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THE ANALYSIS AND EVALUATION OF PUBLIC
EXPENDITURES: THE PPB SYSTEM

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THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS: AN OBSTACLE TO EFFECTIVE PUBLIC PROGRAM ANALYSIS AND DECISIONS

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In this paper, Professor Bonnen discusses the importance of understanding the distributional impact of government programs. He cites numerous issues of current interest which raise major equity questions, and notes the extent to which our present knowledge of the distribution of program benefits and costs falls short of the information needed to make appropriate equity decisions. Professor Bonnen sets forth a list of questions about the size and incidence of the benefits and costs of government programs and the characteristics of the beneficiaries. He suggests that "When one can answer . . . these questions with some degree of clarity and when this information can be reasonably well integrated, it should be possible to evaluate the distributional impacts of the public program involved."

After explaining how the source of funding and the design of programs can have a major effect on the incidence of program benefits and costs, Professor Bonnen examines the distributional consequences of three government programs—higher education, water resource development, and the farm program. He asserts that "In some cases, the distributional characteristics of a program . . . have become, over time, quite perverse when measured against the original purpose. . . . More commonly, the distributional consequences of the programs may have been perverse, but we have not really known this with any certainty because it was not obvious and we never bothered to measure it." Professor Bonnen concludes that strong efforts must be made by both government and academic analysts to improve the data and analysis related to the distributional impacts of government programs. Moreover, he asserts "Until Congress concerns itself with these matters more systematically, programs are likely to develop dynamics of their own, running on in a self-serving contemplation of the use of public wealth for private ends. This should be a source of concern to the Congress." Distributional data are not currently demanded in the administration of programs. "If Congress and the President do not demand them, they will never exist."

Introduction

The distributional impacts of both public and private decision making increasingly are being questioned. Despite our society's equity commitments, many public programs are administered with little attention to their distributional impact. It should not surprise us then when these programs exhibit perverse distributional consequences. Yet surprised we are at nearly every turn because we almost always fail to collect information on distributional impacts of programs. We do not even really understand the process by which distributional impacts work their way through the society. Without such knowledge we often work at cross purposes, we waste resources, and we fail to attain program objectives.

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This paper has four parts. First is a discussion of the importance of distributional impacts in society. Second is a brief exploration of the endemic lack of data on distributional impacts. Third is a longer discussion of the type of information necessary to measure and evaluate distributional impacts. Fourth are recent analyses of the somewhat surprising distributional consequences of three public programs, presented as examples of the kind of distributional analyses that are possible in some cases even with limited data.

The objective of this paper is to develop some understanding of the need in public decision making for greater concern over distributional effects and their measurement.

THE IMPORTANCE OF DISTRIBUTIONAL IMPACTS*

The distributional impacts of public programs are important, and are becoming more important. There are several reasons for this.

First is the great growth in wealth of this nation. As a society moves from relatively modest levels of per capita and family income to unprecedented levels of wealth, its social and economic priorities shift from an early dominating need for economic growth to some greater concern with how that growth is distributed. Since 1929 U.S. real national income has more than tripled and per capita income has doubled. Median U.S. family income in 1968 exceeded \$8,000 per family [14]. Much of this growth has occurred in the period since World War II. As median income grows, the absolute dollar difference between the top and the bottom incomes increase even more dramatically. As a consequence, the capacity for vast differences in human welfare and life styles is increased. With great growth in the wealth of a society, the concept of poverty changes and the society's notions of the minimum acceptable level of physical welfare increase. Finally, also with economic growth, transportation and communication technologies improve and the economic and social space of society shrink greatly. With television in almost every American home, consciousness of the disparities in wealth grows, even more rapidly than the disparities themselves. Thus, it is to be expected that as a society's wealth grows its priorities will shift to include a greater concern for equity goals.

Increased concern in society over matters of equity creates a need to know more about existing distributions and the distributional impacts of, for example, public programs. Distributional information is usually necessary before meaningful determinations of equity can be made. Equity itself is a value judgment made by society about what is fair or equitable. This judgment normally is legitimized by the political process usually through legislation that establishes some standard or criteria of equity. The idea of equity is not to be confused with that of equality. An equal distribution may or may not be considered equitable depending on society's or the individual's criteria for what is fair or equitable.

There is a social organizational or political reason that also explains the greater importance of distributional issues today. The question of equity is tied to the concept of community. Between groups where there is no community, there can be no meaningful notion of equity.

*Further discussion of this issue is found in the papers by Weisbrod, Schmid, Freeman and McGuire, in this volume, and Feldman in vol. 3 of this collection.

When we begin to redefine community, politically and socially, the meaning of equity also is redefined. We are today in the middle of just such a redefinition of community. Thus, our sense of equity is being transformed and what was acceptable by yesterday's standards of equity may not be acceptable today. For this reason, many older public programs are increasingly questioned today.

There is, in addition, a related or underlying technological cause for the increasing concern over equity. In the last thirty to forty years, we have built into the dynamics of our society a high, sustained rate of technological change. Our industrial revolution has moved from an age of invention into a scientific age in which technical advance is generated by the consciously planned application of science. Our scientific research and development capacity is today much heralded. Through the early stages of this transportation we have lived with a political and social mythology that assumed technological change was neutral in its distributional impact, i.e., that it did not change the existing distributional patterns. In truth, this is rarely the case. Typically, some groups gain and others lose in any technological change.

The naive belief that all technical change is neutral in distributional impact is today questioned both by social scientists and by citizens. In fact, unrestrained technological change has created so many undesired environmental effects in man's biological and social order that the necessity for humane management of our technology is now generally viewed as urgent. Unfortunately, we know very little about the processes by which technological change works its distributional effects and we seem to be greatly deficient in institutional arrangements to contend with the problem.

All of this results in a pervasive concern about society's performance in terms of equity. This greater concern focuses primarily on the equity performance of the economic engine of society as well as on various major institutions, the equity consequences of the political and social organizational rules of society, and the equity impact of our public program decisions. Every major institution in the society, the universities, corporations, foundations and government agencies, is under increasing pressure to re-evaluate its behavior as a part of our social system and to measure itself more conscientiously against society's evolving standards of morality and equity. No matter the legitimacy of the pressures or one's reaction to them, they are real. They exist and we must in some fashion contend with them in the political process. To do this for public programs we must have information on the distribution of program benefits and costs.

This paper is concerned with information on distributional impacts of public programs. However, the need for and the importance or value of this information derives primarily from the equity problems and concerns of society. Without judging the values involved let us describe some of the equity issues that suggest the types of distributional information that are needed today.

ISSUES REQUIRING DISTRIBUTIONAL KNOWLEDGE

The equity issues currently raised are many—some old, some new. Let us describe a few that in recent years have been voiced in some form in the Congress. There have been many questions and much

conflict over the apparent lack of racial and minority group access to public programs as, for example, in education, food and nutrition, health and employment. In these as in other issues, much of the conflict is over the question of what the distributions of program benefits actually are. Adequate distributional information is rarely available upon which to judge the equity issues.

At the heart of the debate on the price and wage guidepost policy of the last administration is the equity issue of how increased productivity is to be shared. Besides the immediate interest of consumers, labor and management, other major groups are affected if the overall consequence of price and wage decisions leads to inflationary redistributions of income and wealth. Such *ad hoc* arrangements as the guideposts are a monument to our failure to build adequate institutional arrangements for deciding such issues in a politically acceptable and equitable manner.

The debate on the need to share and the advisability of sharing Federal revenues with State and local government is generated by the very great disparities between the States in willingness and ability to meet human needs.* The pressure toward changing the rules on public assistance grants to States is also grounded in a similar concern with Aid to Dependent Children (ADC) payments, which, for example, in New York are many times those of Mississippi. Some believe that program differences of this sort create undesirable migration and compound other problems.

The perennial efforts to reform the tax structure are primarily equity matters. Besides the general concern for tax loopholes, there is a rising current concern over the alleged abuse of tax exempt status by creation of some spurious foundations and the maladministration of others. There is, as well, the longstanding dispute over the oil, gas, and mineral depletion allowance.

The public debate over the selective service or draft law primarily involved disputes on the equity of who was being drafted.

The economic growth consequences and equity implications of the prevailing geographic and regional distribution of public expenditures on defense contracts, public facilities, and the federal support of higher education have all come up for debate.

Equity considerations arise in the distribution of research and development (R. & D.) funds since R. & D. investment is believed to have a great deal to do with the distribution of future economic growth by area as well as functionally in the society. An additional equity concern of increasing importance arises because the benefits and costs of technological change are not by some standards equitably distributed. Indeed, as indicated earlier, the society increasingly questions the distributional consequences of technological change in a most fundamental manner. There is an obvious need today to do the best we can in analyzing both of these kinds of distributional consequences from public investments in R. & D.

There is a Pandora's box of related equity issues. Historically, our society has tended to allow market forces to determine the answers to the question of who should benefit from a new idea or technology.

*Further discussion of this issue is found in the papers by Schultze, and Mushkin & Cotton in this volume.

However, rising levels of conflict suggest that the distributional consequences of this approach are less and less acceptable to the society. Yet we are not now actively developing adequate alternative institutions to determine and legitimize who receives the benefits from new technology or other innovations in society. A case in point is the current conflict over who is to control Community Antenna Television (CATV). Many question whether this uninhibited clash of self-interest will well serve society and the public interest except as an accident. This scene is replicated practically every time there is a major innovation in our technologies. Its most fundamental implication for society lies in the fact that this is the process by which we change many of our social rules. It is a process that permits a nearly random rearranging of the fabric of our society with all that implies for equity. Many social observers argue that an inadequate consideration of equity lies at the origin of much of the corrosion of community that we see in social behavior today.

Law and order is the subject of much debate today in the face of a not inconsiderable amount of disorder. Some argue that much of the disorder has its origin in the manner in which law itself is enforced. Leaving aside the current most controversial examples, take the limited case of the enforcement of property rights in this society. The benefit impact from strict enforcement of property rights has a distributional consequence rarely appreciated. Those who benefit directly are naturally limited to those who have property and the more property you have the greater tend to be your benefits. Since property also is highly correlated with the legitimate access to the exercise of police power this tends to be a closely linked, directly reinforced, distributional system. This, in turn, leads directly to another issue of considerable import, the performance of the instrumentalities of law when property and human rights come into conflict. For example, recourse to civil or criminal suit to protect human rights is not equally accessible to every member in the society. Indeed, access to justice is highly correlated with the control of sufficient assets to command good legal talent.

The right of access to many public services is a property right that presumably comes with citizenship. However, the distribution of the right of access to public services in this society has come to be a matter of major contention. Yet, we know almost nothing about how to protect or allocate these rights. We really do not know how legitimately to change the rules of society without incurring great costs. In fact, social scientists do not understand the process by which such property rights are related to the other strategic factors of the social order or of the economic engine of society. Thus, at this point we know almost nothing about how to develop institutions that legitimately may determine the distributional performance of the society or its economic sector.

One might go on almost endlessly, but this list should suffice to make concrete the fact that equity problems are important, have major political implications, and are in some cases both longstanding and of increasing importance. Different groups do not reflect the same concerns but in the various problems and stresses reflected in the political and social processes today, equity questions are high on many agenda for social action. If one is to face these issues intelligently good data on distributional effects are necessary.

THE LACK OF KNOWLEDGE AND DATA ON DISTRIBUTIONAL IMPACTS

As one reviews Congressional hearings and agency program materials, one is impressed by the lack of knowledge or even raw data on program impact including the distribution of program benefits. It is as if these were impolite if not inapolitic questions to raise.

A recent experience of the author is instructive. At the invitation of Charles L. Schultze, then on the senior staff of the Brookings Institution, and more recently U.S. Budget Director, I attempted to measure for a Brookings conference the distribution of benefits of certain Federal subsidy programs. It was decided that these should be the Bureau of Reclamation's irrigation water development program, the Maritime Administration's ship construction and operating subsidies, and the Federal Aviation Administration's subsidy programs. Despite eight months of consistent work, it was not possible to put any really useful numbers together. The Maritime Administration and the Federal Aviation Administration provide very little public information. They put minimal effort into systematic data collection or analysis. The apparent reason is that the demands made upon the administration of these programs do not require much data. The number of direct beneficiaries of the Maritime subsidies run only to about twelve or thirteen firms in any one year. One gets the impression that as far as quantitative records are concerned these programs are managed from the lower left-hand drawer of the administrator's desk.

The Bureau of Reclamation is another matter. Here there is a wealth of data, but readily available only in forms that tend to defeat any comprehensive analysis of the programs distributional impacts. The total reclamation program data that the Bureau reports is aggregated from reclamation project reports but the project level detail is not given. Thus, it is not really possible to connect the statistics that are reported for the projects with the statistics that are reported for the U.S. Both sets of data must be integrated for any comprehensive analysis of the program's distributional impacts. It almost seems as if these data were consciously arranged to avoid the possibility of any distributional analysis.

For the purposes of the Brookings paper I was forced to abandon my original ideas and to use some data that were available from the 1964 agricultural price support program for cotton. The U.S. Department of Agriculture's Agricultural Stabilization and Conservation Service (ASCS) produces for its own administrative purposes strikingly detailed statistics on allotment acreage and number of farmers by allotment size group. From this and certain of the pricing and other value data it was possible to produce an estimate of the distribution of benefits [3].

ASCS deals with about two and one half million beneficiaries for whom detailed records must be kept as to their eligibility for allotments and the size of those allotments and their compliance. Due to the administrative complexity of the program a substantial amount of internal data collection is necessary. Over time much of this has come into the public domain. It is important to note, however, that a lot of the data in the public domain today is there only because Congressmen or Senators initially asked for it and saw that it was published.

After reviewing a number of Federal program areas one must conclude that we are unlikely to improve the situation, with respect to data availability for this type of analysis, until Congress asks some of the more important distributional questions of those administering the programs. Congress is going to have to be willing to put additional resources into more sophisticated data retrieval systems than presently exist. These data are not currently demanded in the administration of the programs. If Congress and the President do not demand them they will never exist.

The facts are that we do not even fully exploit presently existing data. Economists have not done the analysis of distributional issues that is now possible in those policy areas where some data are available. The PPB system has already helped to some extent to bring distributional questions into focus and to establish the relevance of equity issues and the urgency of many distributional questions. However, in a general sense, economists are still shirking the responsibility to move beyond efficiency criterion in their analytic interests.

THE INFORMATION NECESSARY TO APPRAISE DISTRIBUTIONAL IMPACTS

What do we need to know if we are to estimate the distributional impacts of public programs and judge their desirability? Look first at the ideal situation. We need to be able to answer the following questions in something like the order in which they are stated.

For benefits:

1. What is the purpose or objective of the public program or legislation, part of which is the question, *who should benefit?*
2. *Who actually benefits*, what groups? It is sometimes not easy to identify beneficiary groups clearly.
3. How much are the *total benefits* of the program? Placing a value on the benefits of many programs is also not an easy analytical proposition.
4. What is the *distribution of program benefits* among beneficiaries?
5. What is the *current distribution of incomes and assets* or other relevant dimensions of welfare among (a) actual beneficiaries and (b) intended or potential beneficiaries?

For costs:

6. *Who should pay the program costs?* Sometimes the nature of the program contains strong implications as to who the burdened should be; other times this is almost an unanswerable question.
7. *Who actually does pay* the cost of the program? Identification of the burdened groups should consider not only the tax structure, but direct price and income effects and the indirect effects of major factor and product substitution caused by the program.
8. What are the *total program costs*? Many times this includes, as it does in question 7, economic and social costs not reflected in federal budget expenditures but market and non-market costs generated through the operation of the program itself. Thus, these are not simple questions.
9. *How are program costs distributed* among the burdened groups?
10. What is the *current distribution of incomes and assets* among

(a) the actual burdened groups and (b) the intended or potential burdened groups?

Finally:

11. Integrating the above information, what are *the alternatives* in achieving the same program objective and which alternative is most efficient; that is, attains the same desired distributional (or other) impact but at a lower cost?

When one can answer all of these questions with some degree of clarity and when this information can be reasonably well integrated, it should be possible to evaluate the distributional impacts of the public program involved. I know of no case in which such an ideal has been obtained to date. Major theoretical as well as data gaps must be filled first. Until then, decision makers will operate with far less information. It should be pointed out, too, that economists as economists cannot answer all of these questions. The normative matter of who should benefit or who should pay involves value judgments which economists may not make as scientists. Of course, if some general statement of norms or objectives can be provided, the economist like any logician can develop certain conditionally normative deductions upon which to base a decision as to who should benefit and who should pay.

It is often not possible to answer with any clarity questions one and six about who should benefit and who should be burdened. The evidence from the legislation or from the program's history may not be that clear. The economist, however, may make a substantial clarifying contribution if he can answer questions two and seven; that is, who actually does benefit and who actually is burdened by the costs of these programs. By injecting positive information of this nature into the policy process one often helps produce a clarification of the objectives.

The economic theory literature most related to these questions is focused on the classical theory of factor shares and national income distribution.¹ Little of it is of value for our needs and even on its own grounds it is an intellectually underdeveloped area today. That which does serve to some extent is the eclectic benefit-cost and public finance literature. We are in need of theoretical and analytical constructs that will allow us to interrelate in a causal manner changes in macro-economic variables, public program impacts, and changes in the economic and social rules of society with the distribution of income and assets, not only for the Nation but for regions, various sociodemographic subsets, and interest groups. This is a tall order, but the needs are more and more urgent and economists must pursue this task.

Economists have spent most of their conceptual and empirical energy on questions three and eight, that is, in attempting to measure the total benefits and the total costs of particular programs. The empirical part of the benefit-cost measurement literature focuses almost exclusively on these questions.

Answering questions four and nine on the distribution of benefits and costs is rarely a simple problem for it varies profoundly with differences in the nature of the program and the variety of funding techniques used. Both funding and program influences are discussed in some detail in the following two sections.

¹ See the review of literature in [22, 23, 24] and the volume on the theory of income distribution by Weintraub [30]. Also look through the A.E.A. Index of Economic Journals [1]. Note that the classification scheme of the Index contains no major distribution category except for factor shares.

Questions five and ten, about the prevailing income and asset distributions among actual or intended beneficiaries and burdened groups, are not independent of the first two questions about who the beneficiaries or burdened groups are or should be. Indeed, collecting data on such very specific incidence groups can be a difficult analytical and data collection problem. Not only are asset distributions generally nonexistent but getting income distributions for specific incidence groups can be extremely difficult, if not impossible, in many cases today. However, it is absolutely necessary to proceed through this stage, for even after you have measured the distribution of program benefits and burdens, it is not possible to judge the welfare or equity impact of the programs until you know the welfare and equity situation of those affected. Weisbrod and Hansen have a recent interesting treatment of this problem [31].

In the case of none of the programs that I am aware of, are we in a position today to mesh the information on the distribution of program benefits with really adequate knowledge of the prevailing welfare conditions of the target population. In fact, about the best we are able to do in most of these programs is to identify who the beneficiaries are. In few cases are we able to say how much of the benefits individuals with various characteristics receive. In even fewer cases can this then be matched with a little data on income characteristics of beneficiaries. In almost no case can we match benefits with current asset distributions for the target population. If you do not know what a program is currently doing to a target population you cannot possibly work intelligently and systematically to improve the direction and character of impact. Generally, we do not really know today what we are doing to ourselves in equity. Our state of knowledge is frankly pitiful.

Finally, answers to question 11 on the cost of alternatives to attain a program objective are necessary to provide information on the trade-off between alternative distributional (as well as other) features of a program.

THE EFFECT OF FUNDING SOURCE

The funding of the social insurance programs out of trust fund sources presents a fundamentally different problem from that of a welfare program transferring money income to dependent children out of general funds collected directly from taxpayers. Measuring the distribution of burden presents a different problem if the program is funded from an income tax rather than a sales or property tax. In the situation where the program is funded out of general revenues, one has to assume a cross section of the revenue sources in structuring one's analysis of the distribution of burden.

In many cases where a program involves a product that is eventually sold to consumers (as in the wheat price support program) part of the cost of the transfer of benefits (to farmers) is funded not by taxpayers but by consumers through some device, the cost of which is passed on directly in the price to the consumer. In the case of the wheat program, a certificate payment system produces this consequence. Wheat price supports also result in higher than current free market prices and thus create a direct transfer from consumer to producer. In other cases public laws or programs may affect real wealth transfers di-

rectly between groups in the society without use of the market. Other programs are funded in a manner that transfers the incidence of burden over time, classically through the sale of debt. There are other issues that involve substantial spatial differences in the distribution of burden so that one region, in net effect, may be subsidizing another even though both are eligible for the program. Other questions of burden may require measurement of the impact on different income groups and various economic interests. In any case, it is readily seen that the problem of measuring the distribution of burden of program costs can be quite a different analytical problem from one program to another.

The real incidence of burden is not always obvious. Factor and product substitution effects can be very substantial and are rarely included in calculations of program costs. Structural factors intervene. The incidence literature in taxation identifies many situations in which incidence is shifted. Analogous situations arise in measuring the distribution of burden of program costs.

THE EFFECT OF PROGRAM DIFFERENCES

The nature of the individual program also has a profound effect on the analytical problem. Expenditure programs are of many different forms. Capital investment programs, particularly of the natural resource development type, have been the primary focus of most of the benefit-cost type of analyses. Some of the most common Federal expenditure programs, however, are those that transfer real income. These programs can be quite varied in nature. Some transfer income directly, other provide social services and even others transfer real income in kind, as in the food distribution programs. While equity considerations are not given very high priority in most capital investment programs they tend to be a prime objective of most public expenditure programs that transfer real income directly to some group in society. In any case, some equity considerations are eventually imposed on most direct income transfer programs even if they were not an original consideration in the intent of Congress or of the political interest groups that generated the support to create the program.

Government research and development (R. & D.) expenditures constitute a third type of public expenditure program that has distinctive implications for data needs and analysis. While the immediate beneficiaries of a federally subsidized R. & D. investment may be the initial recipients of the funds, the long run consequences of these programs transform the technologies of society and through technology many of society's social rules. These programs are of singular importance for they cast long shadows into all parts of the society.

Closely related are the regulatory programs and legislation that change the social organizational rules of society. Some of these, such as the antitrust laws, attempt direct manipulation of markets by imposing rules on the structure of markets or on market behavior. Much legislation deals directly with the rules by which society lives. Many of these rules, as for example, the patent and copyright laws, specify criteria that attempt to affect who shall get the initial direct benefit of a new idea or technology.

Finally, there are some additional matters. It is worth noting that the distributional impacts of program changes are likely to be different in the situation where the change in the program involves an expansion than where expenditures are cut. In short, there is a need to analyze distributional impacts at the margin when evaluating programs. The experience of tight budgets over the last several fiscal years has underlined this rather dramatically in some cases. Every economist understands that most changes in prices not only have a price effect but an income effect on both household and firm behavior. Similarly, most income changes have a price effect as well as an income effect. It is well to keep in mind in analyzing public programs that most changes in programs will have both a resource use effect as well as an income redistribution impact. Both will have incentive and disincentive consequences.* In short, our responsibility in analyzing public programs does not end with the goal of efficiency and its measurement in a benefit-cost ratio. Indeed, efficiency and equity are frequently intertwined analytically as well as in social policy.**

ADDITIONAL CONSIDERATIONS

Besides gaining command over the distributional impacts of individual programs there is another level of knowledge that is necessary for intelligent and comprehensive policy planning. Congress and the executive branch must know something more about the aggregated impact of Federal programs by regions and for the United States as a whole. That is, it is well that we know the regional effects of individual programs and thus their differential regional impacts. It would be most useful to be able to aggregate the natural resource development investments of various resource development programs into regional aggregates with distributional knowledge within each region and between regions. The same would be true for the whole of our educational input or of the full range of our health programs. There is a need to gain an overview of the plethora of individual programs which presumably add up to some comprehensive whole but for which at this point in time we have very little in the way of knowledge about how they actually add together, if they do. Nor do we have any real notion of the spatial implications for these general program areas. There are indications in our development literature and in studies of the social pathologies of this society, such as poverty, that some of our difficulties today arise as a result of the systematic long term differentials in the distribution of investments in education, in natural resource development, etc. Before we can avoid these kinds of problems we need to know they exist.

There is, in addition, a need to develop a measurement of the distributional impacts of total Federal program expenditures. In other words, we need an overview of the national picture of public expenditures and funding with their impact by various distributional characteristics—income, age, sex, family status, degree of urbanization and race, for example. Again some subcategorization such as educational programs, health, manpower, etc., would be useful as well.

*Further discussion of this issue is found in the paper by Schultze in this volume.

**Further discussion of this issue is found in the paper by Weisbrod in this volume.

An interesting, though given the state of the arts a necessarily rather assumption-ridden, approach to this problem has been produced by Gillespie. His general finding is rather striking. His results indicate that for total Government expenditures and funding:

The Federal pattern of fiscal incidence generally favors low incomes, burdens high income, and is mainly neutral over a wide middle income range. The State and local pattern also favors low income but is essentially neutral over both the middle and upper income ranges. A comparison of the two patterns controverts the conventional view that the State and local's tax structure is regressive and the Federal tax structure progressive; indeed, just the reverse is true, for in net terms the State-local structure grants larger benefits to the lower income range than does the Federal [17].

Gillespie goes on to conclude:

More basically, the question arises whether equity . . . should be considered only with reference to tax burden distribution, or whether the relevant criterion should be defined in terms of net benefit (or burden) distribution. If the latter view is taken, tax reform and expenditure reform can no longer be considered independent problems [17].

There are several reasons why one might question Gillespie's results but his attempt at empirical measurement of the overall impact of public programs on the distribution of income underlines dramatically the very significant conceptual and data needs we face before genuinely satisfactory measurement will be possible.³ Indeed, one of the conclusions that should be drawn from Gillespie's effort is that this kind of empirical measurement of public program performance can best be done by the Federal Government itself or in very close cooperation with the Bureau of the Budget and other immediate sources of internal program data.

Perhaps we need again to repeat the model that was followed in the creation of our national income statistics. Much of the intellectual investment in the primary design of concepts and system was executed by the National Bureau of Economic Research in close conjunction with Federal statistics agencies. It was then implemented by the Government as a Federal system. Certainly the conceptual and data problems are on the same order of difficulty and we are in a similar early stage in developing these numbers for program analysis purposes. Such a system, of course, would be designed to collect data for the full range of program analysis needs including distributional questions.

DISTRIBUTIONAL CONSEQUENCES OF THREE GOVERNMENT PROGRAMS

This Nation has a long history of creating public programs at least in major part for equity reasons. Among older examples are the farm programs, Corps of Engineers and Bureau of Reclamation programs, and many of the public assistance or welfare programs; examples from recent years include the poverty programs, the food distribution programs, many of the manpower and some of the education (title I of

³For an earlier interesting study of total Federal fiscal distributional impact see Alfred H. Conrad's study in [27].

ESEA) programs. Much of the current aid to urban areas has a major equity element among its purposes.

Yet the distributional consequences of our equity programs often turn out to be perverse. We seem to manage these programs without much continuing thought to their equity objectives. Equity objectives or standards are rarely spelled out in the legislation. Once enacted equity concerns seem to recede. Measurement of goal attainment is often reduced to gross rules of thumb, smearing and confusing the original legislative intent. The efficiency of administrative organization is substituted for program efficiency as an overriding congressional concern once clientele support develops. In execution this seems eventually to lead to a fuzziness if not outright drift in the purpose of some programs. The PPB system should lead to improvement but until Congress concerns itself with these matters more systematically, programs are likely to develop dynamics of their own, running on in a self-serving contemplation of the use of public wealth for private ends. This should be a source of concern to the Congress.

We know that, in some cases, the distributional characteristics of a program, while perhaps not to begin with, have become over time quite perverse when measured against current equity standards or even the program's original purpose. This would appear to be the case in the instance of the farm programs which were created because farmers as a group were receiving far less for their labor and resources than nonfarm people. Today the program is under criticism because the distribution of program benefits *among* farmers is highly concentrated with a large number of farmers receiving very little and a small number receiving very large payments and price-support benefits.

More commonly, the distributional consequences of a program may have been perverse but we have not really known this with any certainty because it was not obvious and we never bothered to measure it. Investment in higher education, for example, may not, as we tend to assume, provide general upward mobility on the basis of ability rather than wealth.

There is evidence, too, that some natural resource investments such as those made in the West by the Bureau of Reclamation have very perverse, and, one assumes, unintended distributional consequences on the growth of other regions.

Let us look briefly at these three cases as examples of the kind of analysis that can be done in the context of public program analysis for policy decisionmaking. By some standards at least, all exhibit distributional characteristics that are not now being considered adequately in program decisions and design.

THE DISTRIBUTION OF BENEFITS AND COSTS OF HIGHER EDUCATION

What do we know about the distributional consequences of society's investment in public higher education? The belief is fairly general that most youth have access to this system on the basis of ability, that education provides an avenue for upward mobility in this society based on ability rather than wealth. Certainly this society holds normative beliefs that suggest that the direct benefits of higher education should be distributed in this manner. What are the facts about the distributional impact of this investment in human resources? W. Lee

Hansen and Burton A. Weisbrod have analyzed this question for the State of California [18, 19]. Their work is instructive for its ingenuity, for the kind of distributional analysis that it suggests is possible in human investment programs, and for the kind of surprises that distributional analyses can provide.

The California system of higher education has the general reputation of being one of the most open and accessible and as well financed and with as low tuition as any in the Nation. Yet Hansen and Weisbrod's data suggest strongly that the effect of the system is most regressive. It can be seen in table 1 that the subsidy as a percent of income rises from 12 percent at \$8,800 of income to 41 percent at the \$12,000 level of income. The authors find that while the tax structure is slightly regressive the benefit distribution is quite regressive.

This results from several factors. The total subsidy to a student's education averages \$4,870 at the University of California, \$3,810 in the State college system, and only \$1,050 in the junior college system. Since the average family income rises progressively from \$7,900 for those who have no children in California public higher education to \$12,000 per family with children at the University of California, the effect is to provide the largest educational subsidy to the wealthiest. This is partly the consequence of academic entry requirements since 80 percent of the high school graduates are not eligible to enter the University of California. But that is not the end of it. They go on to state:

Even more interesting is the fact that the percentage of all students qualifying for the University of California [table 2, column 1] rises quite dramatically by family income level—from about 10 percent in the lowest bracket (under \$4,000) to 40 percent in the highest (over \$25,000). Thus, the correlation between high school achievement and family income—and all that it reflects—is startling indeed. This pattern persists as we widen our view to include those eligible for both the university and State colleges [table 2, column 3]. But a close examination of the differences between the two columns shows that the percentage of those eligible only for the State college system is roughly constant at all income levels; thus, university eligibility requirements account largely for the unequal distribution of opportunity [18].

TABLE 1.—AVERAGE FAMILY INCOMES AND AVERAGE HIGHER EDUCATION SUBSIDIES RECEIVED BY FAMILIES BY TYPE OF INSTITUTION CHILDREN ATTEND, CALIFORNIA, 1964

	California families without children in California public higher education	California families with children in California public higher education, children in—		
		Junior college	State college	University of California
Average income.....	\$7,900	\$8,800	\$10,000	\$12,000
Average subsidy.....	0	1,050	3,810	4,870
Subsidy as percent of income.....	0	12	31	41

Source: W. Lee Hansen and Burton A. Weisbrod, "Benefits, Costs and Finance of Public Higher Education," (Chicago: Markham Publishing Co., 1969), ch. IV, table 6.

TABLE 1.—DISTRIBUTION OF HIGH SCHOOL GRADUATES BY ELIGIBILITY FOR PUBLIC HIGHER EDUCATION IN CALIFORNIA, BY TYPE OF EDUCATION AND FAMILY INCOME

[in percent]

Family income	Percentage distribution of high school graduates by eligibility for—		
	University of California (1)	State colleges (2)	University of California and State colleges (3)
0 to \$2,999	10.7	17.3	28.0
\$3,000 to \$4,999	11.5	14.8	26.3
\$5,000 to \$6,999	11.9	13.6	25.5
\$7,000 to \$8,999	16.2	17.0	33.2
\$9,000 to \$11,999	19.4	17.7	37.1
\$12,000 to \$14,999	22.5	17.3	39.8
\$15,000 to \$17,999	27.9	17.5	45.4
\$18,000 to \$19,999	29.5	15.6	45.1
\$20,000 to \$24,999	33.3	12.8	46.1
\$25,000 and over	40.1	14.2	54.3
Not reported	13.3	14.7	23.0
All	19.6	16.7	36.3

Source: W. Lee Hansen and Burton A. Weisbrod, "Benefits, Costs, and Finance of Public Higher Education" (Chicago: Markham Publishing Co., 1969), ch. IV, table 7.

Hansen and Weisbrod also estimated for California that "the combined State and local tax structure is regressive below \$8,000 and is essentially proportional above that level."⁴ Thus, they conclude that:

The general nature of the redistributive effects of the current method of financing public higher education in California is clear. Some low-income people have benefited handsomely from the availability of publicly subsidized higher education. But on the whole, the effect of these subsidies is to promote greater rather than less inequality among people of various social and economic background, by making available substantial subsidies that lower income families are either not eligible for or cannot make use of because of other conditions and constraints associated with their income position. To overcome the effects of the present system would require a substantial overhaul of the pricing system in public higher education, a realignment of the tax structure, and/or a broadening of the eligibility base for public expenditure programs. With respect to the latter alternative eligibility for public subsidies to young people might well be expanded so as to embrace all young people—not only those who go on to college but those who opt for alternative ways of expanding their earning power, such as apprenticeship or on-the-job training, or even investments in businesses. In any case, it is clear that whatever the degree to which our current higher education programs are rooted in the search for equality of opportunity, the results still leave much to be desired [18].

THE DISTRIBUTIONAL IMPACTS OF WATER RESOURCE DEVELOPMENT

A considerable literature has developed around the problems of constructing benefit-cost ratios for natural resource investment projects. These have mostly concerned water and power development, conservation, and flood prevention projects. In all of this activity little effort

⁴ Note this is different from Gillespie's results for the U.S. [17].

has gone into comprehensive attempts to measure the distributional impacts.

There are some recent major exceptions I should like to point out. There is first of all the pioneering study by Robert Haveman which develops and applies a procedure for adjusting the benefit-cost calculation for the income redistribution consequences of the benefit distribution as well as the distribution of the cost of funding Corps of Engineers' projects in the 10 Southern States [20]. This adjustment results in a number of (though by no means all) projects with otherwise negative B/C ratios to exhibit positive values. Haveman's analysis suggests (as do some of the Corps hearings) that welfare and equity considerations entered into the political decisions to invest in these projects. The substantial adjustments that result also suggest that distributional analyses should be done for all major natural resource investment projects.

Subsequently, A. Myrick Freeman has applied a similar methodology to six Bureau of Reclamation projects in the West with interesting results on the income distribution impacts [16].*

Even more recently in a very different kind of study K. William Easter and Charles W. Howe have explored the interregional redistributive consequences of Bureau of Reclamation water development investment in the West [21]. Their emphasis is upon the regional transfers that take place. This fascinating study is soon to be published by Resources for the Future.

The issues are complex. Western farmers pay an annual price of from \$30 to \$135 per acre below the cost of supplying water [23]. And the consequent price of irrigation water is below that which "other potential users are willing to pay although at present not all of the irrigation water could be put to these higher valued uses" [21]. The value added per acre foot of water varies greatly by use, from well under a hundred dollars per acre foot in agriculture, through several hundred dollars in various recreational uses, to thousand of dollars an acre foot in municipal and industrial uses [32, 33]. Most of the water developed in Western reclamation projects goes into agricultural uses despite its lower value product. For economic, legal, and political reasons it is difficult to transfer to other uses later. Thus, major malallocations of resources are developing within agriculture and between agriculture and the nonagriculture sector in the West.

But this is not where the problem ends. Since there exists a chronic overcapacity to produce in agriculture, the issue arises as to whether the development of new irrigation lands has any positive benefit nationally whatever its local value. In addition to which the creation of highly productive irrigated land in the West must (particularly in the face of the existence of excess agricultural capacity and acreage allotments) create, through production substitutions, income losses in other regions. The question is where and what are the welfare implications. Easter and Howe have developed an empirically based three region farm production model for several commodities along the general lines suggested by Tolley [29]. From this they are able to estimate the substitution effects in production and the approximate impact on regional farm production and income. Finally, they also attempt to estimate the

*Further discussion of this issue is found in the paper by Freeman in this volume.

cost which reclamation projects add to the annual cost of agricultural programs pointing out the inconsistency between federal programs in which tax monies are used in one case to increase production (reclamation) and in another case to decrease production (farm price supports and acreage allotments).

With the permission of the authors, I have reproduced below tabular materials on cotton production from their three-sector model. The model also provides similar detailed data on potatoes, vegetables, fruits and nuts, dry edible beans, rice, sugar beets, feed grains, and alfalfa hay. It can be seen in Tables 3 and 4 that under the pressures of excess capacity and a consequent reduction in U.S. acreage allotments, cotton acreage has declined in every area, except the reclamation West where it rose, between 1949 and 1966. Nowhere is the decline as precipitous as in the South where 1964 acreage was less than half that of 1949. In Tables 5 and 6 it can be seen that differential changes in yields mute these shifts considerably. Nevertheless, with respect to cotton the authors conclude that:

If cotton were not produced on reclamation land, then 978 thousand bales could be produced in other areas by increasing acreage allotments. To meet this production allotments could be increased by about one million acres since the land coming back into cotton production would be less productive and would yield on the average about one bale per acre while the reclamation land taken out yields almost two bales per acre. Assuming a uniform increase in the allotment based on the 1964 distribution of acreage, the South would harvest about 550 thousand more acres and the North 20 thousand, while in the West (including Texas and Oklahoma) acreage would decline by about 85 thousand acres. The West would be a net loser but the non-reclamation West would have a gain in acreage allotments of approximately 430 thousand acres.

In terms of annual net income for farmers, the South would gain roughly \$27.5 million and the North \$1 million while the reclamation West would lose \$50 million and the non-reclamation West would gain \$21.5 million [21].

The authors go on to conclude from their model that:

There can be little doubt from the data analyzed that reclamation irrigation has had a significant effect on U.S. agriculture. Increased production on reclamation served land has increased USDA payments, stimulated regional production shifts and reduced non-reclamation farmers' income. Annual commodity program payments were estimated to increase from \$20 to \$464 per acre of land irrigated by reclamation, varying with the commodity and assumptions concerning relative productivity and the effectiveness of commodity programs. The reclamation impact on crops not under the annual commodity programs ranged from the \$9 million to \$20 million shift in gross farm income for pears to the \$350 million estimated shift in farm income for potato farmers. Finally, from 5 million to 17 million acres of cropland have been displaced by the 1944-64 increase in reclamation irrigation. In terms of income foregone this would be a minimum of \$50 to \$170 million annually.

TABLE 3.—U.S. COTTON ACREAGE HARVESTED BY REGIONS

[In thousands of acres]

Regions ¹	1964	1959	1954	1949	1944
California-Arizona.....	1,128	1,181	1,313	1,231	501
New Mexico-Nevada.....	183	192	199	226	104
Total, West ²	1,316	1,376	1,517	1,520	505
Texas-Oklahoma.....	6,174	6,728	8,417	11,802	8,070
South Central.....	4,501	4,542	6,115	9,610	6,515
South Atlantic.....	1,570	1,593	2,382	3,673	3,074
Total, South ²	12,248	12,868	16,914	24,485	18,059
North.....	351	405	427	594	337
Total ²	13,915	14,649	18,858	26,599	18,952

¹ The South Central includes the States of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, and Tennessee. The South Atlantic includes the States of Florida, Georgia, Maryland, North Carolina, South Carolina, and Virginia. The North includes the States of Illinois and Missouri.

² May not add to totals due to rounding.

Source: Charles W. Howe and K. William Easter, "Interbasin Water Transfers—Economic Issues and Impacts," Resources for the Future, Johns Hopkins Press, 1969, ch. IV.

TABLE 4.—COTTON ACREAGE HARVESTED IN 17 WESTERN STATES

[In thousands of acres]

Region	1964	1959	1954	1949	1944
California-Nevada-Arizona.....	1,131	1,187	1,320	1,235	401
New Mexico-Texas-Oklahoma.....	6,359	6,917	8,614	12,037	8,174
Total.....	7,490	8,104	9,934	13,322	8,575
Reclamation portion ¹	514	504	514	381	145
Nonreclamation.....	6,976	7,600	9,420	12,941	8,430

¹ In 1964, 360 acres were in California, Arizona, and Nevada while 154 acres were in New Mexico, Texas, and Oklahoma.

Source: See table 3.

TABLE 5.—U.S. COTTON PRODUCTION BY REGIONS

[Thousands of bales]

Region ¹	1964	1959	1954	1949	1944
California-Arizona.....	2,524	2,488	2,301	1,751	449
New Mexico-Nevada.....	259	305	293	252	113
West ²	(2,783)	(2,794)	(2,595)	(2,023)	(562)
Texas-Oklahoma.....	4,260	4,521	3,825	6,117	3,157
South Central.....	5,760	4,838	4,605	5,142	5,330
South Atlantic.....	1,529	1,277	1,489	1,663	2,381
South ²	(11,549)	(10,637)	(9,919)	(12,922)	(10,869)
North.....	401	483	407	474	407
Total ²	14,733	13,914	12,921	15,419	11,833

¹ See table 3.

² May not add to totals due to rounding.

Source: See table 3.

TABLE 6.—COTTON PRODUCTION IN 17 WESTERN STATES
[Thousands of bales]

Region	1933	1939	1951	1943	1944
California-Arizona-Nevada.....	2,529	2,494	2,304	1,762	449
New Mexico-Texas-Oklahoma.....	4,514	4,820	4,116	6,379	3,270
Total ¹	7,043	7,315	6,420	8,141	3,719
Reclamation portion ²	3,978	3,934	2,933	487	164
Nonreclamation.....	6,065	6,331	5,522	7,654	3,555

¹ May not add to total due to rounding.

² In 1933, 775 bales were in California, Arizona, and Nevada while 203 bales came from New Mexico, Texas, and Oklahoma. Also 557,000 bales were from land receiving full reclamation irrigation service, 403,000 bales from land with supplemental service and 8,000 bales from land with temporary service.

³ Only 5 percent or 154,000 bales was American-Egyptian cotton.

Source: See table 3.

These impacts of reclamation projects have not been adequately considered in evaluating project feasibility. Therefore, additional research indicating possible procedures for including these costs in the cost-benefit analysis would seem very appropriate. Even if the United States were in a situation of no excess capacity in agriculture (which the numerous land retirement programs help remind us we are not) it does not follow that additional Federal irrigation is needed. If additional capacity is desired, the least cost means of increasing capacity should be selected. Ruttan's study indicates that the returns from additional investments in irrigation itself would be greater in regions outside the West. In addition, one should consider investments in drainage, land clearing, the development of new or low cost inputs before deciding on a particular mix of programs to increase agriculture's productive capacity [21].

Both the Hansen-Weisbrod and the Howe-Easter studies are thoughtful and imaginative analyses of distributional questions. While neither produce all of the information implied by the ideal set out earlier here, both provide impressive evidence of perverse distributional impacts in major public programs. Their contribution is substantial for little quantitative knowledge of such impacts previously existed.

THE DISTRIBUTION OF BENEFITS FROM THE FARM PROGRAM*

The final case involves some analysis the author has done on the distribution of benefits from the farm program. In a general way we have known for some time that this program has a concentrated distribution of benefits. Many agricultural economists, most prominently T.W. Schultz, have long drawn attention to this fact. However, there have not previously been any systematic quantitative measures of the degree of that concentration. Little has been known about distributional differences between commodities and between regions and States within commodities [2]. Nor has there been any comparison of the differential distributional impacts of price supports and the direct payments that have entered into the program as a major factor since 1962.

*Further discussion of this issue is found in the paper by Ruttan in vol. 3 of this collection.

In the United States in the middle of the Nineteenth Century, rural life meant farm life. There was little rural economic activity besides that generated by farming. The preponderance of U.S. population lived in rural areas and practically all of that was on farms [8]. Today less than 30 percent of our population is rural, and less than 5 percent is on farms [6, 7, 9]. While some of that rural population living in small rural communities are dependent on the economic activity generated in agriculture, it is a *prima facie* matter that farm programs in the nature of things simply cannot and do not serve all rural people today.

The farm commodity programs, like any government subsidy program, have two quite different general effects and potential purposes. The first is to redistribute income from nonfarmers to farmers; the second is to affect resource allocation—to attract to an economic activity more resources than the market mechanism would otherwise pull in. The farm commodity programs were developed during the late 1920's and the 1930's. The primary political support that brought them into existence had as its clear objective the redistribution of income premised on the proposition that farmers were generally poor and that the resources farmers commanded earned far less than they could have earned in the nonfarm sector. Because of the unique characteristics of this industry it was obvious that if anything was to be done about this income situation it would have to come through public policy. It is interesting to note that even in the early history of these programs most economists, however, focused on the resource allocation effects and practically all of the analysis that has been done by economists has concerned itself with the resource allocation problems of the industry. However, a concern for equity explains the origins of these programs even in the case of the resource allocation argument where it was contended that agriculture as an industry suffered certain inherent disadvantages in the market which resulted in a chronic low rate of return on investment. This usually carried the implied social consequence that growth in productivity would be slowed relative to the nonfarm sector with consequent impact on the overall rate of U.S. economic development.

The criticisms of the farm program today seem to be generated by two factors. The program has succeeded beyond anyone's dreams in attaining its objective of supporting total farm income. Secondly, the program's distributional characteristics have been ignored.

A 1967 study by the Department of Agriculture for the Senate Agricultural Committee provides a direct insight into the equity considerations that relate to the resource allocation argument [25]. Four different standards were used for computing a parity income or parity return to resources in farming.⁶ Farm programs enacted during the Kennedy and Johnson administration years had, by 1966, provided parity or higher income returns (by all four standards) for the 16 percent of all farmers who had gross sales of \$20,000 or more. This group produced more than two-thirds of all agricultural products in 1966. The 16 percent of all farmers in the \$10,000 to \$20,000 gross

⁶ A "landlord standard" assumed that the resources were rented and the farmer's labor paid for at nonfarm rates for similar age, sex, and skill levels. A "stockholders standard" assumed sale of farm resources and investment in a cross section of the Standard and Poor's 500 stock average. Both of these standards were then estimated with and without capital gains.

sales category in 1966 who produced 18 percent of all output earned 81 to 98 percent of a parity return depending upon the standard used. While there is a wide dispersion around these mean figures, these programs have now generated a parity return or better to the most efficient farmers who produce the bulk of our farm products.

The entire structure of the industry has been transformed from the traditional subsistence farming economy of the Nineteenth and early Twentieth Centuries into a highly specialized industrial enterprise in which command over resources, output, and income in agriculture have become far more highly concentrated. Today less than 10 percent of all farmers produce over half of all agricultural output; about half of the farmers produce 95 percent of all the U.S. agricultural output [15]. With few exceptions, farm programs, whether they are credit, conservation, or commodity programs, are designed today so that a farmer's access to them is directly related to the size of assets he controls, the amount of land he operates and his volume of output. Under these conditions it perhaps is not surprising that the farm programs are increasingly questioned with respect to the equity of their distributional consequences.

Recent work by the author throws considerable light on the distributional characteristics of farm commodity programs [4]. For our purposes this presentation will be limited to a summary of the results and a sample of the statistical evidence for the reader's own inspection. The data presented are in the form of Lorenz curves and Gini concentration ratios. The Lorenz curve tells one what percentage of the farmers received what percentage of the benefits. The Gini concentration ratio measures the degree of concentration of the distribution of benefits—that is, it measures how far a given distribution departs from a completely equal distribution of benefits between all beneficiaries.¹

From table 7 it can be seen that all of the commodity programs are fairly highly concentrated, some of them greatly so. Looking down this table you will see that the 40 percent of the smallest farmers (allotment holders) receive much less than a proportionate share of the program benefits even in the case of the programs with the least concentrated distribution of benefits. In a typical program such as peanuts, table 7 suggests that it would be necessary to generate about \$10 of program benefits for every dollar going to the lowest 40 percent of smaller peanut farmers. Variation across all the commodity programs would range from about \$6 to \$34 of total benefits for every dollar going to the lowest 40 percent of the farmers. Looking at the very bottom of the distribution, this same table shows that it would be necessary to generate from \$20 to \$100 of benefits for each dollar going to the lowest 20 percent of farmers.

Even after considering all the qualifications that go with these numbers, the data suggest very clearly that the farm programs are not efficient means for affecting an income redistribution to the smaller low income farmers. Since it is clear from the parity income study that the more efficient farmers are already receiving near parity

¹ A Gini ratio of 0 indicates a completely equal distribution between all beneficiaries. A Gini concentration ratio of 1 indicates that one beneficiary received all of the benefits and the other potential beneficiaries none. Thus, as the concentration ratio rises from 0 toward 1 it reflects a greater and greater concentration in the distribution of benefits. For those interested in the nature of the data sources, the methodology, and the limitations of the estimating procedure see pages 461-483 of [4].

income or better, it seems an inescapable conclusion that any attempt to solve the low income small farmer problem via price supports would generate huge windfall profits to the more efficient larger scale operators.

TABLE 7.—DISTRIBUTION OF FARM INCOME AND VARIOUS PROGRAM BENEFITS: PROPORTION OF INCOME OR BENEFITS RECEIVED BY VARIOUS PERCENTILES OF FARMER BENEFICIARIES¹

	Percent of benefits received by the—						Gini concentration ratio
	Lower 20 percent of farmers	Lower 40 percent of farmers	Lower 60 percent of farmers	Top 40 percent of farmers	Top 20 percent of farmers	Top 5 percent of farmers	
Sugar cane, 1955 ²	1.0	2.9	6.3	93.7	83.1	63.2	0.739
Cotton, 1954 ³	1.8	6.6	15.1	84.9	69.2	41.2	.553
Rice, 1953 ³	1.0	5.5	15.1	84.9	65.3	34.5	.632
Wheat, 1964:							
Price supports	3.4	8.3	20.7	79.3	62.3	30.5	.566
Diversion payments	6.9	14.2	26.4	73.6	57.3	27.9	.430
Total benefits ⁴	3.3	8.1	20.4	79.6	62.4	30.5	.569
Feed grains, 1964:							
Price supports	0.5	3.2	15.3	84.7	57.3	24.4	.588
Diversion payments	4.4	16.1	31.8	63.2	45.8	20.7	.405
Total benefits ⁴	1.0	4.9	17.3	82.7	56.1	23.9	.565
Peanuts, 1964 ³	3.8	10.9	23.7	76.3	57.2	23.5	.522
Tobacco, 1965 ³	3.9	13.2	26.5	73.5	52.8	24.9	.476
Farmer and farm manager total money income, 1963 ⁵	3.2	11.7	26.4	73.6	50.5	20.3	.463
Sugar beets, 1955 ²	5.0	14.3	27.0	73.0	50.5	24.4	.456
Agriculture conservation program, 1964: ⁶							
All eligibles	7.9	15.8	34.7	65.3	39.2	13.3	.343
Recipients	10.5	22.8	40.3	59.7	36.6		.271

Source: Except as noted all figures are from a 1968 study by Bonnen [4].

This table presents portions of 2 Lorenz curves relating the cumulated percentage distribution of benefits to the cumulated percent of farmers receiving those benefits. Cols. 1 through 3 summarize this relationship cumulated up from the lower (benefit per farmer) end of the curve, and cols. 4 through 6 summarize the relationship cumulated down from the top (highest benefit per recipient) end of the curve.

² For price support benefits plus Government payments.

³ For price support benefits.

⁴ Includes price support payments and wheat certificate payments as well.

⁵ David H. Boyne, "Changes in the Income Distribution in Agriculture," *Journal of Farm Economics*, vol. 47, No. 5, December 1965, pp. 1221-1222.

⁶ For total program payments. Computed from data in "Frequency Distribution of Farms and Farmland, Agricultural Conservation Program, 1964," ASCS, U.S. Department of Agriculture, January 1966, tables 3 and 8.

⁷ Not available.

The welfare impact of these distributions cannot actually be ascertained fully unless we have a measure of the current distribution of income and assets among beneficiaries for comparison with the distributions of program benefits. Ideally, one would desire to have this not only for the U.S. as a whole for all farmers but one should also have the income and asset distribution of cotton producers for comparison with cotton program benefits, and similarly for all the rest of the programs. Such estimates are not available. The best that is immediately available for this purpose is a measure of the Lorenz curve of the net money incomes of farmers and farm managers estimated for 1963 by Boyne [5] and for 1964 by Coffey [11].⁸ Boyne's figures are arrayed in Table 7 where they can be compared with similar Lorenz distributions for the various programs. At the level of the lowest 40 percent of farmers only tobacco, sugar beet, and ACP programs have the effect of adding proportionately more program benefits to a farmer's income than he commands as a share of farm

⁸ One may also compare the program distributions of Table 7 with several income comparisons that have been computed in Table 10 using very different and less satisfactory data.

income. That is, this group of farmers receives 11.7 percent of farm income, but a higher percentage than this of tobacco, sugar beet, and ACP program benefits. The lowest 20 percent of farmers receive 3.2 percent of net farm money income. But they receive more than 3.2 percent of the benefits of the wheat, peanut, tobacco, sugar beet and ACP program. Rice, feed grains, cotton and sugar cane all provide to this lowest group of allotment holder less of a share of program benefits than they average as a share of farm income. One is tempted to say that these latter programs are regressive in their income impact in farming, but this is not proved by this crude though relevant comparison. Nor can we argue conclusively that the ACP, sugar beet and tobacco (and possibly peanuts and feed grains) programs have a progressive income impact—even though our data seem to suggest this.

There are too many logical difficulties to bridge. Cotton benefit distributions should be compared with cotton farmer income distributions—not all farm income. Also some regionalization of the farm income distribution is needed to allow for geographic and industry mix differences associated with differences in productivity. One cannot always assume that one is necessarily dealing with the same general set of low incomes, or indeed with low income at all, when one speaks of the lower end of the distribution of benefits from a program. While it may be fairly reasonable to assume that a small cotton allotment represents a small farmer, such an assumption is not necessarily reasonable in the case of wheat or feed grains. Farmers do grow more than one commodity typically, and a small allotment may sometimes represent a minor enterprise in a substantial operation. It also should be noted that farm income accounts for a relatively small part of the total income of quite a number of smaller producers [15]. This partially accounts for the very low concentration of total income of farmers from all sources as compared to the high concentration of gross and net incomes from farming operations that can be seen in table 10.

Thus, the net effect of these programs may be less regressive than the data suggest—or possibly more regressive—but the pattern is clear.

There are a few other conclusions that can be drawn from the distributional data. The programs exhibiting the greatest concentration in the distribution of benefits are indeed extremely concentrated. The U.S. sugar cane program exhibits a Gini ratio of 0.8 but individual states have concentration ratios as high as 0.9 (Hawaii). Perhaps even more remarkable is that the sugar program which is administered as a single program for both cane and beets demonstrates both the highest concentration of benefits among farm programs in sugar cane (.8) and the lowest concentration of program benefits in sugar beets (.456). All other commodity concentrations fall in between. This speaks worlds about the different technological structures of these two sugar industries and their differing political behavior over time in deciding how to allocate increases in acreage allotment.

Another conclusion of interest is the evidence of a time trend toward greater concentration. This can be seen in Table 7 for those commodities in which data for different years is available.

The Agricultural Conservation Program (ACP) is an anomaly among programs that generate farm income. In table 7 it can be seen that its benefits are far more equally distributed than any commodity program. ACP subsidizes various conservation practices, from putting lime on the soil to tilling the land and building ponds. It is obviously administered in a manner to assure the largest number of participants. This distributional outcome would seem to have more to do with ACP's political role among the farm programs than with any organizational or technological imperatives of conservation.

It is also worth remarking that the variation in concentration within a particular commodity program from state to state and region to region can be rather large. These reflect primarily great variations in productivity and yield, and rather substantial differences in the median allotments as well as the relative variation around those medians. See the example of cotton in Tables 8 and 9.

Tables 8 and 9 are included to provide an example of the kind of detailed data that can be computed and are available by state and region for each commodity benefit stream listed in Table 7. These may all be seen in another study by the author [4].

The available data also allow one to compute the distribution of benefits by size of allotment (see Table 8). Indeed, this is an intermediate step to producing the Lorenz curves. The availability of such a distribution with an absolute dimension that is highly correlated with productivity allows one, particularly in the case of cotton, to gain some insight into the potential for conflict between efficiency and equity objectives. Let me just quote the conclusions from the author's earlier study of cotton benefit distributions [3].

The older eastern cotton-growing regions are higher cost areas. In fact, cost per unit of output on efficiently managed cotton farms is reputed to decline sharply, possibly by as much as one-half in some major production areas, as one moves from the Southeast to the West [12]. Historically, since 1935 the Delta and the Southwest have maintained their share of national cotton output (about one-third each), while the share of the Southeast had declined from one-third to less than one-fifth, and the West's share has increased from 4 percent to about 20 percent.

Thus, in effect, cotton acreage has been shifting out of the Southeast and to the West. In efficiency terms this is a movement of allotment rights from an area where yields are about one bale per acre to one where average yields are over two bales. In equity terms it is a movement of allotment rights from smaller, lower-income farmers to farmers operating on a large scale and receiving much higher incomes. An acre of allotment rights in California is worth almost three times (before considering production costs) what it is worth in Georgia. Yet almost 40 percent of all cotton farmers earn their living in the Southeast as compared to about 3 percent in the West. The logic of this suggests that the disparity is so great today that it is probably impossible to attain the welfare objectives in the older eastern cotton areas with price supports of the 1964 program type, except at unacceptably high levels of government-generated intramarginal rents in the West and other producing areas of high productivity.

TABLE 2.—DISTRIBUTION OF 1964 UPLAND COTTON PRICE-SUPPORT BENEFITS: PROPORTION OF UNITED STATES, REGIONAL, AND STATE BENEFITS ACCRUING TO FARMERS WITH ACREAGE ALLOTMENTS UNDER OR OVER VARIOUS SPECIFIED SIZES

State or Region	Percent of benefits accruing to allotments										
	Under 5 acres	Under 10.1 acres	Under 15 acres	Under 30 acres	Under 50 acres	Under 100 acres	Under 200 acres	200 acres and over	350 acres and over	500 acres and over	1,000 acres and over
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Alabama.....	6.5	24	37	57	69	82	92	8.4	3.7	1.8	0.3
Florida.....	9.8	34	49	73	84	94	99	1.3	0	0	0
Georgia.....	2.1	12	22	45	63	81	93	6.9	3.0	1.3	0
North Carolina.....	12.1	30	41	60	72	86	95	5.4	1.8	1.0	.3
South Carolina.....	5.6	18	28	47	61	79	92	8.3	3.1	1.6	.4
Virginia.....	37.7	66	77	88	94	98	100	0	0	0	0
Southeast.....	6.3	21	32	53	66	82	93	7.5	3.1	1.5	.3
Arkansas.....	0.9	5	11	24	34	50	65	34.5	21.9	15.1	6.6
Illinois.....	3.5	15	19	31	48	67	90	10.4	0	0	0
Kentucky.....	4.9	14	21	37	58	78	96	3.9	0	0	0
Louisiana.....	1.6	9	17	32	44	60	76	24.3	12.0	6.8	1.7
Mississippi.....	2.4	10	17	29	37	48	63	37.3	22.7	14.1	5.2
Missouri.....	2.1	7	15	34	50	71	85	14.5	8.7	5.1	1.7
Tennessee.....	7.3	26	40	61	74	88	95	4.6	1.6	.6	0
Delta.....	2.5	11	18	32	43	56	71	29.4	17.7	11.3	4.3
Oklahoma.....	.5	3	8	28	52	82	95	4.9	1.8	.7	.2
Texas.....	.2	1	2	9	21	49	76	24.3	11.0	6.6	2.7
Southwest.....	.2	1	3	10	23	51	77	23.1	10.4	6.2	2.6
Arizona.....	.1	1	2	5	9	21	40	60.0	39.4	30.5	14.5
California.....	.2	1	4	9	15	29	48	52.4	39.3	33.2	21.5
New Mexico.....	1.0	4	8	21	38	65	83	16.8	7.6	5.5	1.5
West.....	.2	1	3	9	16	30	49	51.0	36.3	29.8	17.7
United States.....	2.0	8	13	25	36	54	71	28.6	17.1	12.1	5.9

Source: "1964 Upland Cotton: Final Planted Acres and Number of Farms Planting Cotton by Size of Effective Allotment," USDA, ASCS, Policy and Program Appraisal Division, mimeo, Nov. 6, 1964 (2 pages).

TABLE 9.—DISTRIBUTION OF 1964 UPLAND COTTON PRICE SUPPORT BENEFITS: PROPORTION OF U.S., REGIONAL, AND STATE BENEFITS RECEIVED BY VARIOUS PERCENTILES OF FARMER BENEFICIARIES¹

State	Percent of total benefits received by the—									Gini concentration ratio
	Lower 10 percent of farmers	Lower 20 percent of farmers	Lower 33 percent of farmers	Lower 50 percent of farmers	Top 50 percent of farmers	Top 33 percent of farmers	Top 20 percent of farmers	Top 10 percent of farmers	Top 1 percent of farmers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Alabama.....	2.1	4.3	8.0	17	83	73	60	45	15	.546
Florida.....	2.7	5.3	8.8	19	81	69	54	37	10	.483
Georgia.....	1.2	3.0	8.0	16	84	71	58	42	11	.531
North Carolina.....	2.5	4.9	8.2	13	87	76	64	47	15	.577
South Carolina.....	1.7	3.3	5.6	13	87	77	63	43	13	.534
Virginia.....	5.2	10.4	17.3	26	74	65	52	37	11	.401
Southeast.....	1.9	3.7	6.2	15	85	75	61	47	14	.571
Arkansas.....	0.8	2.6	5.2	11	89	80	70	56	20	.652
Illinois.....	1.2	2.4	4.9	11	89	83	71	53	12	.650
Kentucky.....	1.5	3.0	5.0	11	89	80	65	47	10	.613
Louisiana.....	1.0	2.8	6.4	12	88	79	69	54	16	.608
Mississippi.....	1.0	2.1	4.9	9	91	84	75	64	23	.701
Missouri.....	1.3	3.0	6.5	14	86	74	61	44	14	.566
Tennessee.....	2.4	4.8	9.0	18	82	72	58	42	13	.515
Delta.....	1.2	2.3	5.9	11	89	81	70	58	21	.657
Oklahoma.....	1.1	3.7	9.6	21	79	65	50	31	7	.416
Texas.....	.4	2.0	6.4	15	85	71	56	37	10	.530
Southwest.....	.5	2.0	6.3	14	86	73	56	39	11	.512
Arizona.....	.5	1.5	4.1	10	90	80	65	47	15	.628
California.....	.7	1.9	4.2	8	92	84	72	57	25	.686
New Mexico.....	.8	2.4	5.7	14	86	75	60	42	11	.565
West.....	.5	1.6	3.9	8	92	84	72	56	22	.682
United States.....	.9	1.8	4.9	10	90	80	69	53	21	.653

¹ This table presents portions of 2 Lorenz curves relating the cumulated percentage distribution of benefits to the cumulated percent of farmers receiving those benefits. Cols. 1 through 4 summarizes this relationship cumulated up from the lower (benefit per farmer) end of the curve, and cols. 5 through 9 summarizes the relationship cumulated down from the top (highest benefit per recipient) end of the curve.

Sources: (a) "1964 Upland Cotton: Final Planted Acres and Number of Farms Planting Cotton by

Size of Effective Allotment," USDA, ASCS/Policy and Program Appraisal Division, mimeo, Nov. 6, 1964 (2 pages); (b) "Agricultural Statistics, 1965," USDA, 1966, p. 62. Prices from this source were used in computing State value of production figures for use as weights in combining the distributional data from source (a); (c) "Crop Production, 1965 Annual Summary," USDA, SRS, Dec. 20, 1965, p. 84. Yield and acreage data from this source were used in computing State value of production figures for use as weights in combining the distributional data from source (a).

In the case of wheat and feed grains there was also an opportunity to observe the consequence of the recent addition of direct payments to the price support system allowing price supports to be dropped approximately to world prices. Economists have long argued that:

If the avowed purpose is to redistribute income from those with higher incomes to those with lower incomes, then a program that directly provides income or services to the intended beneficiaries is more efficient and more effective than one that raises the demand for some product they, and others, produce [10].

Agricultural economists have argued for years that this is the better way to approach the income problem in agriculture. However, it obviously does not happen automatically when one shifts to a direct payment scheme. As one can see in Table 7, in the case of the feed grain program in 1964, direct payments did indeed reduce slightly the overall concentration of program benefits from that which would have prevailed if there had been only a price support program. However, in the case of wheat the direct diversion payment actually increased the Gini ratio on the total benefit distribution above that for price supports—though not significantly. It is obvious that if you design a direct payment distributional system in much the same manner as the price support program, the distributional consequences will be approximately similar. In agriculture today the capacity of the direct payment instrument for redistribution is clearly not being used. Rather, the distributional ground rules of the price support system are being imposed also on the direct payments.

Since the distribution of government payments are both very visible (unlike price support benefits) and highly concentrated, efforts have been made in Congress in recent years to place a limit on the size of the total payment that a single farmer may receive.

Recently available data on the distribution of total payments in 1967 make it possible to examine the concentration of total government payments and to test the distributional impact of a payment limitation [13]. A total of \$3.1 billion in government payments were made in 1967. Eighty percent of this total went to three crops: \$932 million to cotton, \$865 million to feed grains and \$731 million to wheat. The only other commodities with direct payments were sugar and wool which received \$70 million and \$29 million respectively. All the remaining \$439 million went into conservation (ACP, \$225 million) and land withdrawal [15].

In Table 10 it can be seen that the distribution of total payments in 1967 was highly concentrated exhibiting a concentration ratio of 0.671. This exceeds the concentration in every commodity benefit distribution in Table 7 except sugar cane. It falls between the concentration exhibited in Table 10 by gross and net farm income in 1967—which is what one might logically expect.

TABLE 10.—DISTRIBUTION OF 1967 GOVERNMENT PAYMENTS AND FARM INCOME: PROPORTION RECEIVED BY VARIOUS PERCENTILES OF FARMERS¹

1967	Percent of income received by the—						Gini concentration ratio
	Lower 20 percent of farmers	Lower 40 percent of farmers	Lower 60 percent of farmers	Top 40 percent of farmers	Top 20 percent of farmers	Top 5 percent of farmers	
1967 total government payments:							
With no limitation on size of total payment:							
Assuming \$25,000 limitation ²	1.1	5.7	13.3	85.7	69.0	42.4	0.671
Assuming \$10,000 limitation ³	1.1	6.0	14.1	85.9	67.2	39.0	.652
Various measures of farmer income in 1967:	1.2	6.5	15.3	84.7	64.4	33.8	.623
Gross receipts from farming ⁴	1.6	3.3	10.1	83.9	72.3	49.4	.693
Realized net farm income ⁵	4.5	9.0	19.3	80.7	59.0	26.2	.641
Nonfarm income of farmers	25.5	51.0	70.1	29.9	15.6	5.6	.125
Total income of farmers	14.9	29.8	44.5	55.5	37.0	15.0	.211

¹ This table presents portions of 2 Lorenz curves relating the cumulative percentage distribution of benefits to the cumulative percent of farmers receiving those benefits. Columns 1 through 3 summarize this relationship cumulated up from the lower (benefit per farmer) end of the curve, and columns 4 through 6 summarize the relationship cumulated down from the top (highest benefit per recipient) end of the curve.

² Government payments to farmers as actually distributed in 1967. Total payments were \$3,100,000,000.

³ Assumes all 1967 beneficiaries continue to participate in programs and are eligible for payments. Under the \$25,000 limit payments would total \$2,800,000,000 and under the \$10,000 limit \$2,600,000,000.

⁴ Including Government payments and imputed nonmoney income from farm products consumed at home and from the rental value of the farm dwelling.

⁵ Net of farm production expenses and changes in farm inventories of livestock and crops.

Sources: Computed from data in "Farm Income Situation," USDA, FIS-211, July 1968, pp. 68-69, except direct payment data which are from the Congressional Record, July 31, 1968.

If one assumes a \$25,000 limit were imposed on total payments to a single beneficiary in 1967, the concentration of the overall distribution of benefits declines only from a Gini ratio of 0.671 to 0.652 and total payments decline from \$3.1 to \$2.8 billion. If one assumes a \$10,000 limitation, the concentration ratio declines only to 0.623 and total payments decline to \$2.6 billion. This suggests that even quite low payment limitations are unlikely to have any revolutionary impact on the actual concentration of total payments made under present direct payment eligibility rules. It suggests as a consequence that any decision to limit payments should be based primarily on (1) the politics rather than the economics of equity between farmers, (2) the politics and economics of equity between large payment beneficiaries and taxpayers (the \$10,000 limit creates a potential transfer of \$0.5 billion), and (3) consideration of the impact of a payment limitation on increased federal budget costs for production control that could result from a decline in program participation by large producers.

Changes in program design such as have occurred since 1961, shifting emphasis from price supports towards direct payments, have considerable effects upon the distribution of the costs of the program also. While no quantitative analysis is attempted here it is clear from the logic of the situation that the cost of the price support operation is borne through the taxes necessary to sustain the storage and control operation, and also through consumers who pay some of the cost through higher market prices. The shift toward direct payments shifts this relative burden away from the consumer and toward the taxpayer.

One exception to this is the wheat program where direct payments are generated by a certificate system that is paid eventually by the consumer through the market. The price support approach, in which a higher proportion of the costs are borne by the consumer in the form of food costs, has a far greater impact on the low income consumer than would be the case of direct payments in which the cost is borne primarily by a progressive income tax. Thus, price support-acreage diversion programs can be described as doubly regressive—that is, a major share of the cost is borne by consumers with below average incomes and a major share of the benefit is received by farm producers with above average incomes. The shift toward direct payments, while not significantly affecting the distribution of benefits among farmers, has reduced the regressiveness of the distribution costs.

CONCLUSION

This paper has argued that distributional consequences of public decisions have major and increasingly important impacts in our society. We have a long history of public commitment to equity purposes. Yet we know very little about the social processes by which distributional impacts are institutionalized and are filtered through the society. We know even less about how to redesign distributional systems without incurring excessive political and social cost. In fact, we do not at this point even have good descriptions of the distributional impacts or characteristics of our public programs. What little we do know suggests, as in the three cases just presented, that there are many surprising and apparently perverse distributional impacts.

Both the integrity of our many public commitments in equity and our efficiency in the use of tax monies to attain public ends require far greater effort to collect data for program analysis of the distributional impacts of public decisions.

The three cases—higher education expenditures, Bureau of Reclamation investments, and the farm program—contain several lessons. If we do not systematically attempt to collect data and assess distributional impacts, we shall always be surprised by the many unintended consequences of our public decisions. Even if we accept the original objectives of older programs, we fail to attain our ends because we have failed to keep the equity objectives clearly before us. The use of indirect means, such as price supports, is a tricky and uncertain way of attaining equity objectives.

Finally, past decisions made without adequate distributional knowledge now appear (given our objectives) often to lack in economic and social wisdom. But even more importantly, these past decisions cannot now be easily or cheaply reversed. This is particularly true in light of the irrevocable specialized capital investments in the reclamation program and the past farm program benefits that are now capitalized into the cost structure of agriculture. The cost of our past ignorance of distributional impacts is clearly high. There is no need to persist in such error. But we must now collect the data and do the analysis of the distributional impacts that are needed for today's decisions.

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