

Staff Paper Series

Staff Paper P76-27

August 1976

A SIMPLE ANALYSIS OF ACREAGE RESPONSE TO SOME AGRICULTURAL PROGRAMS

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1. Introduction and scope.

The purpose of this paper is twofold: (a) To analyze the effect of some common agricultural programs on the planted area of a crop. This will be done within the framework of a simple model mostly by graphical methods. (b) To comment on an estimative procedure by which a support price, which is linked to acreage restrictions, is transformed to an "effective support price."

Three programs will be analyzed, namely, unlinked support price, link support price and diversion payment. The main features of these are as follows.

1. Unlinked support price. The government announces a support price. If the market price is lower than the announced price, the government compensates the farmers for the difference. No acreage restrictions are imposed.

2. Linked support price. The government announces a support price (which might be in addition to the unlinked support price) but in order to be eligible for payments the farmer has to undertake some restrictions. These are basically of two sorts: (a) An allotment of area which is permitted to be planted with the crop under the program. (b) Diversion: the farmer is not allowed to plant any crop on a certain definite area. A common version of this is that the diverted area can be devoted to some soil conserving uses.

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Usually the acreage restrictions are allocated to the farmers according to some proportion of the planted area at some basic period in the past. For example, if in the basic period the farmer used to plant 1,000 acres of wheat, and the allotment is 80% of the basis, he will have an allotment of 800 acres and diversion of 200 acres. (Under the present definition, if the program allows the farmer to devote the 200 acres to another crop, it is not a diversion.)

3. Diversion payments. Under this program the government announces a diversion rate to be paid for diverted area. Sometimes there are minimal and maximal limits for diversion.

The last two programs can be mandatory or voluntary. Only the voluntary programs will be analyzed here.

2. The model.

The following is a very simple model of an individual farmer. The objective is to assume the simplest model, which still can describe the response of the farmer to the various programs in a rather general way. In most cases the results can be generalized to more complicated cases in an obvious way.

For simplicity, assume that there are two crops: one is the crop under the program which is investigated, say "wheat" and the other represents an aggregate of all alternative crops.^{1/} Assume that the farmer has a total area of \bar{A} acres, which he has to allocate between "wheat" and "alternatives."

^{1/}The name "wheat" is applied here generally to the crop under consideration only for convenience of writing. But the discussion is not restricted to wheat. In fact some programs even did not include wheat in reality.

A_w will denote the area allocated to wheat and A_a the area of alternatives.

For simplicity let us assume that there is no subjective uncertainty with regard to prices and natural conditions, that is, each farmer assumes that he knows for sure what will be the prices. However, different farmers might have different expectations. This assumption is made in order to avoid uncertainty which complicates the analysis of the individual farmer, and at the same time to allow differences among farmers in their price assessments.

Assume that there are constant returns to scale in "wheat" (the crop under consideration). This implies that for a given set of prices of wheat and inputs the farmer can decide on the amount of inputs, yield and profit per acre of "wheat", no matter what is the total "wheat" area. In other words, the decision on input-yield composition and the decision on scale are separated. Keeping all prices, except that of "wheat", constant, the net income per acre of "wheat" is an increasing function of "wheat" price only, which will be denoted by:

$$\pi(P)$$

such that: $\pi'(P) > 0$

Further, assume that there are decreasing returns to scale in the alternative crop. With all prices constant, total net income from the alternative crop is an increasing function of the area planted under this crop, with a diminishing marginal productivity. Denote the net income of the alternative crop as a function of its area by

$$\phi(A_a)$$

such that: $\phi'(A_a) > 0$ and $\phi''(A_a) < 0$.

Total net income from both "wheat" and alternatives will be denoted by ψ

$$\psi = \phi(A_a) + \pi(P) \cdot A_w$$

In a free market, the farmer will grow A^m acres of "wheat" ($\bar{A} - A^m$ of alternative), where the marginal net incomes of wheat and alternative are equal, and total net income is maximal.

Figure 1 describes the "free market" allocation: total area \bar{A} is represented by the distance $\overline{O_w O_a}$. Any point along $O_w O_a$ represents allocation between "wheat" (measured from left to right) and alternative (measured from right to left). Suppose that the farmer assesses that the market price will be P^m . Then net income per acre of wheat will be $\pi(P^m)$ (see upper section of figure 1). Total income from "wheat" as a function of its planted area is described by $O_w b$ in the lower section of figure 1. The net income function of alternative, $\phi(A_a)$ is depicted by the curve $O_a c$ in the lower section and its corresponding marginal curve is ef in the upper section of figure 1. Total net income for each allocation is derived by a vertical summation of the "wheat" and alternative net income curves (curve cb in the lower section of fig. 1). Maximal net income is ψ^m , obtained at allocation A^m , where the marginal curves intersect (point g in the upper section).

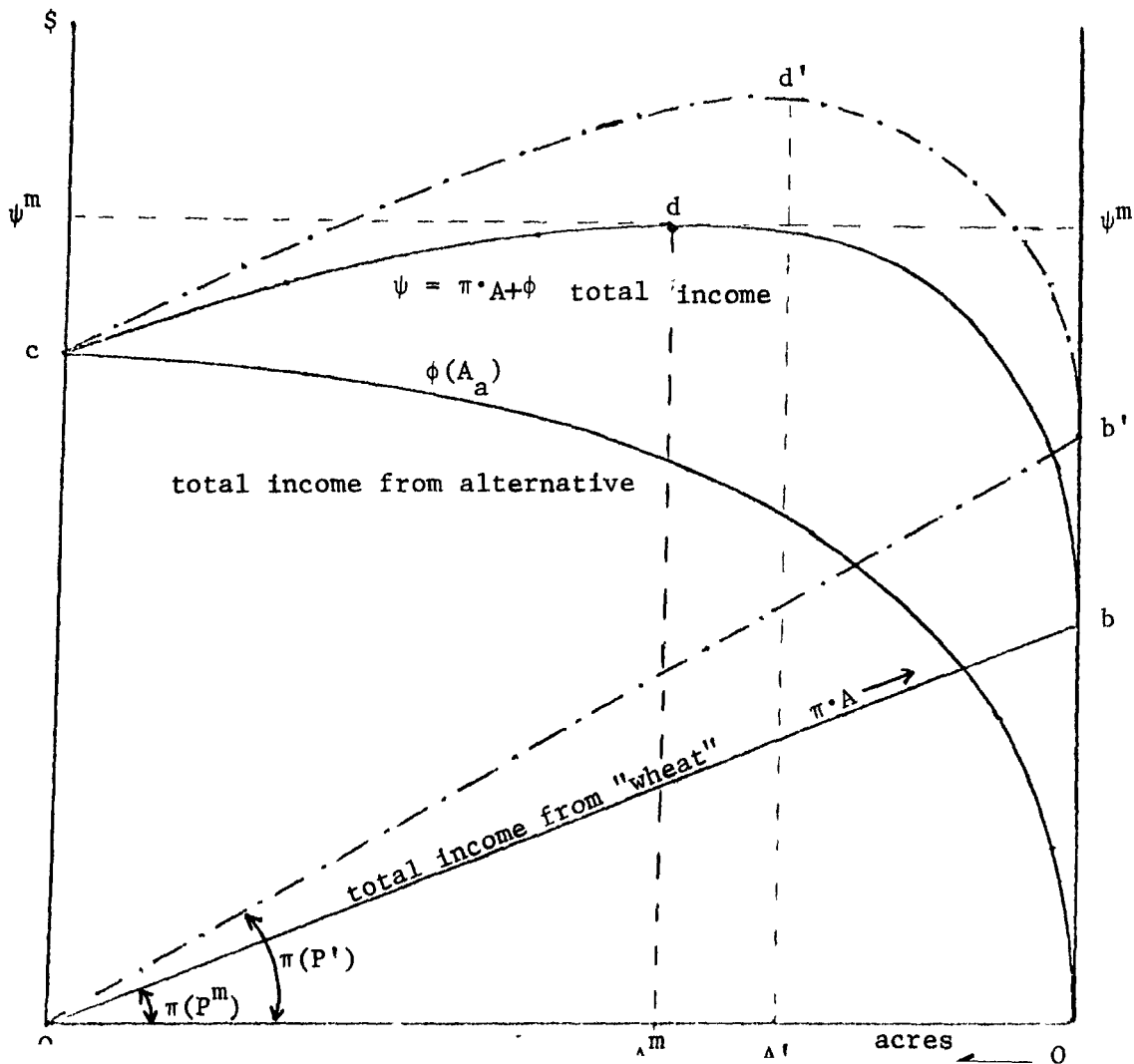
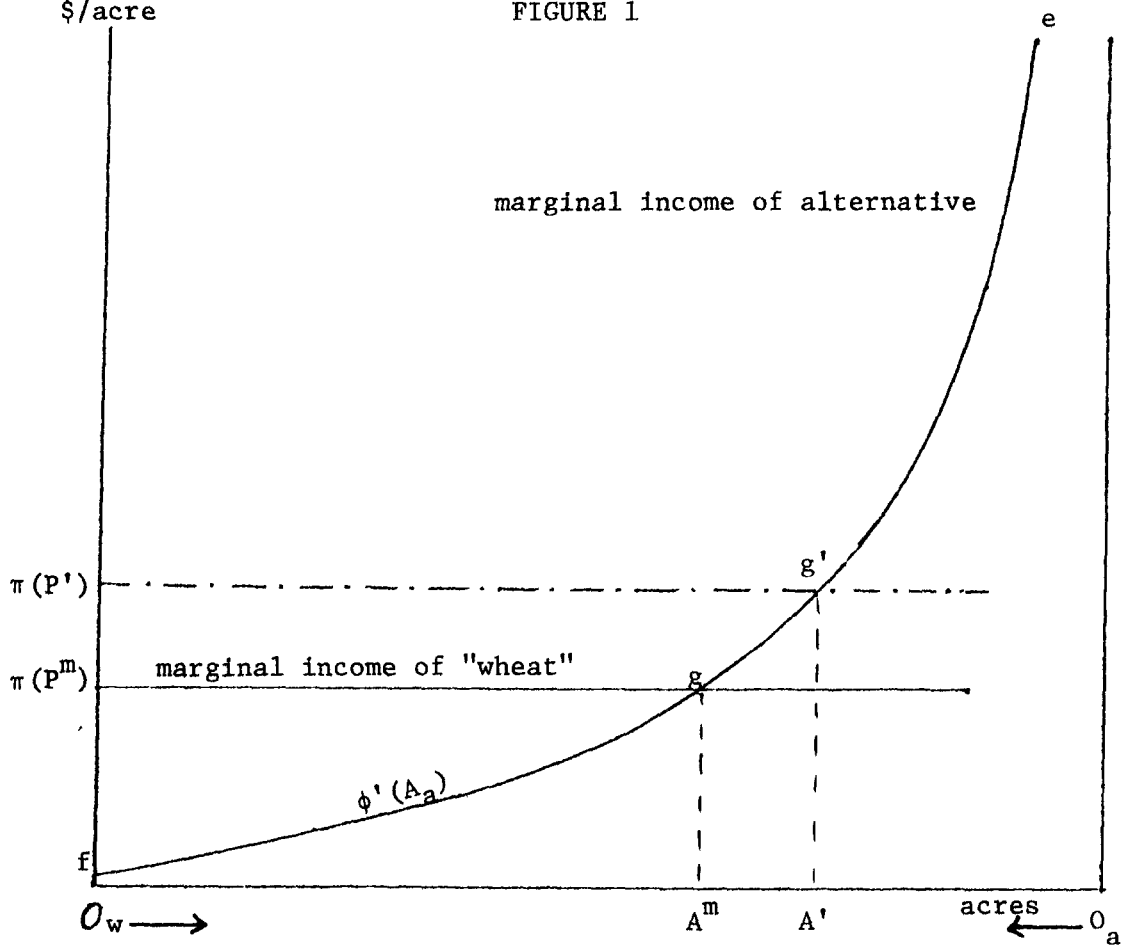
Suppose now, that for some reason, the market price as expected by the farmer, increased from P^m to P' . Net income per acre of wheat is now $\pi(P')$ (higher than $\pi(P^m)$). The dashed curves of figure 1 describe the new situation, which results in increasing "wheat" area from $O_w A^m$ to $O_w A'$ (decreasing the area of alternative from $O_a A^m$ to $O_a A'$). In this manner a curve which describes "wheat" area as a function of prices can be derived. Generally, such a curve has a positive slope like the curve in figure 2.

Let us now analyze the effect of the above mentioned agricultural programs on the total area of "wheat". For each program the individual

\$/acre

FIGURE 1

4a



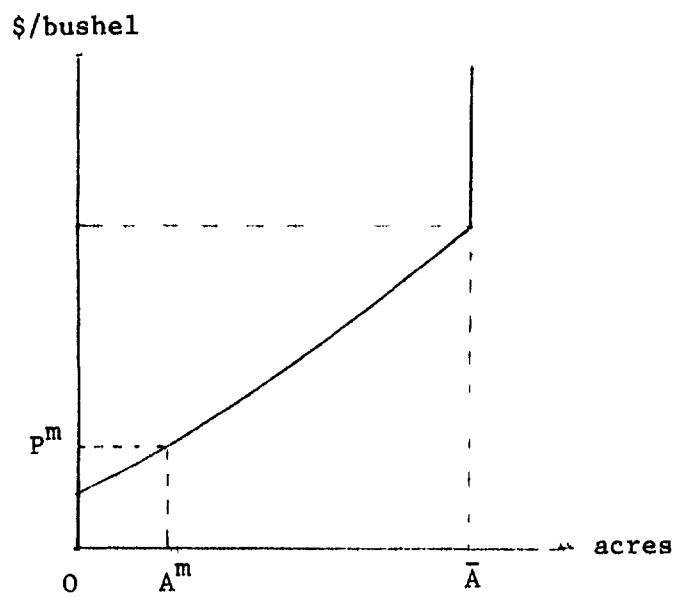


FIGURE 2

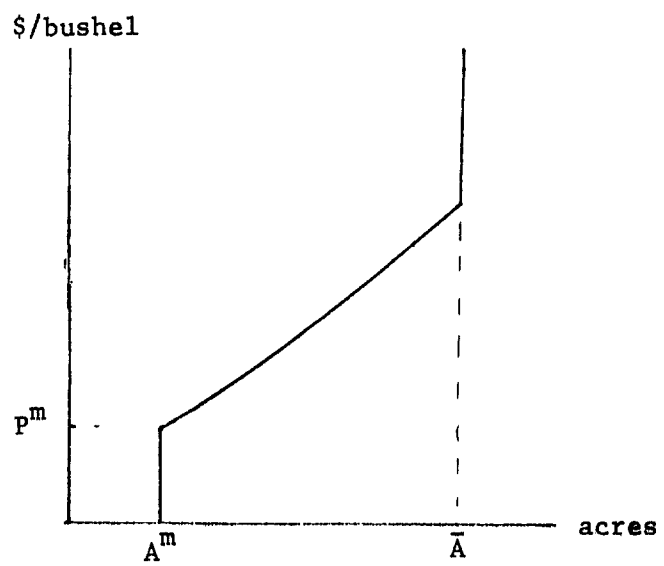


FIGURE 3

response will be investigated first and then the aggregate industry.

3. Analysis of some agricultural programs.

3.1. Unlinked support price.

The program was described in section 1. The acreage response of an individual farmer to the expected market price was derived in section 2 (see figure 2). When the announced support price is higher than the expected market price, the farmer would extend his "wheat" area, following the same curve as in figure 2. Suppose, that he expects P^m to be the market price, so that without the program he would plant A^m acres of "wheat". His "wheat" area as a function of variable support price is identical to that portion of the curve in figure 2, which is to the right of A^m (see figure 3).

Notice that different producers might have different assessments on market price, and therefore have a different critical level of support price, above which they will change their "wheat" acreage. The industry curve of "wheat" area as a function of unlinked support price can be derived by a horizontal summation of the individuals' curves. It is obvious that in total an unlinked support price has a positive effect on "wheat" acreage.

3.2. Linked support price.

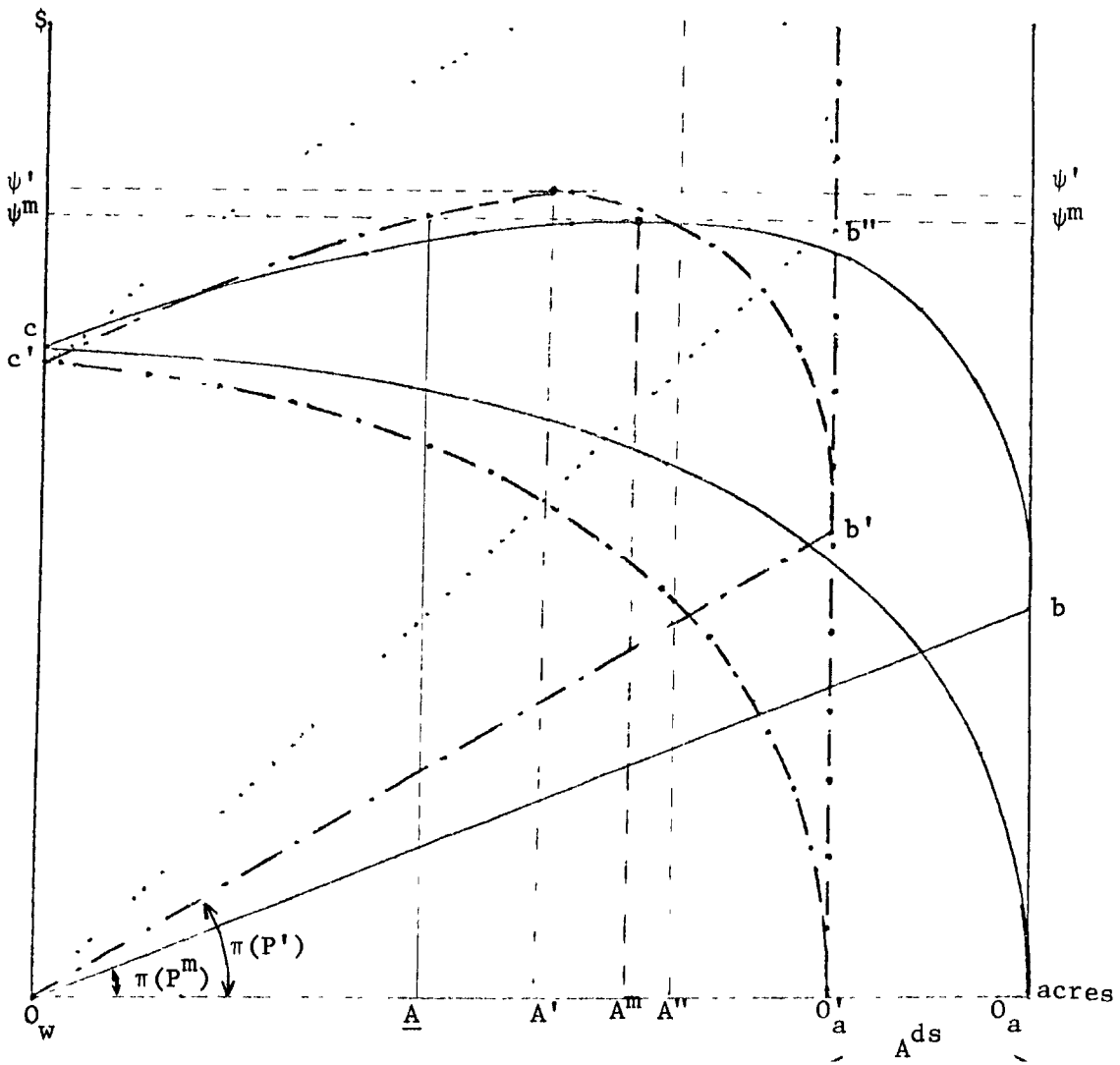
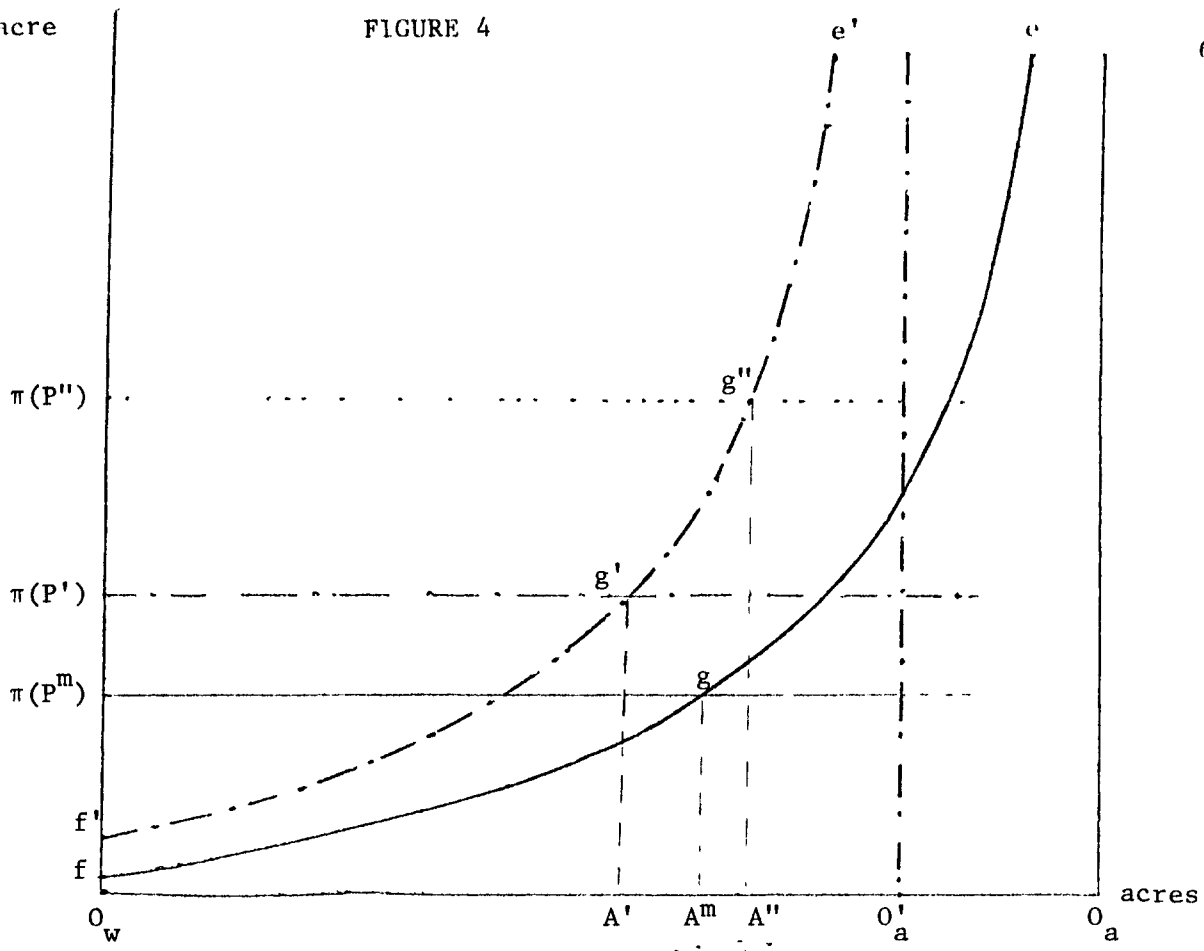
Denote the linked support price by P^{LS} , the diverted area by A^{ds} and the area permitted to be planted under "wheat" by A^s . The farmer has the option to "buy" the whole package of support price with the acreage restriction or to stay outside the program. The comparison between the two possibilities is demonstrated in figure 4. The nonparticipation case is identical to the free market case, and the relevant net income curves of "wheat", of alternative crop and in total are $O_w b$, $O_a c$ and bc respectively, as in figure 1 above. The marginal curves of "wheat" and alternative are

$\pi(P^m)g$ and ef respectively. A^m is the optimal allocation with maximal net income of ψ^m . The situation under the program is described by the dashed curves in figure 4. The farmer must divert A^{ds} of his land so instead of a crop area of $\overline{O_w O_a}$ he is allowed to plant only $\overline{O_w O_a'}$, the difference is A^{ds} , the diverted area. Assuming that the support price $P^{LS} = P'$ is higher than the expected market price P^m , the net income per acre of "wheat" is now $\pi(P')$, which is higher than $\pi(P^m)$. The total net income curve of "wheat" is $O b'_w$ and the marginal curve is $\pi(P')g'$ in the upper section. The total and marginal net income curves, of the alternative crop are obtained from the nonparticipation ones by shifting these curves to the left by an amount equal to A^{ds} . (See $\overline{O_a' c'}$ and $\overline{e' f'}$ in figure 4.) The highest net income with a support price P' and diverted area A^{ds} is obtained by allocation A' , where the dashed marginal curves intersect (g' in the upper section). Total net income with this allocation is ψ' , which is the maximal point of the total net income curve $b'c'$. Let us first analyze the case where the only acreage restriction is diversion (no maximal "wheat" area). If the linked support and price is high enough, the net income under the program is higher than outside, the farmer will participate. Otherwise he will not. It should be noted that when there are no restrictions on maximal "wheat" area, the "wheat" area under participation may be greater or smaller than the nonparticipation area, depending on the level of the support price and the amount of diversion. Let us now analyze the effect of increasing the linked support price P^{LS} , keeping the diverted area constant. For low values of P^{LS} the farmer will not participate and will allocate his land according to A^m , the "free market" allocation. At some level of P^{LS} he will be indifferent whether to participate or not. Above this he will participate and as the support price continues to increase, A' , the "wheat" area increases. (See the case with dotted curves

\$/acre

FIGURE 4

6.1



in figure 4 which corresponds to a higher support price P'' . (The best allocation now is A''). One can draw a curve which describes "wheat" acreage as a function of the linked support price, given the amount of diversion. Notice that at the indifference level of P^{LS} , "wheat" area might be either smaller or greater than A^m , the nonparticipation area. The first case is demonstrated in figure 5 and the second one in figure 6 (in these figures A^m is the nonparticipation "wheat" acreage, A^I is the wheat acreage at the indifference price support level, P^I).

Consider now the effect of the linked support price on total acreage of the whole "wheat" industry. Each farmer might have different indifference levels of price support. As P^{LS} increases, more and more farmers participate and "jump" to the acreage at their indifference level. Now, if the indifference acreage is greater than the nonparticipation acreage (figure 6), then in total, "wheat" acreage increases with P^{LS} . However, if for the individuals the acreage at the indifference support price is smaller than the nonparticipation acreage, the direction of change in total wheat acreage is not a priori unique, since part of the farmers reduce their "wheat" planting when they first enter the program, others will increase their acreage when they are already inside the program.

Continuing to assume no maximal acreage restriction, let us analyze the effect of changing the diversion restriction, keeping the price support level constant. Figure 7 is similar to figure 4 with the addition of the dotted curves, which represent an increase of the diverted area from $\overline{O_a O'_a}$ to $\overline{O_a O''_a}$. P^m is the expected market price, P^{LS} is the linked support price, A^m the nonparticipation allocation, A' the original participation allocation (when diversion is $\overline{O_a O'_a}$) and A'' the allocation after further increase of diversion. Generally it is clear that for a participant farmer, an increase in the

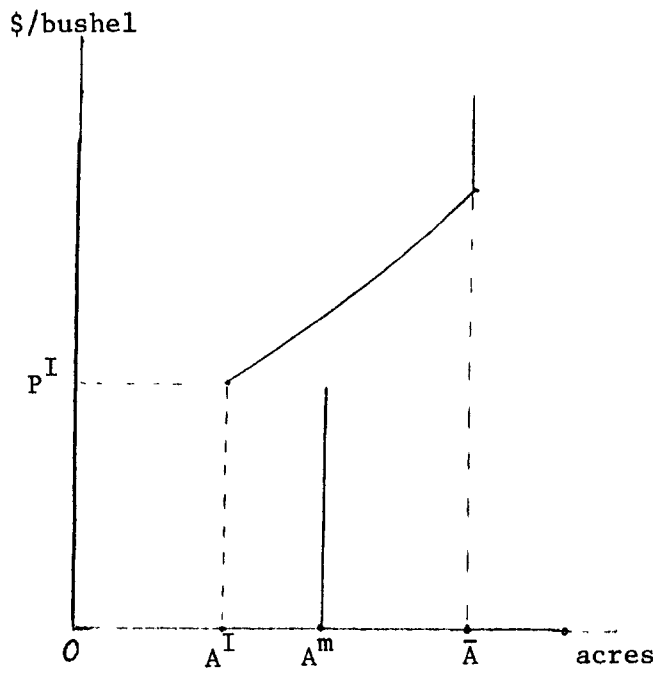


FIGURE 5

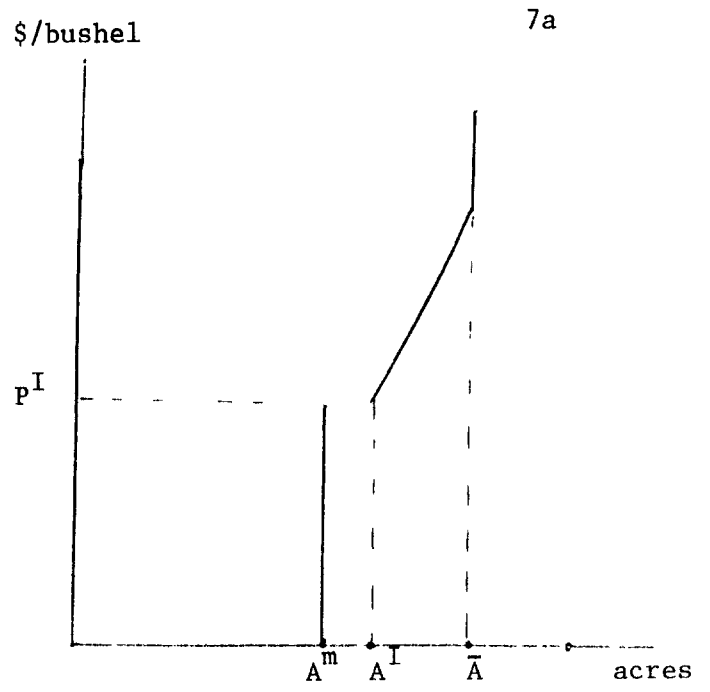
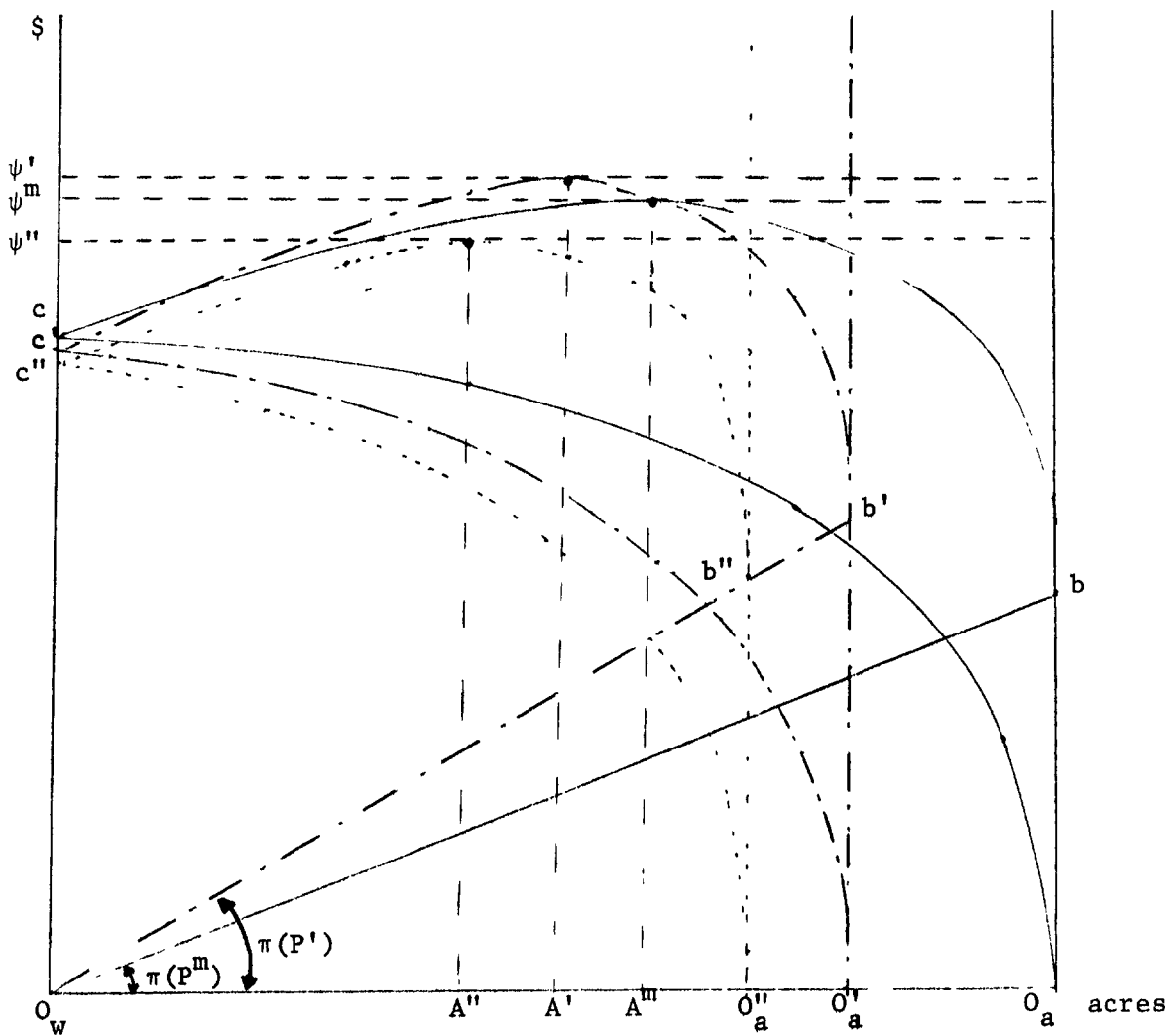
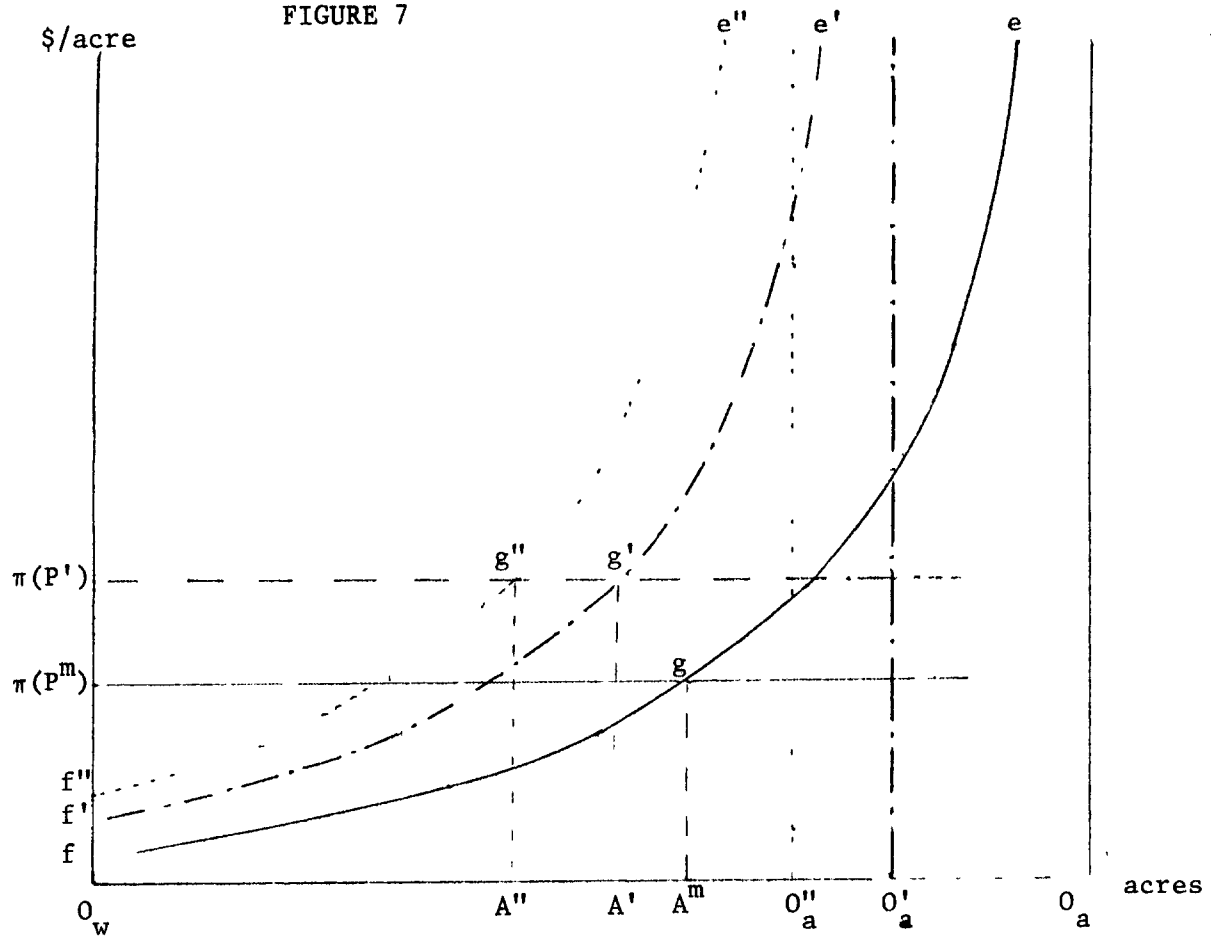


FIGURE 6

FIGURE 7

7b



diverted area results in reducing "wheat" acreage. This is true for every given support price, so in terms of figures 5 and 6 this means a shift of the acreage-support price curve to the left (i.e., for each support price, "wheat" area is smaller). In addition, total net income at the best allocation decreases when diversion increases (compare ψ'' with ψ' in figure 7) so at some level of diversion, given the support price, the farmer will be indifferent whether to participate in the program or to withdraw. Notice also, that at the indifference level of diversion, "wheat" acreage might be either smaller or greater than the nonparticipation acreage, so that when the farmer leaves the program his "wheat" area might be increased or decreased. For a given support price, a curve which describes "wheat" acreage for different diversion levels is drawn in figures 8 and 9 which correspond to the case of smaller and greater indifference acreage respectively. In these figures A^m is the nonparticipation acreage, A^I is the acreage at the indifference level of diversion A^{dI} .

The industry "wheat" acreage as a function of the diversion restriction is obtained by summing the individuals' functions. As with the function of support price, the slope of the curve of acreage against diversion might be negative, as an increase of the diversion restriction makes the participants reduce their land allocation to "wheat", and as more and more farmers whose indifference acreage is greater than the nonparticipation acreage leave the program. However, it might be the case that the nonparticipation acreage is greater than the indifference acreage and in this case the slope of the industry wheat acreage as a function of the diversion level might be positive.

All the last discussion can be summarized graphically as follows. Let us draw iso-income curves in the (P^{LS}, A^{ds}) plane, i.e., all the combinations of support price and diversion which result in the same total net

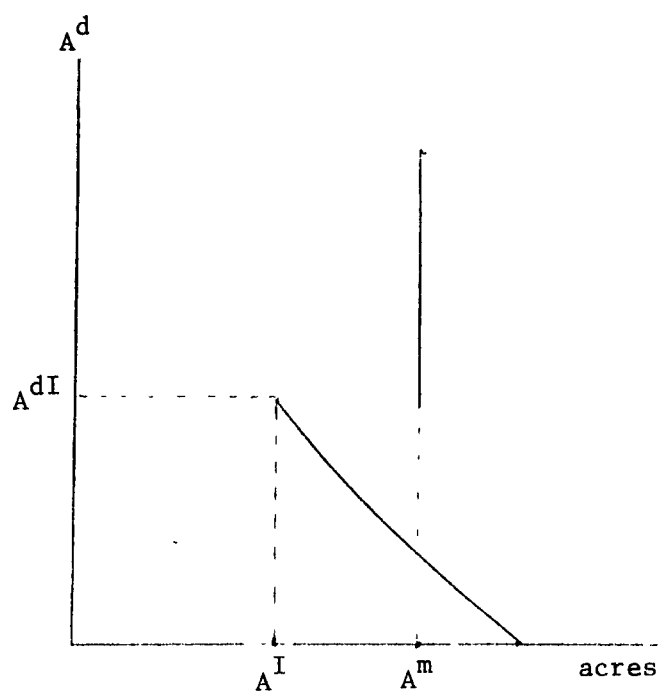


FIGURE 8

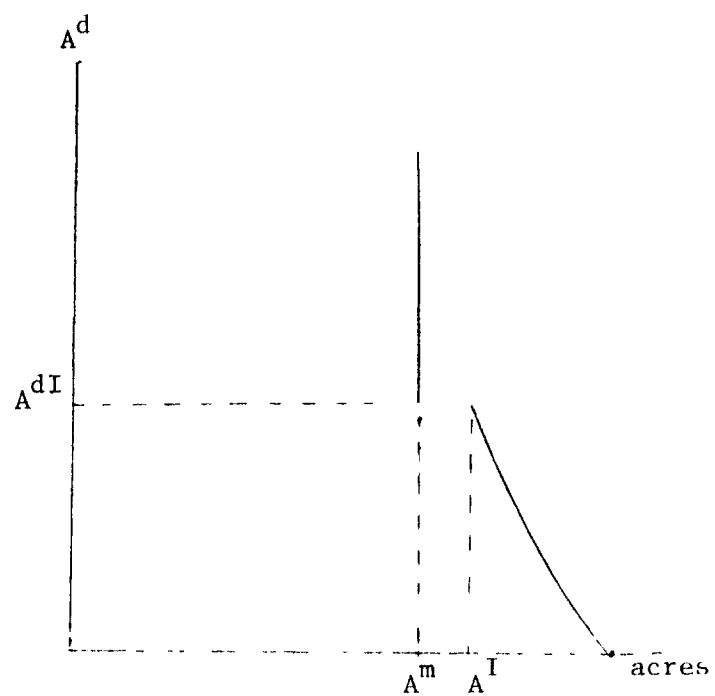


FIGURE 9

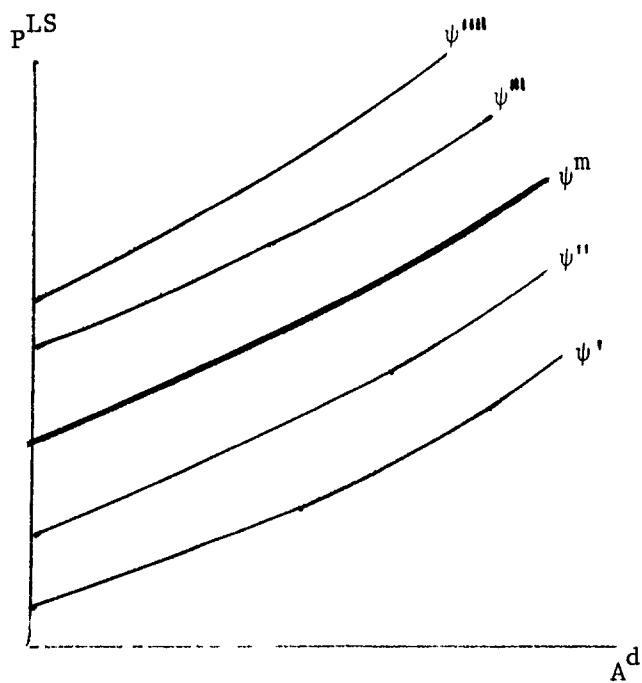


FIGURE 10

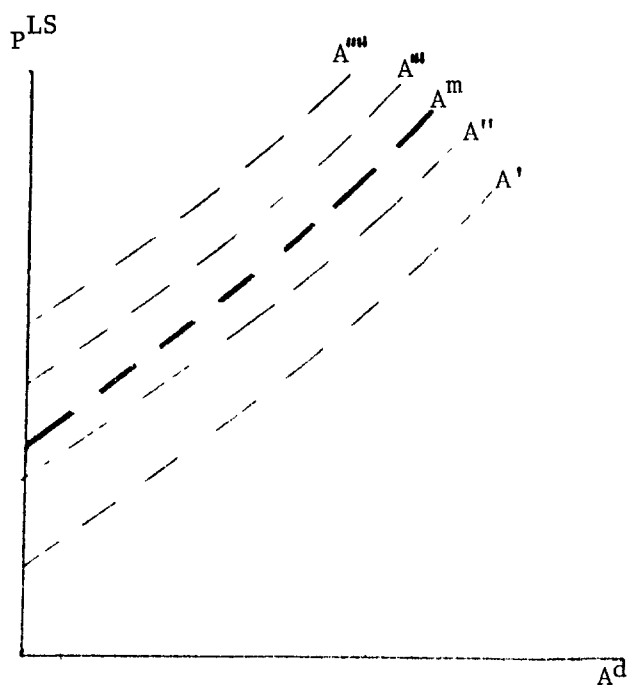


FIGURE 11

income. It is obvious that such an iso-income curve has a positive slope. Some iso-income curves are drawn in figure 10, denoted by ψ' , ψ'' , ψ''' , such that ψ''' represents income greater than ψ'' , greater than ψ' , etc. One of these iso-income curves represents net income which is equal to the nonparticipation income, i.e., it is the combinations of support prices and diversion areas at which the farmer is indifferent as to whether or not to participate in the program. This iso-income curve is denoted by ψ^m in figure 10. Since all the combinations below and to the right of ψ^m are inferior to ψ^m and all which are above and to the left of ψ^m are superior to ψ^m , ψ^m itself is the indifference combinations of P^{LS} and A^{ds} .

In a similar way, one can draw an iso-acreage curve which indicates the combinations of support-prices and diversions which result in the same "wheat" acreage under participation. The slope of an iso-acreage curve in the (P^{LS}, A^{ds}) plane is also positive. A whole "map" of iso-acreage curves is drawn in figure 11 designated by A' , A'' , A''' ...to indicate increasing acreage ($A' < A'' < A'''$... etc.) One of the iso-acreage curves corresponds to the nonparticipation acreage and is denoted in figure 11 by A^m . Note that A^m and ψ^m reach the P^{ds} axis at the same point, i.e., at P^m .

Let us combine the two "maps" of iso-income and iso-acreage together in the same figure. Generally, two cases are possible.

Case 1. The slope of the iso-acreage curves is greater than the slope of the iso-income curve. This case is depicted in figure 12. In this case the indifference acreage is smaller than the nonparticipation acreage. As a result, when the support price is just above the indifference level the farmer will reduce his acreage when he enters the program. In this case the aggregative acreage of the

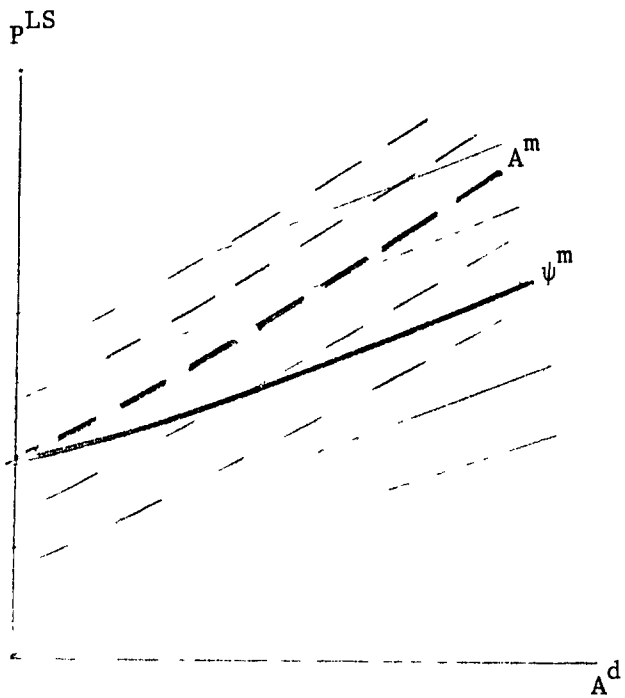


FIGURE 12

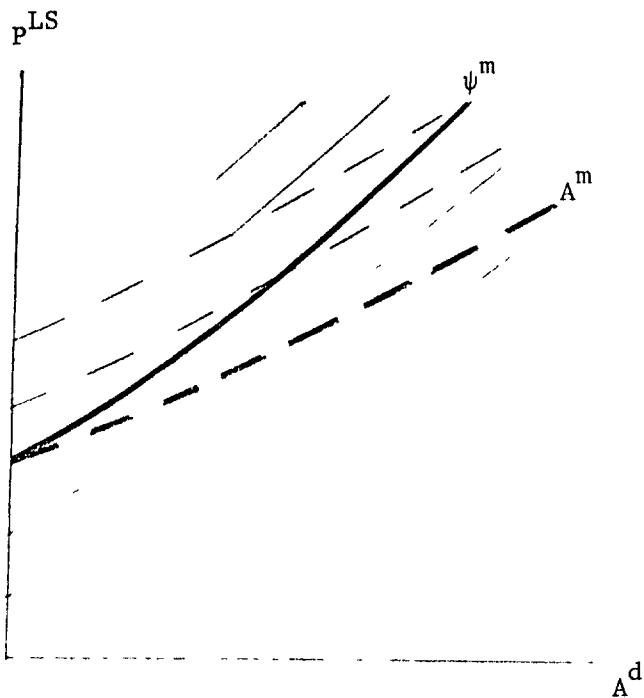


FIGURE 13

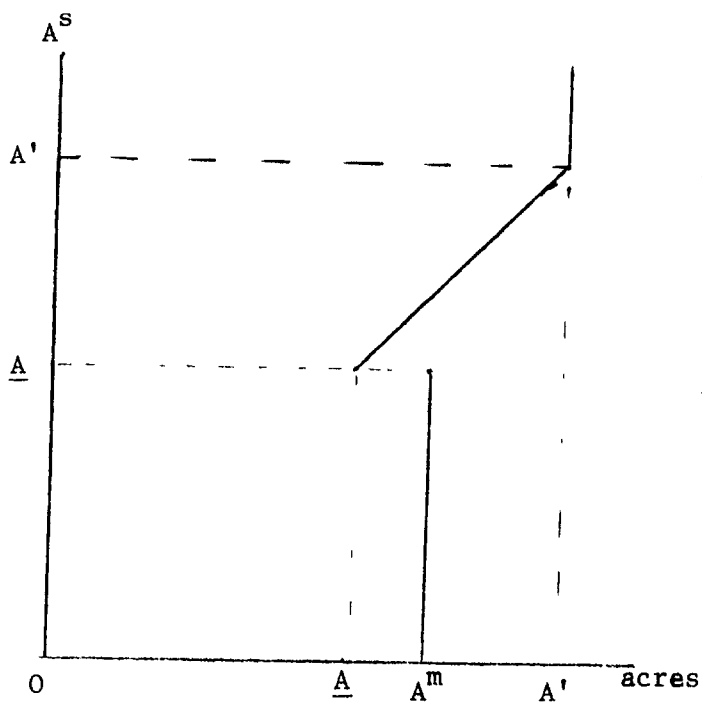


FIGURE 14

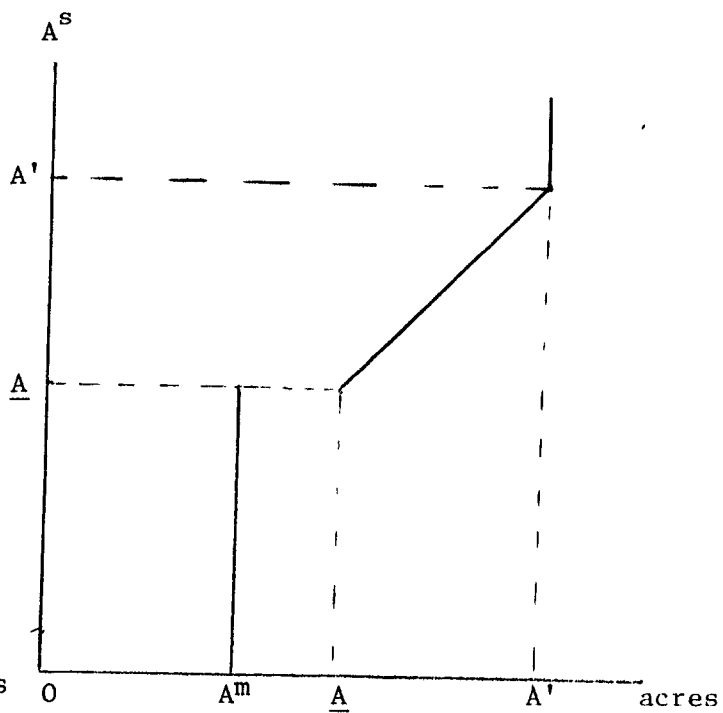


FIGURE 15

whole industry might increase or decrease as P^{LS} increases. Similarly, total acreage might increase or decrease as the diversion restriction increases.

Case 2. The slope of the iso-acreage curves is smaller than the slope of the iso-income curves (figure 13). In this case the results are unique: an increase of P^{LS} and a decrease of A^{ds} result in an increase of total "wheat" acreage.

So far, it has been assumed that there are no maximal "wheat" acreage constraints. Let us introduce this restriction to the analysis. The only interesting case is of course, the case in which this restriction might be effective, i.e., when the linked support price and diversion are such that the farmer chooses to participate in the program. Such a case was presented by the dashed curves in figure 4 above, where P^m and P' are the expected market price and linked support price, respectively, A^m is the nonparticipation allocation of land, A' the allocation when support price is P' and diversion is $A^{ds} = \overline{O'a}$, where there is no maximal acreage restriction. ψ^m is the maximal net income with nonparticipation and ψ' is the maximal net income under participation when there is no maximal acreage restriction. Let us denote the minimal land allocation under participation that gives at least the nonparticipation net income (ψ^m) by \underline{A} (see figure 4). It is obvious that given P' and A^{ds} , if the maximal acreage allotment A^s is less than \underline{A} , the farmer will not participate in the program and will allocate his land according to A^m . As A^s , the "wheat" acreage allotment, increases above \underline{A} he will participate and plant A^s of wheat ($\bar{A} - A^{ds} - A^s$ of alternative crop) until A^s is equal to A' , the allocation of land in a program with no allotment restriction. Above A' the maximal acreage restriction is not

effective since the farmer would not exceed A' anyway.

For a given linked support price P^{LS} and diversion restriction, one can plot the farmer's "wheat" acreage against the allotment. In the effective range (i.e., between \underline{A} and A') the slope of this curve would be 45° . As in the analysis of P^{LS} and of A^{ds} , here also, the indifference allotment \underline{A} might be either less than or greater than the nonparticipation acreage. The two cases are plotted in figures 14 and 15 respectively.

The effect of increasing the maximal "wheat" acreage allotment on the aggregate acreage cannot be signed a priori. In the case that the allotment of indifference for the individuals is smaller than the nonparticipation acreage, an increase of the maximum acreage constraint will cause more and more individuals to join the program and reduce their "wheat" planting. However those who have already participated will increase their acreage.

3.3. Diversion payments.

Assume that a diversion payment is added to a linked support price, which was analyzed above, i.e., the government offers to pay the participants for the diverted area. Suppose that the rate is R^d dollars per acre, total payment is $D = R^d \cdot A^{ds}$, where A^{ds} is the area which the farmer has to divert if he participates in the program. In terms of figure 4 the effect can be described by shifting the net income curve of the alternative crop, $\overline{O_a c'}$, and the total net income curve, $\overline{b' c'}$ upwards by an amount equal to D . However, this diversion payment is a lump sum so it does not affect the marginal curves (upper section of figure 4) and therefore the optimal allocation of land under participation in the program is not changed. On the other hand, the profitability of participation does change, that is, the indifference levels of the linked support price, of the allotment constraint

and of the diversion restriction, change as the diversion payment increases. In terms of figures 10, 12 and 13, each iso-income curve now represents higher net income than originally, by the amount of diversion payment D . In particular, the iso-income curve which corresponds to the nonparticipation income shifts downwards, which means that the indifference conditions of support price and diversion shift towards lower support price and greater diversion.

Recall that there are two possible cases with regard to "wheat" acreage at the indifference state.

Case 1. The indifference acreage is smaller than the nonparticipation acreage.

Case 2. The indifference acreage is greater. In case 1, the effect of raising the diversion payment on total aggregative "wheat" acreage is negative while in case 2 it is positive.

Note that a special case of the general linked support price with diversion payment is when the support price is zero, that is the only payment is the diversion payment. In this case the optimal land allocation to "wheat" under participation is always smaller than the nonparticipation acreage. It follows that raising the diversion rate causes more and more individuals to join the program and to reduce their "wheat" planting, so that the aggregative acreage decreases.

The diversion payment discussed above was conditioned on a fixed diverted area, and as such was considered as a lump sum. Assume now that a fixed rate per acre is offered to variable amounts of diverted area. To analyze this case, let us relax the assumption of constant returns to scale

in "wheat" and assume the usual assumption of diminishing marginal productivity of land. For each expected market price, P^m , the marginal net income of "wheat" area is negatively sloped instead of being a horizontal line in the previous discussion. This curve is denoted by $\pi(P^m)$ in figure 16, in which the marginal net income curve of alternative crop is drawn from left to right and is denoted by ϕ' . The "market price" allocation of land is at the intersection of the two marginal curves, A^m in figure 16. If a diversion payment is announced that is higher than the marginal net income at the "market price" then the optimal land allocation is such that $R^d = \pi = \phi'$. In figure 16, the land allocation for a diversion rate R^d is: $\overline{O_w A_w}$ acres of "wheat", $\overline{O_a A_a}$ acres of alternative crop, and diversion of $\overline{A_w A_a}$. By raising R^d , the diverted area increases while "wheat" area decreases (as well as the area of the alternative crop). The aggregative "wheat" acreage is also a decreasing function of R^d .

To summarize this section, the acreage response to some agricultural programs has been analyzed. In two unlinked programs, namely, support price and diversion payment, the effect of changing in the parameters of the program on the acreage of the crop under consideration could be uniquely signed. However, in the linked program the direction of change in "wheat" acreage, in response to changes in the linked support price, or in the allotment or in the diversion restriction cannot a priori be determined. There might be contradictory effects and the net effect is a matter of empirical finding.

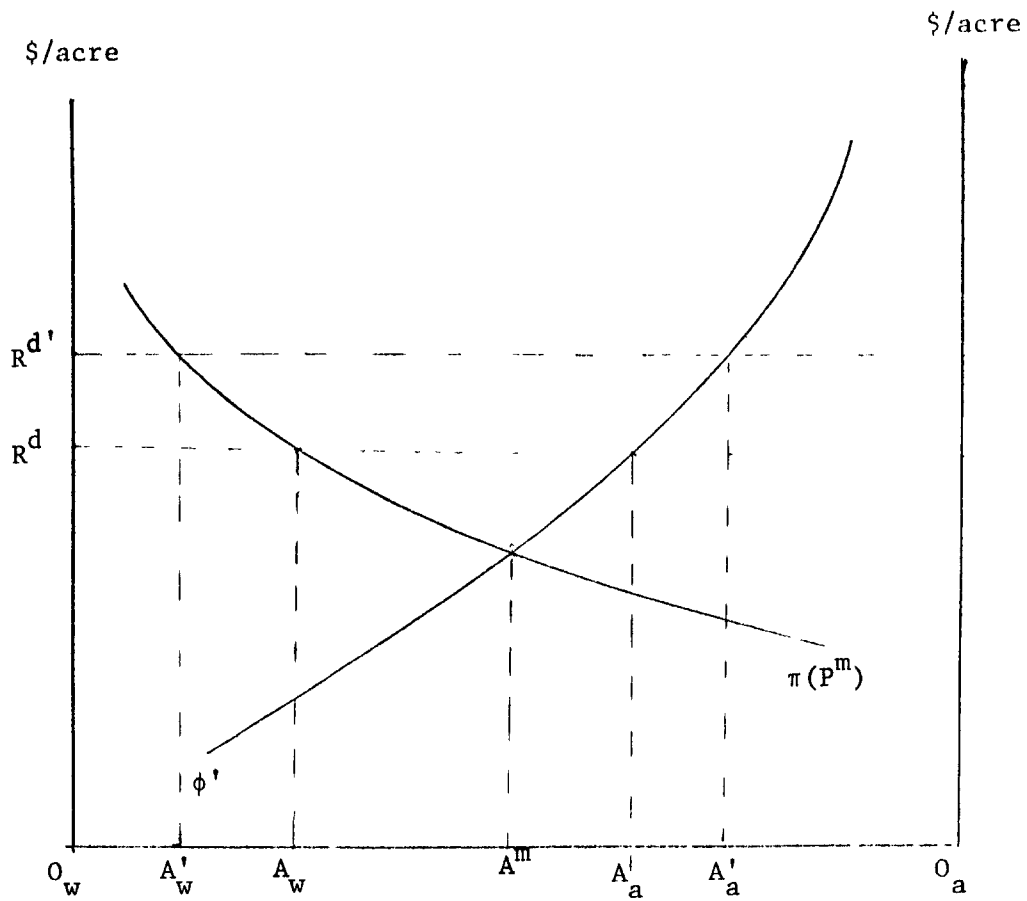


FIGURE 16

4. Some comments on "effective support price."

In the last few years, several articles have been published in which price-acreage relationships of various grain crops were estimated under conditions of support price and acreage restrictions (Houck and Mann (1968) [1], Houck and Subotnik (1969) [2], Houck and Ryan (1972) [3], Ryan and Abel (1972 and 1973) [4, 5, 6]). In these articles, the notion of an "effective support price" was introduced. This variable was supposed to represent the effect of both the support price and the various acreage constraints. Such a summarizing variable might be useful for prediction and for policy analysis if a proper method to estimate it is available. In what follows it is aimed to clarify some theoretical points concerning the "effective support price" and to comment on the theoretical background of its empirical estimation.

It is best to describe the whole matter by quoting one of the articles mentioned above, e.g., Houck and Subotnik (1969) [2]:

Theoretical Model of Effective Support

Price support programs for a number of important crops in U.S. agriculture involve a guaranteed minimum support price in return for which participating farmers agree to reduce acreage relative to some historically established base. The guaranteed minimum price may include several elements--the basic price support loan rate, a direct payment based on participation level, and a direct payment based on production from permitted acreage under the program. It is clear, therefore, that supply analyses which utilize only the basic support rate for several competing commodities will be less useful than those into which the mandatory or voluntary acreage restrictions imposed on farmers can be incorporated.

One approach to this question of incorporating both price support and acreage restrictions in a supply analysis involves the weighting or "normalization" of announced support rates by means of the acreage restrictions imposed on participating farmers. For this discussion, a rather simple analytical framework is developed. A more complete treatment of these ideas is contained in the appendix.

Let a simple acreage supply function be represented by

$$(q1) \quad A = a_0 + a_1 P$$

where A is the harvested acreage and P is the relevant supply-inducing price. All other supply shifters are held fixed and incorporated in a_0 .

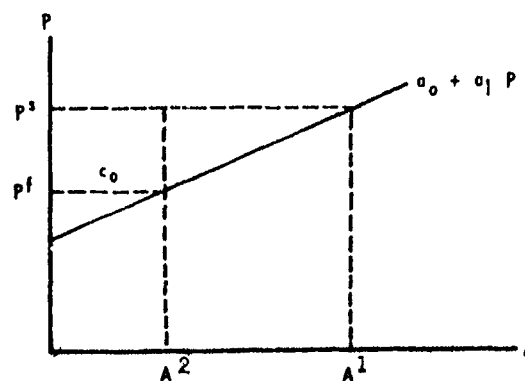


FIGURE q1

Assume now that a support price p^s is offered to the farmers only if they are willing to reduce acreage to A^2 , compared to A^1 which would be harvested without restriction at p^s . This is shown in figure 1. The price p^f is that which would induce farmers to hold acreage at A^2 without restrictions. For this discussion, p^f is called the "effective support price" and is the alternative cost of committing A^2 to this commodity. This effective support rate is the variable which will be taken into account by farmers in planning production patterns among alternative crop enterprises.

The announced support rate p^s may be higher than p^f because policy makers wish to maintain farm income above the level which would occur under p^f (area c_0 in figure 1). This added income is only available to farmers when their acreage is held at A^2 .³

For analytical purposes, it is useful to find a function which transforms p^s into p^f by normalizing or deflating the announced support rate. Consider equation (1) evaluated at two points, p^s and p^f . At each of these points

$$(q2) \quad a_1 = \frac{A^1 - a_0}{p^s} = \frac{A^2 - a_0}{p^f}$$

This relationship implies that

$$(q3) \quad p^f = \frac{A^2 - a_0}{A^1 - a_0} p^s$$

If $a_0 = 0$ or is small relative to A^2 and A^1 , then

$$(q4) \quad p^f \cong (A^2 / A^1) p^s$$

In this case, the effective support rate can be expressed as a function of announced support rate and a ratio of the permitted to the desired acreage. Where no acreage restrictions are employed, p^s and p^f are identical since $(A^2 / A^1) = 1$.

³For additional discussion of this general topic, see (1).

It is not entirely clear from the quotation what is the exact meaning of the curve in figure q1 and in particular what is A^2 . Therefore, it might be useful to interpret it in a somewhat more formal way. Let us denote the maximal allotment constraint by A^s (A^s can be expressed in terms of total area, or as a ratio of the allotment to some basic area). Generally, given all other shifters of the supply function, the planted area, A , is a function of both the support price, P^s , and the allotment constraint, A^s . Denote this function, generally by

$$A = f (P^s, A^s).$$

An interpretation of the curve in the figure is that it is the aggregative acreage response of a crop to the support price when there are no acreage restrictions, i.e., to an unlinked support-price. Formally, denoting the last function by $g(P^S)$, it is defined by

$$g(P^S) \equiv f(P^S, \infty).$$

where ∞ indicates an acreage restriction which is sufficiently large to be ineffective.

What is A^2 in the quoted figure 2? One possibility is that A^2 is identical to the acreage restriction A^S . This interpretation is useless, since P^f , if defined accordingly, does not indicate (through the function $g(P)$) what will be the planted area, A , which is the objective of the procedure. Thus, A^2 (and accordingly P^f) should be interpreted not as the allotment but as the planted area which results from the support price P^S and allotment A^S , that is

$$A^2 \equiv f(P^S, A^S)$$

The definition of P^f in this case is

$$P^f \equiv g^{-1}[f(P^S, A^S)]$$

where g^{-1} is the inverse of g (assuming g is monotonic).

Let us use additional notation, which was also used in the recent articles of the above list. Define the "weight" by which P^S is transformed to P^f by r , i.e.:

$$P^f \equiv rP^S$$

It should be noted that the last formula is nothing more than an identity which defines r . r is said to be "the adjustment factor expressing the acreage restrictions in the program". (Houck and Ryan (1972) [3]).

However, generally, r is not a function of only the acreage restrictions but also of the support price itself:

$$r \equiv \frac{g^{-1}[f(P^S, A^S)]}{P^S}$$

In fact, the analysis of linked price in section 3 above shows that the effect of A^S depends on the level of P^S . For example, the indifference allotment, i.e., the level of allotment at which an individual farmer decides to participate, decreases with P^S . The higher P^S is, the stronger the positive effect of increasing A^S on the aggregative acreage would be. So, r is not a pure function of the restrictions. Changing the support price, P^S , affects P^S directly, and also "indirectly" through r .

The authors of the quoted articles suggest a procedure to estimate r in a given year, which is based on a ratio of the allotment to some base acreage. In this way, they adjust P^S and estimate P^f . The estimated P^f is then used as data in the estimation of the g function (i.e., $a_0 + a_1P$ in the quotation). In view of the fact that \hat{r} , the estimated r , is based only on the allotment, at least the theoretical background of this procedure seems to be poor. However, it should be noted that good results were obtained when using this procedure in empirical estimations of supply equations of various grains. The lack of sufficient theoretical background calls for additional investigation to explain the "success" in the empirical studies. This is important especially if one intends to use the procedure in forecasting and in policy analysis. A theory is needed which can explain the conditions under which \hat{r} can be estimated by using allotment alone. Before using a procedure which proved good in analyzing past data, in forecasting, one must verify that the basic conditions do not change. For example, one may want to predict the effect of increasing the allotment.

To do that, he has to estimate the new \hat{r} , to calculate P^f and to insert it into the "supply" equation $A = g(P)$. Using the procedure described above, \hat{r} is estimated only by the allotment, which means that the same "weight" is applied to every support price. However, theoretically at least, it has been shown in section 3 that the effect of the linked support price on the aggregative planted acreage depends on the level of restrictions and this level might even change the direction of the price effect.

This brings us to another point. In calculating P^f , no distinction was made between linked and unlinked support price P^s . This seems to be erroneous since it has been shown (section 3) that the effect on acreage is different and even might be different in direction.

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