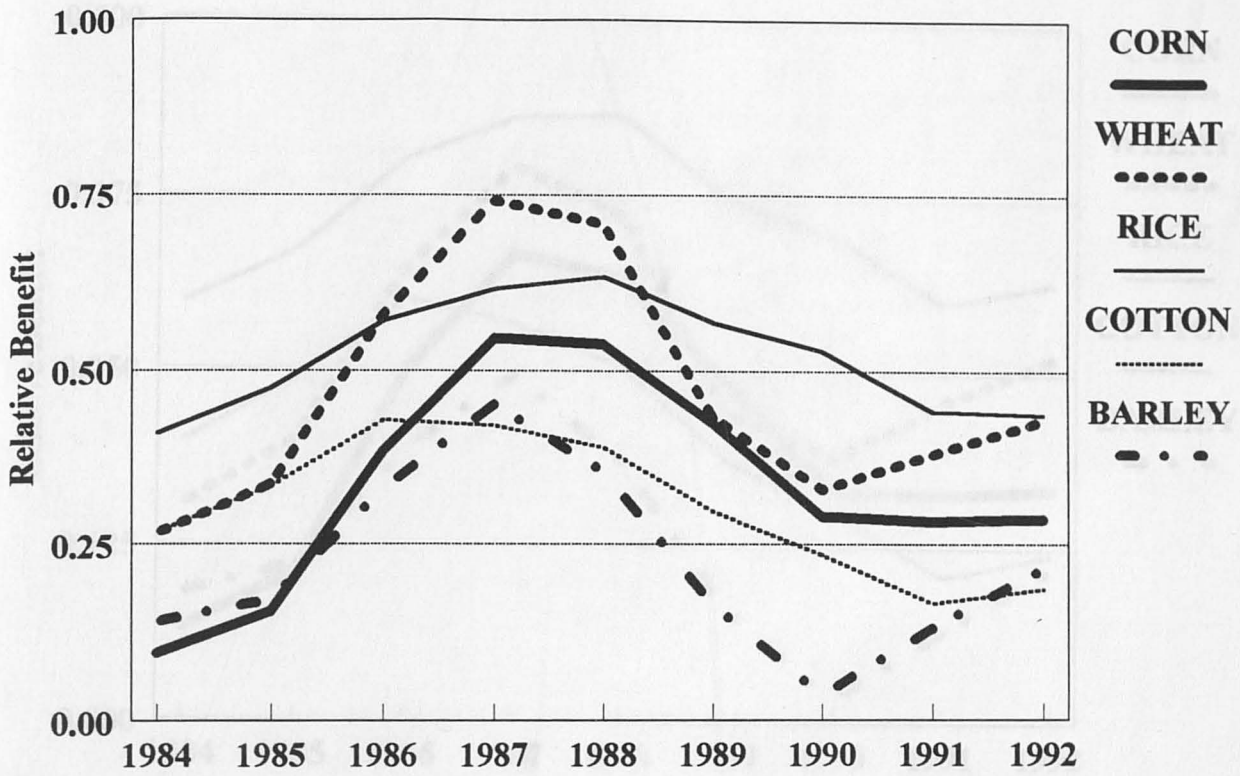


Figure 8. Comparison of government revenue to effective total cash expenses, 3-year moving average

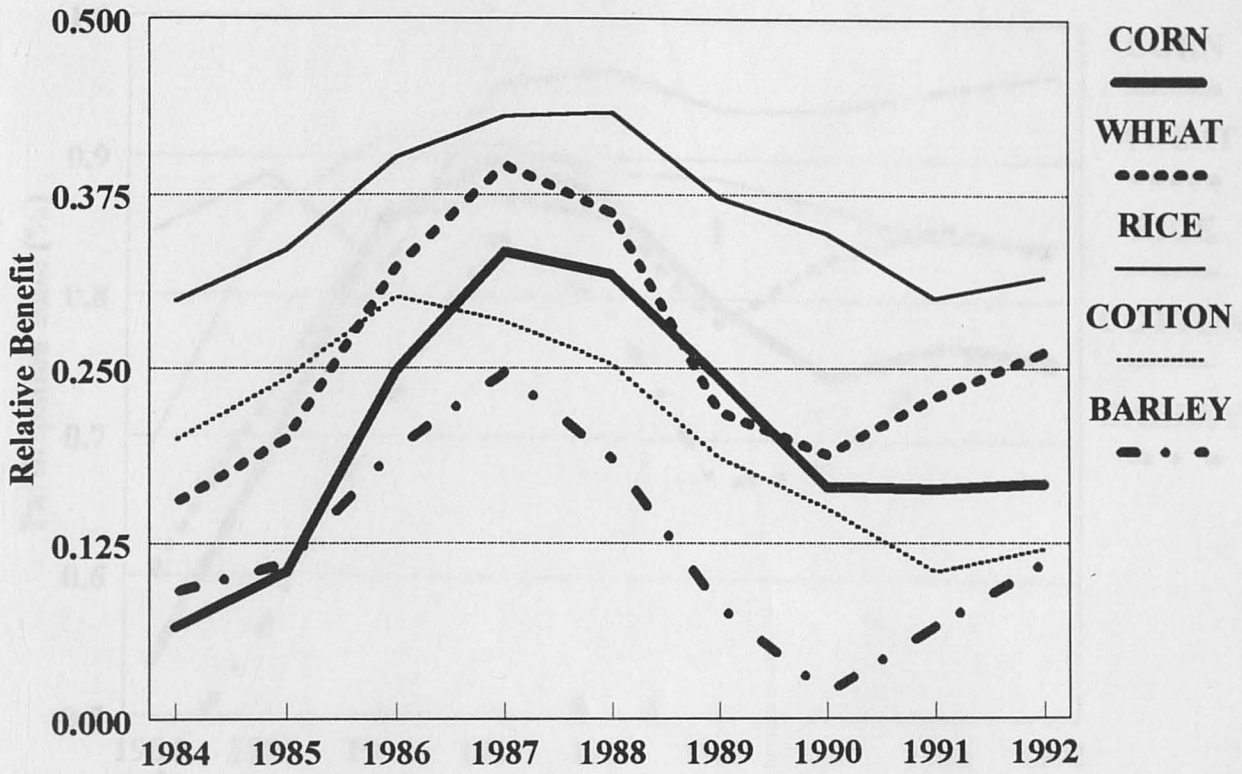


Figure 9. Comparison of government revenue to effective total economic cost, 3-year moving average

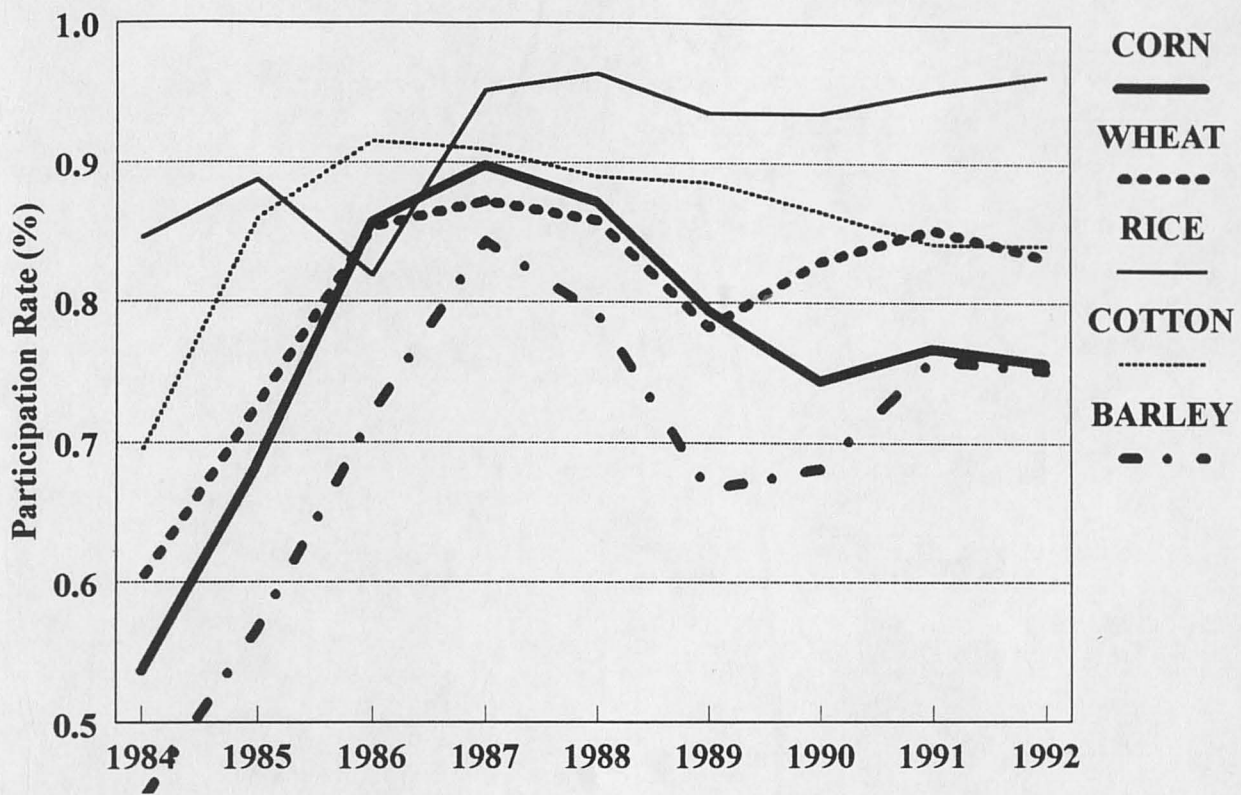


Figure 10. Program participation rates

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