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Assessing Impacts of Agricultural and Home Economics Research

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Public resources for agricultural and home economics research (AHER) have come under increased scrutiny at both federal and state levels as governments seek to slash spending on items viewed as non-essential. While most people would view abundant, safe, and low-cost food and fiber, a clean environment, adequate nutrition and health, and economically viable farms, families, and rural communities as essential, many people do not perceive the linkage between these items and agricultural and home economics research. Public perceptions play a key role, together with lobbying by interest groups, in shaping federal and state budgets. Public spending on AHER in the United States represents a relatively modest $10 per person per year, but research systems must demonstrate accountability and worthiness in the eyes of politicians and the general public for this support to continue. Demonstrating that worthiness requires that the research have a high payoff, that the payoff be measured, and that it be communicated to appropriate audiences.

High rates of return to agricultural research investments have been estimated in previous studies for aggregate agriculture and for research on several specific commodities (Echevarria, 1990; Norton and Ortiz, 1992). The 30-60 percent annual economic rates of return found in many of these studies have been used to justify research budgets to both Congress and state governments. However, as budgets have continued to tighten, pressures have intensified to document the impacts associated with particular types of research in agriculture and home economics including the social sciences. So the question becomes, how do we do it? How can we evaluate research programs in both technical and social sciences and communicate the results to appropriate audiences?

My comments today attempt to address these questions and are divided into three parts. First, I will consider how we can conceptualize the benefits of AHER, for both technical and social sciences. Second, I will explain how we can use this conceptualization in evaluating programs. Lastly, I will offer some observations on how the results of research evaluations can be used as a resource in budget discussions, particularly at the state level.

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Conceptualizing Benefits Research[1]

It is helpful to view agricultural and home economics research as production activities having both inputs and outputs. The principal inputs consist of effort by scientific personnel, and the use of laboratory facilities, experimental plots and animals, computers, libraries, etc. The outputs consist of additions to knowledge. This knowledge comes in many forms and is utilized in several ways. In its most basic form, it might further our understanding of nature and of human behavior and allow us to make technological and institutional advances that otherwise would be impossible. For example, without knowledge of genetics, cell biology, and plant and animal physiology, little progress could have been made in the areas of plant and animal breeding. Or, without understanding the workings of economies and social systems, little progress could have been made in designing institutions that foster gains from agricultural trade or that facilitate child development. Other knowledge comes in more applied forms such as higher yielding crop varieties, management practices that control insects and diseases while reducing pesticide use and production costs, or knowledge of nutrient requirements of livestock or people. In some cases the knowledge is utilized by farm supply industries in cooperation with their own R&D to create new, more productive inputs. In other cases, it is embedded in new institutions such as policies to help reduce soil erosion or improve the quality of life for the aged.

Knowledge produced by AHER is a capital good. As such, it shares some common characteristics with more conventional forms of capital, such as buildings and machines. First, it takes time to produce, often 5 to 10 years or more. This period is longer for basic than applied research and perhaps for technical compared to social science research. Second, the knowledge pays off over a long period of time. Third, the knowledge depreciates and requires maintenance just to remain intact. Scientists grow old and their knowledge must be passed on to younger generations. Knowledge embodied in new inputs or in policies or other institutions also deteriorates or becomes obsolete. For example, disease resistant varieties of crops succumb to new organisms, or changing economic conditions causes policies to become outdated. Roughly a third of annual expenditures on agricultural research is for productivity maintenance (Adusei and Norton, 1990). The existence of gestation and long payoff periods require that we accumulate and consider the time pattern of benefits and costs in evaluating the net benefits of research.

The Nature of Research Benefits

Knowledge produced by agricultural and home economics research affects agricultural productivity and competitiveness, environmental quality, food and farm safety, human nutrition, the economic vitality of rural communities, family resource management, and other factors. The increased productivity means that more output can be produced with the same amount of total inputs or the same amount of output can be produced with a smaller quantity

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1 This section draws heavily on Alston and Pardey, 1995.

of inputs. Society benefits from the more abundant supply of agricultural products which often results in a lower real cost of food and fiber for consumers. Lower food prices particularly help lower-income people, who spend a larger fraction of their income on food than do higher income people. Other benefits of agricultural R&D stem from a safer food supply, the reduced need to farm highly-erodible lands, the releasing of resources from the farm and the household for use elsewhere in the economy, the increased ability of those who remain full-time in agriculture to earn incomes similar to those outside of agriculture, and multiplier effects on income and employment elsewhere in the economy as a result of expanded agricultural output.

Releasing of resources from agriculture and the household means that labor bears adjustment costs, as do families and rural communities. One of the roles of social science research in agriculture and home economics is to identify and calculate those costs so that policy instruments can be designed to mitigate unacceptable income distribution effects and to facilitate adjustment. Of course all countries experience these adjustment costs as per capita income levels grow with overall economic growth. Income growth and higher wages outside of agriculture raise the cost of farm and household labor (both wage labor and the opportunity cost of operator and family labor). Farmers (and spouses) demand labor-saving technologies in attempts to increase productivity and raise their incomes (on or off the farm and in or outside the household). Without research-induced growth in productivity, it is difficult to obtain and sustain an increase in per capita income in agriculture (or in the household). In an increasingly open trade environment it is simply not feasible for a country to opt-out of technological change in agriculture at least for an extended period of time. If they do, technological change in other countries will continue to reduce prices, causing farmers in the technological-laggard country to exit even more quickly.

However, the issue of labor having to bear adjustment costs illustrates that even though research provides benefits to society as a whole, some people may be made worse off. Hence, research evaluation can help identify gainers and losers as well as the magnitude of their gains and losses if an economic framework is employed that provides a common unit of measure. An economic framework cannot answer the question of whether a particular research program is better or worse than another for society without information on the relative values to be placed on different social objectives. But, in many cases it can shed considerable light on the nature and magnitude of the impacts and tradeoffs involved. Policymakers and the general public can then decide whether society is better off or not.

Basic Economic Framework

A basic economic model of research benefits is presented in Figure 1. Let's consider this model and how it can be used to conceptualize the benefits of research that generates technologies that lower *private costs* of producing goods (and services). These goods might be agricultural commodities, (e.g. corn, wheat), household goods (e.g. clean clothes, cooked meals), environmental goods (e.g. abatement of chemical pollution of groundwater). Then,

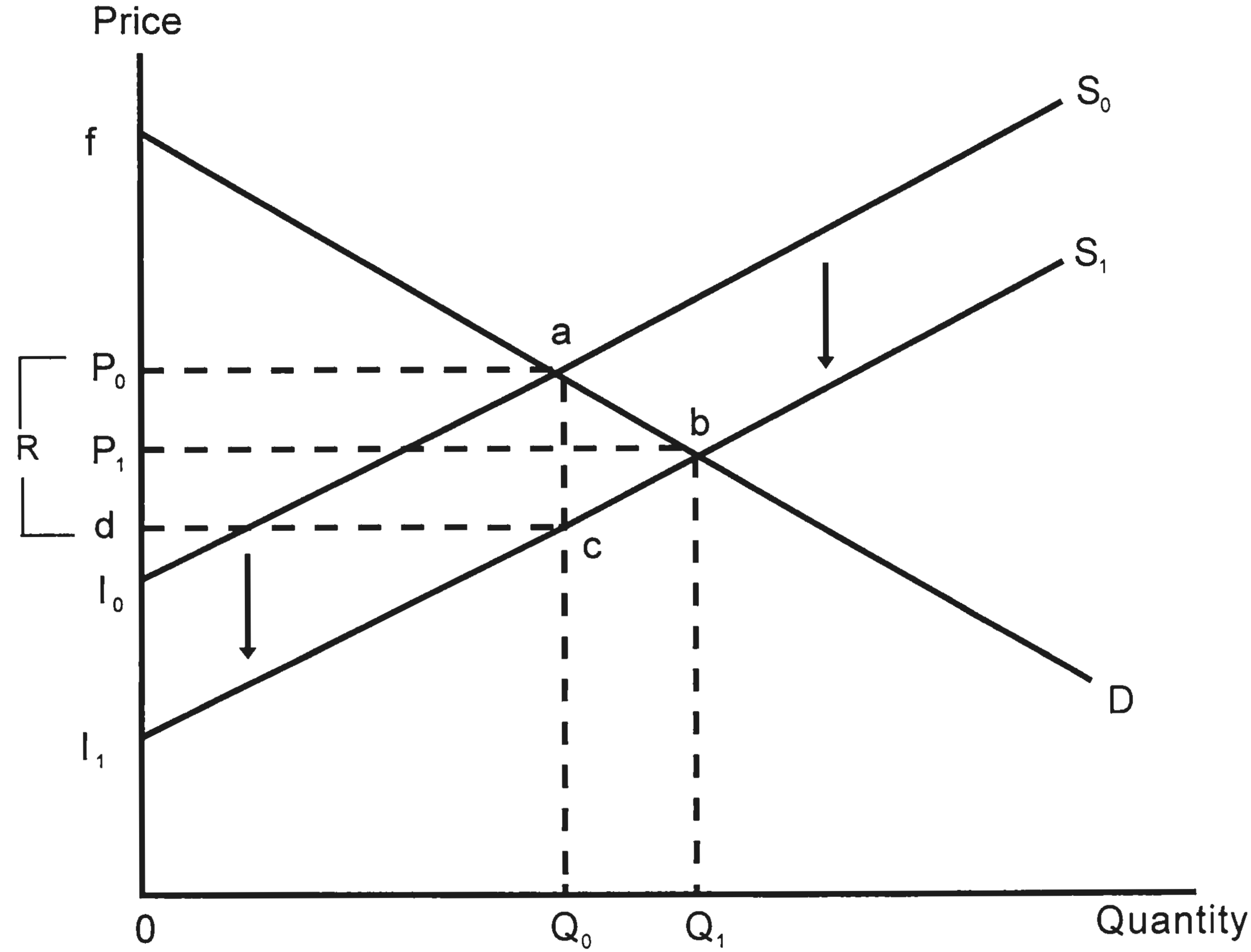

Figure 1. Research induces a shift down in the supply curve from S_0 to S_1 resulting in a cost saving per unit of output of R.

we can alter the model to illustrate the benefits of research that affects the *marginal social cost* of production, which may differ from the marginal private cost due to government interventions in markets (e.g. price support policies) or to externalities (e.g. environmental costs such as water pollution or soil erosion that occur off the farm). Finally, we use the model to illustrate the benefits of research that (a) provides management or market information to producers and consumers enabling them to allocate their existing resources more efficiently, and (b) provides information to policy makers to help them design public policies and other institutional changes.

In the model in Figure 1, S_0 represents the supply curve before a research-induced technical change, and D represents the demand curve. The initial price and quantity are P_0 and Q_0. Suppose research leads to a savings of R per unit in the average and marginal cost of production, reflected as a shift down in the supply curve to S_1. This research-induced supply shift leads to an increase in production and consumption to Q_1 (by $\Delta Q = Q_1 - Q_0$) and the market price falls to P_1 (by $\Delta P = P_0 - P_1$). Consumers are better off because the R&D enables them to consume more of the commodity at a lower price. Consumers benefit from the lower price by an amount equal to their cost-saving on the original quantity ($Q_0 \times \Delta P$) plus their net benefits from the increment to consumption. Although they receive a lower price per unit, producers are better off too, because their costs have fallen by R per unit, an amount greater than the fall in price. Producers gain the increase in profits on the original quantity--i.e., $Q_0 \times (R - \Delta P)$--plus the profits earned on the additional output. Total benefits are obtained as the sum of producer and consumer benefits.

Distribution of Benefits

The distribution of benefits between producers and consumers depends on the size of the fall in price (ΔP) relative to the fall in costs (R).[2] This relative size difference depends on slopes or price responsiveness (elasticities) of supply and demand. The more elastic (flatter) supply is relative to demand, the greater the consumer share of total research benefits (and the smaller the producer share) and vice versa. In the extreme case of perfectly elastic (horizontal) supply with downward sloping demand, all of the research benefits go to consumers because the research-induced change in price is equal to the research-induced cost savings and there is no producer surplus. When demand is perfectly elastic, all benefits go to producers because there is no research-induced reduction in price.

The assumption that price is unaffected by research, so that all of the research benefits go to producers, is likely to be a reasonable approximation for several commodities for which U.S. production is too small to appreciably influence the world price (e.g. sugar) or for which there is a binding support price set by the government (e.g. dairy). On the other hand, when consumption is very unresponsive to lower prices (i.e. demand is inelastic), most of the cost

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[2] It also depends on the nature of the supply curve shift (e.g. parallel as shown in Figure 1 versus a pivotal shift which would reduce producer benefits but which is also less likely).

savings will be passed on to consumers as lower prices, and there will be little, if any, benefit to producers. This situation is likely to occur for commodities that are not traded internationally and for perishables for which the United States produces a big share of relevant total supply. On average, agricultural producers as well as consumers gain from research.

Extending this analysis to the household, the demand for most of the goods produced such as cooked meals, clean clothes, clean houses, and healthy children is relatively inelastic so lowering the cost of producing these goods primarily benefits consumers in the household. The inelastic demand curve also implies that as new technologies lower the cost of household production, household labor will be released to seek employment outside the household, where it can earn a higher wage.

To the extent that the model in Figure 1 represents an agricultural market, "consumer" benefits include all of the benefits due to reduced price and greater availability of the farm product beyond the farm gate (i.e. to people involved in the industries that transport, process, distribute, and sell the product up to retail and to final consumers). Similarly, "producer" benefits include all of the benefits due to cost savings and increased production accruing up to the farm gate (i.e. to people who supply inputs used by farmers, including land, labor, machinery, and material inputs, as well as to farmers). In addition, the benefits include those to all "consumers" of the product and all "producers" of the product, including foreigners. The model, however, can be "disaggregated" to assess benefits to producers and consumers at different levels in the marketing chain and in domestic and foreign markets.

Social Costs and Benefits

The measures of research benefits illustrated in Figure 1 are based on an assumption that marginal private costs are equal to marginal social costs. There are two primary reasons why private and social costs may differ that have implications for research evaluation: (a) government interventions in markets and (b) research impacts that are not priced in the market place (e.g. environmental externalities).

Government Intervention--It may seem natural to argue that the social payoff to research will be smaller if an industry is heavily subsidized (such as rice) or larger if an industry is unprotected (such as poultry) or taxed (such as wine). This intuition is often incorrect. Even if there are social costs as a result of storing excess production or because resources are not being employed in their optimal use, greater productivity can be socially beneficial because if lowers the cost of *all* production, not just the additional production resulting from the research. The particular policies can be superimposed on the model shown in Figure 1 and the effects of market distortions measured. The most important effects of research in the presence of government interventions is to change the distributions of benefits with the effects on net social benefits dependent on the nature of the market, the intervention, and the research. Unpriced Impacts--Several impacts of agricultural research are "non-market" in the sense that they are not priced in the marketplace. For example, many types of research on environmental and natural resource issues result in non-market impacts, e.g., research that affects wildlife habitat and diversity, farm worker health, and water quality. Research related to factors that enhance child development, reduce teen pregnancy, and enhance rural services and amenities are other examples. However, many of the impacts of these types of research can be conceptualized in a market model and innovative means developed to quantify them. For example, when a negative production externality exists such as water pollution or soil erosion, the cost to society as a whole is greater than the cost to private producers. This difference can be reflected in our model by considering the marginal social cost curve (MSC) to be above the standard supply (marginal private cost) curve (S_0) (See Figure 2). The existence of the environmental externality means that the true cost of the production to society is greater than that reflected in the private supply curve and that too much of the product is being produced. The effect of a specific type of research might be to reduce the external cost (shift down MSC), increase the external cost (shift MSC up or shift it down less than S_0 shifts down), or have no effect. Scientists familiar with the research can work with economists to identify the physical changes resulting from the research (e.g. a change in pesticide or fertilizer use and its effect on the environment) and the economist can use "contingent valuation" or other techniques to place a value on the change in the environmental hazard.[3]

Social Science Research--Many types of social science research in agriculture and home economics provide management, market, or other information to producers or families to help them allocate their resources more efficiently. Efficiency gains can result from improved timing of input usage, fuller exploitation of the complementary relationships among inputs, and more profitable or utility maximizing combinations of inputs and outputs given the technology. Efficiency of household as well as agricultural firms can be enhanced. The value of management and market information is derived from the reduction in uncertainty facing individuals about how to allocate their inputs.

Information produced by social science research is often used by policymakers or groups of individuals who redefine public policies, property rights, or, more generally, institutions. Ruttan (1984) has argued that social science research lowers the cost of institutional change. Because policies, regulations, and other institutions influence allocative efficiency, income distribution, and security associated with farm and household as well as community activities, the value of social science research can be assessed if one can determine its influence on institutional changes that had measurable economic impacts.

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[3] Another approach modeling the supply and demand for pollution abatement could also be used (Alston and Pardey, 1995).

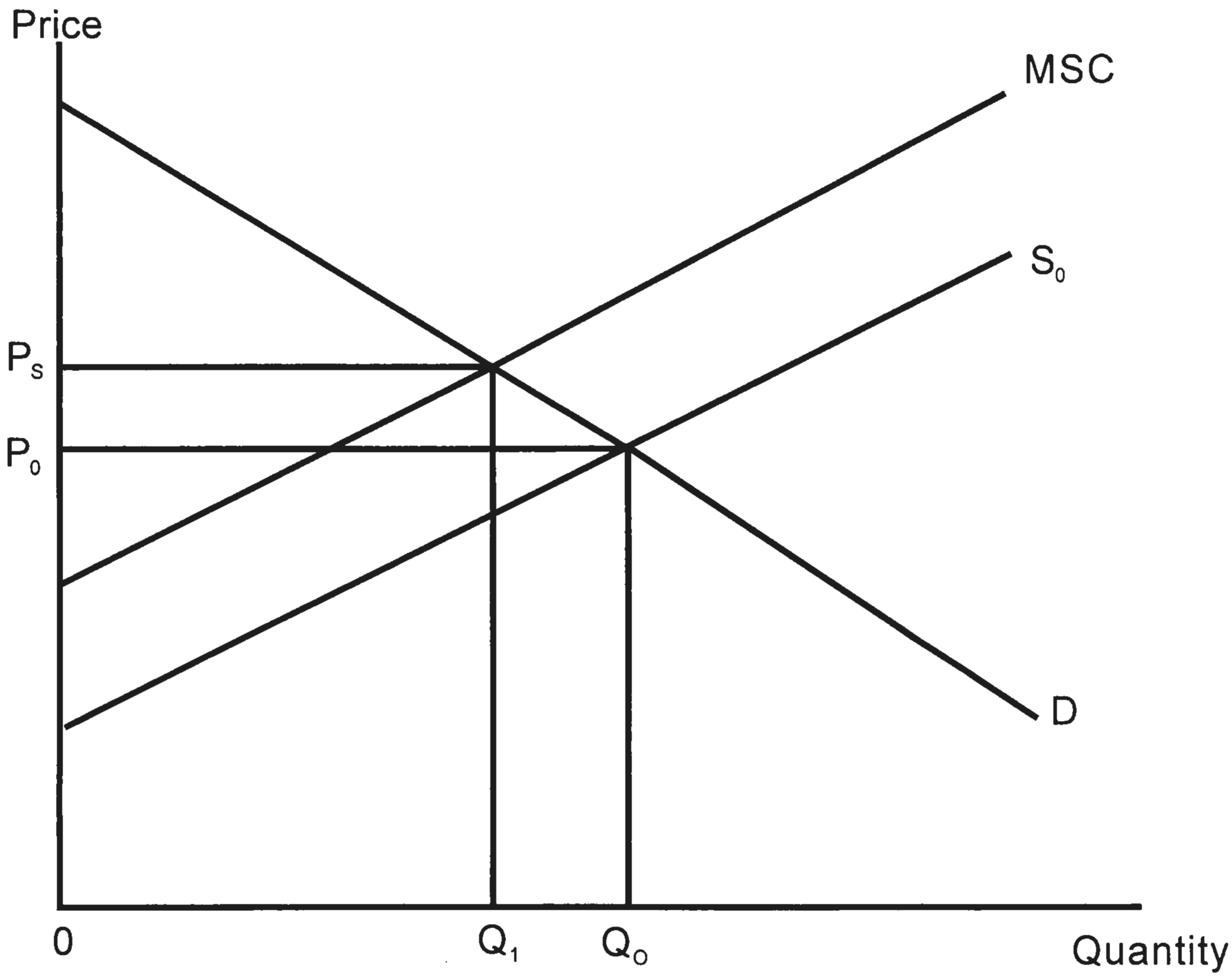

Figure 2. The marginal social cost curve (MSC) may lie above the marginal private cost (supply) curve S_o due to an unpriced external cost.

Applying the Economic Evaluation Framework

The economic model depicted in Figure 1 has been applied in a variety of ways to evaluate agricultural research, in retrospect (ex post) and in prospect (ex ante). It has been applied in a limited way to home economics research (Volker and Deacon, 1982). Implementing any evaluation requires price or cost data and quantity data for the good(s) and services affected by the research. A key piece of information needed is the magnitude of R in Figure 1, or the cost reduction or supply shift due to research. If the model in the figure is applied directly to an ex post analysis in what is known as the *economic surplus approach*, information is gathered on past changes in experimental yields, input costs, time required to conduct the research, extent of adoption by farmers etc., to estimate the degree of the shift year by year. For ex ante analysis, scientists and others are queried about expected yield changes, cost changes, probabilities of research success, extent and timing of adoption, etc. Other factors likely to influence the market are also considered, including government policies, trade, etc. The benefits to producers and consumers are calculated by measuring the appropriate areas off graphs such as Figure 1 and the benefits and costs are discounted over time to arrive at a *net present value* that takes into account the fact that the sooner benefits are received,the more they are worth.

A second approach frequently used for ex post evaluation of research programs is the *econometric approach*. This approach uses historical data on outputs, conventional inputs such as labor, land, seed, fertilizer, etc., and data on research expenditures (and extension and education) to estimate a production, profit, cost, or supply function. The research variable picks up variation in output not accounted for by conventional inputs or by prices, and essentially allows one to statistically estimate the shift in the supply curve illustrated in Figure 1. Estimated benefits based on the model are discounted along with the research costs to arrive at a net present value of research (or oftentimes a rate of return on investment is calculated). Extensive discussion of both of these approaches is found in Alston, Norton, and Pardey (1995).

Evaluating Social Science Research

Social science research seldom affects the quality of production inputs directly and hence usually does not directly shift the supply curve. Rather than being embedded in physical inputs, it is embedded in policies, regulations, and other institutions as well as in the management decisions of producers and consumers. The initial user of the information is not necessarily its ultimate beneficiary. Much of the information generated by social science research is directed toward one or more of the following goals: (1) increased efficiency (including reducing the gap between marginal private and marginal social costs and benefits), (2) altered income distribution in ways desired by society, and (3) improved personal health and safety. Regardless of its goals, social science research can be assessed in an economic framework if the linkage can be drawn between the research and subsequent changes in behavior by policymakers, producers, or consumers. Let's briefly consider how social science research aimed at (a) policymakers and (b) producers and/or consumers might be evaluated.

Research Information for Policymakers--A large amount of social science research output is information aimed at altering institutions (e.g. policies, regulations). To give a hypothetical example, let's assume that a simple policy is already in place to raise the price of milk for farmers (see Figure 3). If prices are supported at P_1 rather than P_0, quantity Q_1 would be supplied rather than the market equilibrium amount, Q_0. The excess production ($Q_1 - Q_0$) would cause the price to consumers to drop to P_2. Producers gain income equal to the area P_1 a c P_0 which results from the price increase ($P_1 - P_0$) on their original quantity produced plus the profits earned on the additional output. Consumers gain P_0 c b P_2 due to the lower price and additional quantity. The government (tax payers) with this policy incurs a cost of P_1 ab P_2. Note that the benefits to society of this policy, $P_1acP_0 + P_0cbP_2 - P_1abP_2$, are negative. There is what economists call a "deadweight" loss of area abc that taxpayers pay but nobody gains (not including any additional costs for collecting the taxes). There is room to improve upon this policy. Let's assume an agricultural economist designs a new policy that still provides a subsidy to producers and consumers but only on their original output and not on any new output that is produced. The deadweight loss has been removed and the policy may be judged an improvement. What is the research worth? It might be worth a maximum of abc minus the research cost. But how do we know that it was the research that caused the policy change? Maybe the politicians felt the cost of the program was too high and just decided to restrict payments to some historical base. This example illustrates the first difficulty in evaluating social science research aimed at institutional change. Even if the research recommends a change, that in fact occurs, it is difficult to establish causality. Often, policy research may have been completed by several researchers independently and the final policy is similar to, but not exactly what, any of them recommended. This causality problem may not be insurmountable if those conducting the impact evaluation carefully trace the process that led to the policy. However, the trail can be difficult to follow because policymakers and their staff are often unaware of where ideas originate in research. And, many ideas originate in basic research in economic theory and methods.

The hypothetical example above also illustrates how "individual" or "unique" policy changes can be. For example, the result of rural sociology or rural development research may suggest policies or institutional changes that generate economic benefits in ways quite distinct from this price policy example, even though they can still be measured in economic surplus terms. Social science research aimed at particular institutions can be evaluated, but we will probably never be able to analyze the impacts of a broad class of institutional changes as we have done with certain classes of production research.

Research Information for Producers and/or Consumers--Many social science research problems provide management or market information to improve resource allocation decisions by producers and consumers. Producers and consumers allocate their resources

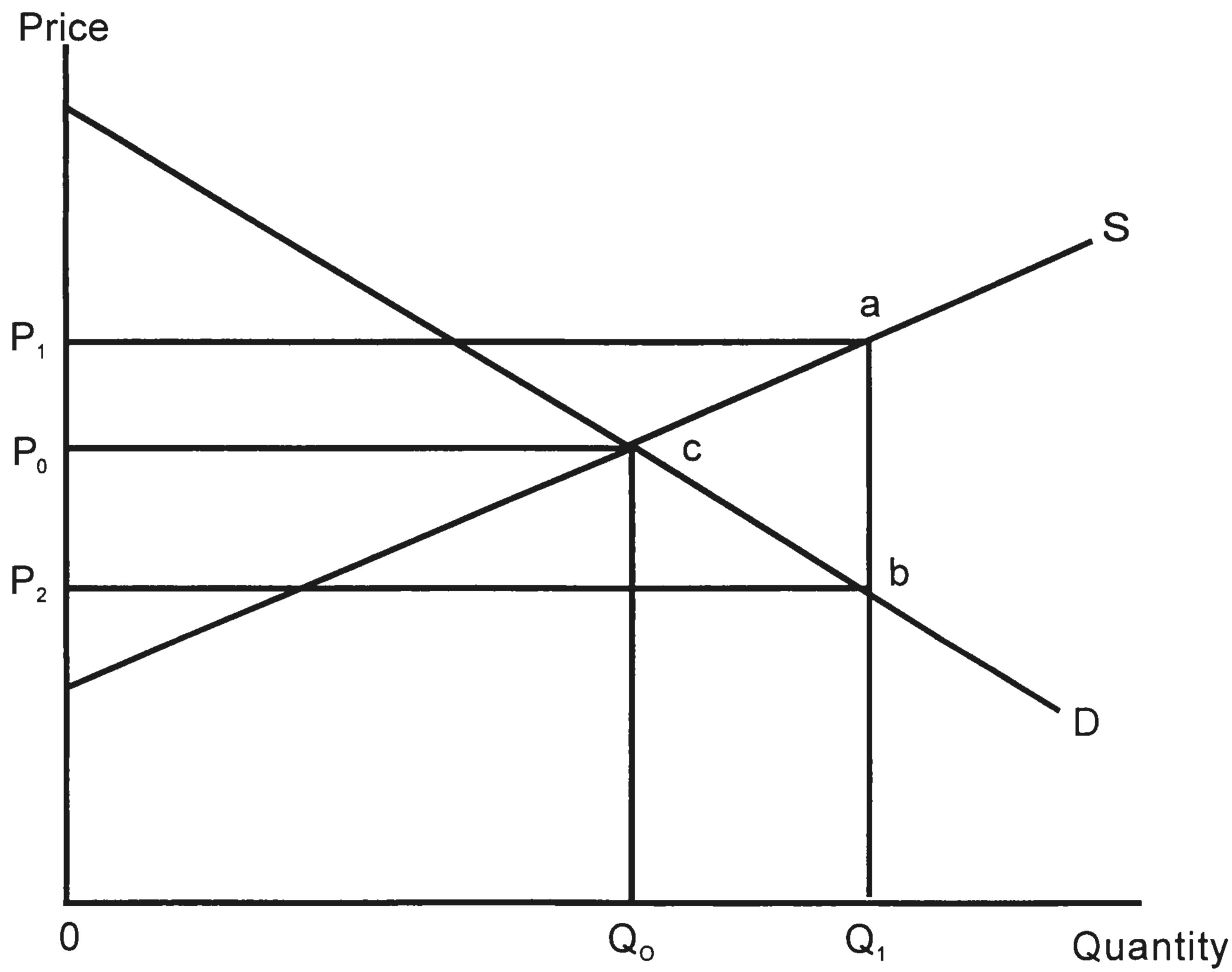

Figure 3. A supported price of P_1 rather than a market price of P_0 would result in a social loss of abc.

based on their subjective estimates of prices, parameters of the underlying technology of goods they produce (or might produce), and characteristics of the goods they consume (or might consume),. Several approaches might be used to value the information produced by research to reduce their uncertainty about these factors. The economic surplus approach mentioned above has been applied by Hayami and Peterson (1971), Bullock (1976), Freebairn (1976, a, b), Bradford and Kelegian (1977, 1978), Norton and Schuh (1981), and Thabet, Ray, and Bullock (1983) to evaluate net benefits of more accurate outlook and price information. This approach can be illustrated in its simplest form using Figure 3 if we assume there is no government policy in place for the commodity but that producers overestimate price by P_1 - P_0. They produce Q_1 which drives the price down to P_2. Consumers gain P_0 cb P_2 because of the increased quantity and lower price, but producers lose what consumers gain as well as abc. They lose abc because the area below their supply curve represents their costs and in this case the price received (P_2) is below their cost. A related graph could be drawn to illustrate the loss incurred if producers underestimate price. Therefore, if social science research efforts lead to price forecasts that are closer to the equilibrium price P_0, then net social losses will be reduced.

Most of the studies cited above present related analysis in which inventory adjustments as opposed to production adjustments occur. Some consider cross-commodity effects as well. Also, if management research enables producers to discover a lower-cost combination of inputs to produce a particular commodity, this should shift down the market supply curve for the commodity and the model in Figure 1 could be employed. Research that helps consumers assess product quality might shift the demand curve and the economic surplus approach can be used to measure the benefits.

The value of information is an outgrowth of uncertainty, and uncertainty can be summarized by the dispersion of individuals' subjective probability distributions over possible states of the world (in other words, individuals perceived odds that the world is a certain way or that different events will occur). Information can change these subjective probability distributions. An approach that can be used to value information produced by research that changes subjective probability distribution is call the "Bayesian Decision Theory" approach.[4] Bradford and Kelegian (1977, 1978) applied Bayesian's decision theory to evaluate the benefits of wheat crop forecasting in the United States. Norton and Schuh used it to value soybean outlook information provided by agricultural economists in Minnesota. With this approach, producers and inventory holders learn not only from observing market behavior, but from the information produced by the research. This information causes these people to revise their prior probability distributions as well as affecting the actual commodity price distribution itself. These changes are evaluated using an economic surplus approach. The value of the information is the difference between maximum economic welfare (utility) with and without the research information.

One difficulty in using this approach is in estimating the subjective probabilities before and after the research. Norton and Schuh assume that subjective prior probabilities were based on historical probabilities of price movements for the previous 15 years. Conditional probabilities were determined by examining past outlook projections and what actually occurred. These probabilities were then used to calculate the posterior probabilities using Bayes formula. No risk aversion was assumed.

There is yet another approach that may provide a better alternative for evaluating broader programs of management and marketing research. This is an approach suggested by Antonovitz and Roe (1982, 1988) for valuing information under price uncertainty and by Roe and Nygaard (1980) for valuing information when the parameters of the underlying technology are uncertain to producers. Rather than assuming that producers behave as though their prior probabilities are updated by Bayes Theorem, they suggest means for valuing information based on "subjective" and "actual" or "more informed" production and/or profit functions. They provide one ex post and two ex ante measures of the value of information. The ex post measure is determined by comparing profit realized in the subjective state with profit realized in the state of perfect information. In the two ex ante cases, the actual output price is not assumed to be known, but rather decisions made in the

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[4] The decision theory approach can be summarized as follows: A variety of actions are open to the decision maker, $a_1, a_2 \ldots a_m$. Several states of nature $S_1, S_2 \ldots S_n$ are also possible and the decision maker has some knowledge of the likelihood (prior probability) of such state occurring, $P(S_i)$. With a given amount of knowledge, the decision maker will choose the action a_i which maximizes his expected utility. The expected utility of the jth action is $\Sigma_i u(a_j | S_i)P(S_i)$. Now if additional information, $Z_1, Z_2 \ldots Z_m$ becomes available to the decision maker and he has knowledge of the probability of the information coming true, i.e., $(Z_j | S_i)$. By Bayes Theorem:

$$P(S_i|Z_j) = \frac{P(S_i)\,P(Z_j|S_i)}{\sum_i P(S_i)\,P(Z_j|S_i)}$$

The revised expected value of a_j is now $\sum_j u(a_j S_j) P(S_i Z_j)$. The value of additional information is the difference between the maximum utility with and without the information and this can be compared with the cost of obtaining the information.

subjective state are compared with those made in a more informed state. As with the decision theory approach, value of information generated for the individual firm then can be translated into a measure of the value of information to society using the economic surplus approach.

Norton (1987) used their suggested approach and estimated a profit function for U.S. agriculture using data for 42 states pooled over the agricultural census years 1978 and 1982. The profit function system was estimated using expected prices and then using the parameters so estimated, along with actual prices, optimal profits were determined. The difference was the value of information (allocative error) which was then regressed on a set of variables including research on farm management, marketing, and price analysis; education, extension expenditures on business management marketing; and a coefficient of variation of output prices. Extension had a significant effect on reducing the allocative error but the other factors were non-significant. This approach may merit additional attention, not just for agriculture, but for home economics as well. In summary, these are several approaches that might be tried alone or in combination to evaluate social science research that impacts on producer and consumer decision making.

Before leaving the topic of measuring social science research impacts, let's examine briefly the evaluation of agricultural communications research. The fundamental value of agricultural communications research is that it (a) speeds up information transfer which is valuable because the sooner the impacts occur the more they are worth, (b) causes information to spread farther so the impacts of other research activities are larger, (c) reduces the cost of reaching existing and/or new audiences, and (d) improves the ability of information recipients to understand the information. Each of these impacts can be measured using economic surplus methods.

Using the Results of Research Evaluations

Research evaluations, both ex post and ex ante, are of little benefit unless they are utilized by decision makers when resources are allocated (at national, state, or within experiment station levels). Aggregate ex post evaluations can be most useful for justifying overall agency (national or state) budget requests. Ex post evaluation of specific program areas or even individual research problems help support the public relations efforts that deans, provosts, university presidents, and others undertake with politicians when arguing for support.
To give a concrete example, in 1982 and in 1993 the marginal products and rates of return to research, extension, and teaching were estimated in Virginia using the econometric approach mentioned earlier. The marginal products were combined with an input-output model, adjusted for technical change, to calculate changes in value-added, household income, and jobs associated with changes in research, extension, or teaching expenditures. These results were used each biennium in the 1980's to support college budget requests at the state level. For example, if $2 million in additional budget were asked for, the impacts on agricultural output, gross state product, household income, and jobs were calculated. The college was relatively successful in obtaining budgets requested, but this case illustrates the difficulty of

evaluating social science research. The college may well have been successful without the estimates provided. One of the factors that probably increased the usefulness of the 1982 study is that in addition to writing a journal article and presenting the results at a professional meeting, an information bulletin and a one-page summary were prepared and the results were presented to state legislators.

The 1982 study was updated in 1993. Again, an information bulletin and a one-page summary were prepared and a meeting was held with agricultural media. In December 1994, the governor proposed a 35% reduction in the budget for agricultural research and extension in order to fund, among other things, prisons and a tax cut. The 1993 study was used to calculate the impacts of this reduction on the state. The Dean and University President have used this information as one of their many arguments in working with the legislature in an effort to restore the proposed cut.

As budgets have tightened, ex ante evaluations have become more important. At the national level, part of the demand for ex ante assessments appears to be coming from politicians and administrators who do not want to be blind-sided by unexpected impacts or side effects of new technologies. Increasingly, budget pressures at both the state and national levels have resulted in calls for help with analysis to support research priority setting.

Social scientists involved in impact assessments have been little involved in priority setting work, and much of their help with priority setting to date has been through participation in scoring activities in which research programs are scored on a series of criteria related to a set of social goals. Scoring activities may be useful in generating discussion among the clientele of AHER about the nature of research impacts, but are seriously flawed for resource allocation decisions. While many of the right participants are involved, they fail to structure that involvement in a logical sequence or to go deep enough in assessing impacts in different dimensions. Unlike ex post evaluation, priority setting requires social science participants to work closely with administrators in the process. The task is time consuming and can be politically delicate within one's own experiment station.

Concluding Comment

Developing cost-effective yet defensible methods for evaluating AHER, including social science research, have become even more important as budgets have tightened in agricultural and home economics. Despite the increased pressure to evaluate all types of programs, we should resist the temptation to allow our analyses to slip from the simple to the simplistic. However, less-than-defensible approaches will be used unless those of us involved in research evaluation continue to improve our methods and better communicate the results of our analyses to decisionmakers.

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