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EVALUATING PUBLIC EXPENDITURES UNDER CONDITIONS OF UNEMPLOYMENT

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Under conditions of full employment, the monetary costs of public expenditures closely approximate the social costs. This is so because the prices paid for the labor and capital inputs to public investments accurately reflect the value of the outputs which are being foregone when resources are diverted to government projects. However, public investments are often undertaken under conditions of less than full employment. "To the extent that otherwise unemployed resources are drawn into use by the public expenditure, the social cost of the expenditure . . . is less than the market or monetary cost . . . by definition, these unemployed resources are not producing other things." This divergence between monetary and social costs can be observed even under conditions of relatively low overall unemployment, because of the "substantial variation of unemployment rates by occupation, by industry, and by region, around the national average unemployment rate."

Using the results of a recently developed computational model, Professor Haveman explains how the true social cost of a public expenditures can be estimated. This framework proceeds by estimating the occupational, industrial, and regional pattern of labor and capital demands generated by the project; relating this pattern of demands to unemployment data for comparable categories; and then adjusting the monetary costs for the idle resource use which is shown to be incorporated in them.

He then describes a method of adjusting for the divergence between "nominal" (monetary) benefit-cost ratios and the more relevant "opportunity cost" (social) benefit-cost ratios. As a result of this adjustment, projects whose benefit-cost ratios might have been unacceptable under full employment assumptions may become acceptable under conditions of less than full employment. He analyzes the effect of using social cost estimates on the design, location, and priorities of public investments and concludes that "only through substituting social opportunity costs for nominal monetary costs in the expenditure criterion can public decision-makers isolate expenditures which are both intrinsically economic and substantial employment generators."

Introduction

In the post-war period, the expenditure side of the public sector has been the subject of a substantial amount of analysis. While some of this work developed and refined the theory of public expenditure analysis, other work was aimed at improving the methods for evaluating the economic gains and the costs of alternative expenditure projects. This paper reflects the latter of these two emphases. It presents the reasons why monetary costs fail to reflect real social costs when the economy is experiencing unemployment and excess capacity, and elaborates a method for adjusting monetary costs when such conditions prevail. The implementation of this method eliminates the overstatement of real costs by monetary costs when some of the resources drawn into use by a public expenditure have idleness as their alternative.

*The views expressed in this paper are the author's and not necessarily those of the Joint Economic Committee.

I

An essential proposition in public expenditure economics is that, in evaluating the economic worth of a public expenditure, it is the *social* costs and *social* benefits which must be evaluated and not the private (or monetary) costs and private (or monetary) benefits. A second proposition is that, while social and private values may well be identical, they are not likely to be when there is some imperfection in the operation of the market system.[2] Clearly, the existence of unemployed resources represents market system imperfection which would cause these two values to diverge.[1]

If resources in the economy are fully employed, the monetary costs of the labor and capital purchased by a public expenditure are likely to be a good approximation of the value of the things which society would be able to enjoy if the expenditure were not undertaken.[2] This is so because the price paid to resources employed in any enterprise tends to equal the value of what these resources are producing in that use. When they are hired away from that activity, society is forced to forgo the output which they would have produced.

Consider, for example, a $100 public expenditure which is used to purchase $100 worth of labor and capital. If there were full employment and if the economy were functioning ideally in other respects, these resources would have been used to produce $100 worth of goods and services of some unknown composition which would have been purchased, used, and enjoyed by members of the society. This $100 worth of goods and services, then, is the social cost necessitated by the public expenditure. Stated alternatively, because of the $100 public expenditure, resources of that value are diverted from producing $100 worth of other things and society is forced to forgo the opportunity of using and enjoying these particular "other things."

However, when there is not full employment of labor, or when plant capacity is not fully used, some of the resources hired by the public expenditure may not have to be diverted from alternative uses. Some of them may be drawn from the pool of unused or idle labor or capital resources. In the case in which the public expenditure employs otherwise idle resources, society does not have to forego the opportunity to use and enjoy other things. By definition, these unemployed resources are not producing other things. Consequently, to the extent that otherwise unemployed resources are drawn into use by the public expenditure, the social cost of the expenditure—the value of the alternative uses that would have been made of the required manpower and capital—is less than the market or monetary cost.

II

It is clear that public expenditures made during a period of substantial unemployment would call into use some resources which would otherwise have been unemployed. Not so obvious, however, is the fact

[1] William J. Baumol, *Welfare Economics and the Theory of the State* (second edition, Cambridge: Harvard University Press, 1967), pp. 185–142. In that volume, Baumol treats unemployment as an external diseconomy requiring a collective remedy outside of the market system.

[2] This, of course, assumes that the market system is operating at its "efficient best" in all other respects.

*Further discussion of this issue is found in the papers by Davis & Kamien, Kneese & d'Arge, Zeckhauser, and Demsetz, in this volume.

that a similar result is likely when the national unemployment rate is quite low. However, this latter proposition—that some resources called into use by the marginal public expenditure would otherwise be idle, even under conditions of relatively full employment—is a point which must not be neglected.

The reason for this effect is the substantial variation of unemployment rates by occupation, by industry, and by region around the national average unemployment rate. If the Nation showed a full employment rate of 4 percent and if every occupation in every region showed that same rate of unemployment, a public expenditure could in all likelihood cause 100 percent of the resources which it required to be diverted from other uses. However, if the 4-percent national rate is composed of a 2-percent unemployment rate in some occupations (regions) offset by a 6- to 7-percent unemployment rate in other occupations (regions) it is not likely that all of the labor which is hired by the public expenditure would be diverted from other uses. A part of these resources would be drawn from the high unemployment occupations (regions) in which case the public expenditure would call into use some resources which would otherwise have lain idle. Indeed, in the case in which there is substantial variation of occupational, industrial, and regional unemployment around the national unemployment rate, it is conceivable that the full set of resource demands imposed by the public expenditure might be met by units of labor and capital drawn from the idle pool.

Table 1 shows that, in fact, there is a substantial amount of variation of occupational, industrial, and regional unemployment rates around the national average. The distribution of unemployment rates around the national average is presented for 1960. In that year the national unemployment rate was 5.6 percent. From the data in these distributions, it is clear that it is necessary to know the structure of demands which a public expenditure imposes on the economy in order to determine the extent to which the expenditure does or does not use resources which would otherwise be unemployed.

TABLE 1.—VARIATION OF OCCUPATIONAL, INDUSTRIAL, AND REGIONAL UNEMPLOYMENT RATES AROUND NATIONAL AVERAGE, 1960

Unemployment rates	Occupational [1]	Industrial [2]	Regional [3]
Below 2.6	4	1	9
2.6 to 3.6	3	2	6
3.6 to 4.6	0	0	8
4.6 to 5.6	2	4	15
5.6 to 6.6	3	4	11
6.6 to 7.6	0	1	7
7.6 to 8.6	1	2	2
8.6 or more	5	2	1

[1] Data for 18 major occupational categories.
[2] Data for 16 major industry categories.
[3] Data for 50 States.

When this result is related to the opportunity cost logic presented in section I, it becomes clear that much public spending in the postwar period imposed social—or opportunity or real—costs on the society which were less than the monetary costs.[3] Moreover, and more impor-

[3] If an unemployment rate of 5 percent is defined as full employment, 10 of the 21 years since World War II were years with idle productive capacity in excess of this minimum; 15 of the 21 years saw unemployment in excess of the frictional minimum if 4 percent is the full employment rate.

tantly given today's unemployment situation, some spending which occurs during periods of rather full employment may entail the use of resources which would otherwise have been unutilized or underutilized. This would be especially true if the pattern of resource demands imposed by a particular public expenditure emphasized the occupations, industries, and regions which had substantial unemployment even though, overall, the economy was rather fully employed. Again, the use of these resources entails zero opportunity costs.[4] Clearly, the accurate economic evaluation of the social costs of a public expenditure requires a detailed estimate of the pattern of the occupational, industrial, and regional demands imposed by the expenditure and a comparison of these demands with the existing pattern of occupation, industrial, and regional unemployment, *both* when the economy is not fully employed *and* when it is.

III

The first step in evaluating the opportunity costs of a public expenditure is to estimate the pattern of the demands generated by the expenditure for labor, by occupation, for capital, by industry, and for both labor and capital, by region. While the pattern of labor and materials employed directly by the expenditure is not difficult to ascertain, the set of final labor and capital demands imposed after the material inputs are traced through the several rounds of the production process is far more difficult to estimate. Recently, this estimation task has become possible because of the national input-output matrix assembled and published by the Office of Business Economics of the U.S. Department of Commerce[5] and the industry-occupations matrix completed by the Bureau of Labor Statistics of the U.S. Department of Labor.[6] When these empirical matrices are incorporated along with basic estimates of the direct resource demands of a public expenditure into an appropriate computational model, the full catalog of direct and indirect demands placed on factor sources—by occupation, industry, and region—can be estimated.

In one particular model developed for the purpose of estimating the complete pattern of labor and capital demands imposed by a public expenditure, the sequence of computations proceeds as follows:[7] Given the basic data on the direct material, equipment and supply inputs required by an expenditure, the complete pattern of industrial demands can be calculated through use of the input-output matrix. Then, on the basis of a set of relationships which grant a preferred status to the region in which the expenditure is undertaken and the

[4] Implicit in this position is the proposition that involuntary leisure has zero benefit to either the unemployed worker or the society.

[5] Morris R. Goldman, Martin L. Marimont, and Beatrice N. Vaccara, "The Interindustry Structure of the United States." A Report on the 1958 Input-Output Study, *Survey of Current Business*, 44 (Nov. 1964), 10–29; Norman Frumkin, "Construction Activity in the 1958 Input-Output Study," *Survey of Current Business*, 45 (May 1965), 13–23; National Economics Division Staff, "The Transactions Table of the 1958 Input-Output Study and Revised Direct and Total Requirements Data," *Survey of Current Business*, 45 (Sept. 1965), 33–49.

[6] U.S. Department of Labor, Bureau of Labor Statistics, *Handbook of Methods for Surveys and Studies*, Bulletin No. 1458 (Washington, 1966), Chap. 7, and U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Employment Statistics, Sources and Data*, Report No. 305 (Washington, June 1966).

[7] An elaboration of the details of this model and its use can be found in Robert Haveman and John V. Krutilla, *Unemployment, Idle Capacity and the Evaluation of Public Expenditures* (Baltimore; Johns Hopkins Press, 1968).

geographic location of each industry's capacity, the geographic distribution of these total industrial demands is estimated. Third, by using the industry-occupation matrix, the labor demands imposed on each region because of the industry output demands are estimated, in occupational detail. Fourth, these occupational labor demands generated by purchases of materials, equipment, and supplies—and distributed among the regions—are added to the onsite occupational pattern of labor demands by region. Finally, the pattern of demands imposed on capital are determined by industry and by region by applying appropriate capital-output ratios to the total output demands, by industry, which were estimated in the second step.

By employing this model, the pattern of resource demands can be computed for any public expenditure in 156 occupation, 80 industry, and 10 region details. Table 2 shows, in substantially consolidated form, the kind of detailed estimate furnished by this model. In that table the pattern of occupational, industrial, and regional demands is shown when a multiple-purpose—including hydroelectric power generation—water development project is constructed in the Lower Atlantic States.

In the final column of this table, it is shown that a total gross output of $1,032 per $1,000 of total project cost is generated by the direct purchases of materials, equipment, and supplies required for the project.[8] Of this total gross output demand, 29 percent of it, or $300, is imposed on the Lower Atlantic region—the region where the project is assumed to be constructed. In addition, because of the heavy demands which this kind of installation places on durable equipment manufacturing, a substantial set of demands are imposed by the project on the Mid-Atlantic and East North Central regions where these industries are concentrated. Together, these three regions account for over 70 percent of the total gross output stimulated by the expenditure. That it is the durable goods industries which account for this regionally concentrated result is also seen in the table. Of the total gross output of $1,032, durable goods production accounted for $539, or over 50 percent. Of the $539 of durable goods output, over $320 or 60 percent is produced by the Mid-Atlantic and East North Central regions.

In the lower portion of table 2 the labor demands required by the project are shown in occupational detail and by region. Because of the nature of this kind of construction installation, many of the labor demands are required on the construction site. This accounts for the heavy concentration of labor demands in the region in which the project is assumed to be constructed. The Lower Atlantic region supplies nearly three-fourths of the total labor demand generated by the project. Consistent with the gross output estimates which demonstrated the concentration of durable goods in the highly industrialized regions, it is seen that those labor demands which the project imposes on other regions are concentrated in the Mid-Atlantic and East North Central regions and among the craftsman and operatives occupations.

[8] This $1,032 represents the total gross output, both direct and indirect, generated by the final expenditure. Its size and industrial breakdown was estimated by an input-output calculation. The value of final demand, representing direct purchases of materials, equipment, and supplies, was $514 (out of $1,000 of total project cost). It is this final demand which, through the input-output calculation, generated the $1,032 of total gross output. The portion of the $1,000 of total project cost not represented by direct purchases of materials, equipment, and supplies is largely accounted for by the direct demand for on-site labor.

ABLE 2.—GROSS OUTPUT BY INDUSTRY AND TOTAL LABOR COST BY OCCUPATION IN EACH OF 10 REGIONS FOR A $1,000 PUBLIC EXPENDITURE ON A MULTIPURPOSE WATER RESOURCE PROJECT ASSUMED TO BE CONSTRUCTED IN THE LOWER ATLANTIC REGION, IN DOLLARS PER $1,000 OF EXPENDITURE[1]

	New England	Mid-Atlantic	East north-Central	West north-Central	Southeast	Lower Atlantic	West south-Central	Mountain and west Coast	Total
INDUSTRY									
griculture, forestry, and fisheries	[2](5)	[2](6)	1(15)	2(21)	1(16)	[2](4)	1(13)	2(21)	6
ining (including crude petroleum)	[3](3)	4 (5)	4 (5)	4 (6)	2 (4)	35(58)	10(14)	7 (9)	77
onstruction	[2](2)	1(11)	1(16)	[2](3)	[2](3)	5(54)	[2](4)	[2](6)	9
ondurable goods manufacturing	7 (7)	20(20)	24(23)	5 (5)	10(10)	11(11)	14(14)	11(10)	103
urable goods manufacture	31 (6)	126(23)	197(37)	27 (5)	29 (6)	49 (9)	25 (5)	56(10)	539
Lumber and wood products	1 (5)	1 (7)	2(12)	[2](4)	2(16)	1 (8)	1 (7)	6(48)	13
Stone, clay and glass products	4 (5)	15(19)	19(24)	6 (8)	7(10)	13(17)	5 (6)	9(12)	78
Primary metals industries	6 (4)	37(28)	47(36)	4 (3)	6 (5)	14(11)	3 (3)	14(10)	129
Fabricated metal industries	6 (6)	23(23)	31(31)	6 (6)	8 (8)	12(12)	5 (5)	11(11)	100
Machinery (excluding construction and electrical)	8(10)	22(29)	34(45)	3 (4)	2 (2)	2 (1)	1 (1)	4 (5)	75
Construction machinery	1 (1)	4 (5)	27(52)	4 (7)	1 (3)	2 (3)	9(17)	4 (9)	52
Electrical machinery	5 (8)	19(29)	25(40)	3 (5)	2 (3)	3 (5)	1 (1)	5 (8)	64
Transportation equipment	1 (4)	3(14)	11(52)	1 (4)	1 (5)	1 (7)	1 (3)	2(10)	20
Miscellaneous manufacturing	1(14)	3(45)	1(21)	[2](5)	[2](3)	[2](2)	[2](2)	[2](7)	7
ansportation and warehousing	1 (2)	6 (8)	8(11)	2 (2)	2 (3)	49(58)	2 (3)	3 (4)	72
holesale and retail trade	1 (2)	6 (6)	9 (9)	1 (2)	2 (2)	70(75)	2 (2)	3 (3)	93
rvices	4 (3)	14(11)	21(16)	4 (3)	4 (3)	71(54)	6 (5)	7 (6)	131
Total gross output[4,5]	45 (4)	177(17)	264(26)	45 (4)	52 (5)	300(29)	61 (6)	89 (8)	1,032

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OCCUPATION

ofessional, technical, and kindred	2	6	9	1	1	48	2	3	72
nagers, officials, and proprietors	1	5	8	1	2	43	2	3	65
rical, and kindred workers	2	6	9	1	1	22	2	3	46
lesworkers	[3]	1	1	[3]	[3]	6	[3]	[3]	9
aftsmen, foremen, and kindred	[3]	11	15	3	3	274	[3]	[3]	319
Carpenters	[3]	[3]	[3]	[3]	[3]	48	[3]	[3]	49
Cement finishers	[3]	[3]	[3]	[3]	[3]	4	[3]	[3]	4
Iron and metal workers	[3]	1	1	[3]	[3]	22	[3]	[3]	22
Construction equipment operators	[3]	1	1	[3]	[3]	45	[3]	[3]	46
Other building trades	[3]	2	3	[3]	[3]	37	[3]	[3]	41
Mechanics	1	2	4	1	1	12	1	1	12
Labor foremen	1	5	9	1	1	48	1	1	56
Other craftsmen, foremen, and kindred	4	11	20	3	4	54	3	7	108
eratives and kindred workers	[3]	2	2	1	[3]	15	1	1	22
Truck and tractor drivers	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
Sailors and deckhands	[3]	12	17	2	[3]	39	[3]	[3]	86
Other operatives and kindred	[3]	1	2	[3]	[3]	3	[3]	[3]	7
rvice workers	[3]	[3]	4	1	1	77	1	1	89
borers	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	2
rmers and farmworkers									
Total labor cost[6,9]	12 (2)	47 (7)	70(10)	12 (2)	14 (2)	527(73)	13 (2)	24 (4)	719

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[1] Percent of row totals stated in parentheses behind the dollar values.
[2] Less than $0.1 but greater than 0.
[3] Less than $0.5 but greater than 0.
[4] Rows may not add because of rounding.
[5] Percent of total gross output stated in parentheses behind regional total gross output figures.
[6] Percent of total labor cost stated in parentheses behind regional total labor cost figures.

Finally, the substantial disparity in the pattern of industrial and occupational demands generated by various project types should be noted. While all of the project types analyzed were water resource investments, the anatomy of their industrial, occupational, and regional impacts is far more diverse than is generally recognized. While some project types require very little on-site construction (dredging), others require the installation of huge capital facilities (multipurpose projects). For 12 project types analyzed, the ratio of labor compensation (direct and indirect) to total project cost ranges from .52 to .72. The range in the ratio of on-site labor cost to total labor cost extended from .25 to .58. The ratio of durable goods demanded to gross material demands extends from .2 to .65. When all of the project types are assumed to be constructed in the Lower Atlantic region, the percent of national gross output retained in that region ranges from 24 to 32 percent; the percent of national labor cost retained extends from 69 to 75 percent. Even more radical disparities among project types are noted as detailed industrial or occupational sectors are studied.

IV

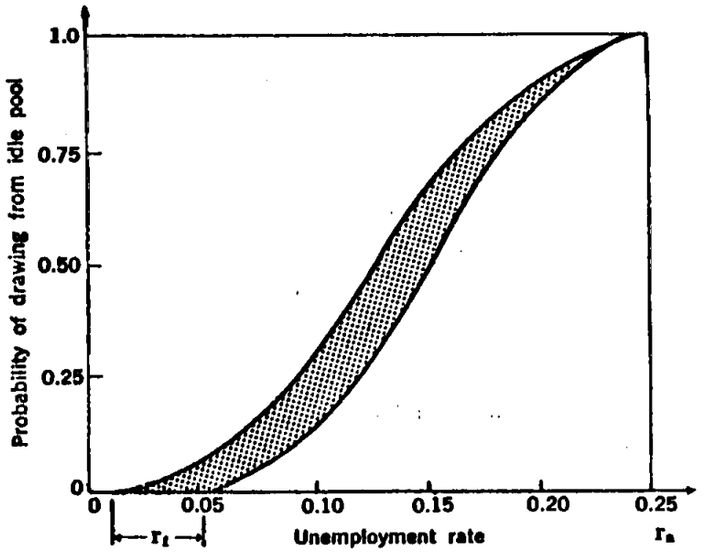
Having ascertained the pattern of resource demands imposed by a public expenditure, the next step in evaluating the social costs of these demands is to compare them with the occupational and regional pattern of labor unemployment and the industrial pattern of excess plant capacity. As described above, the monetary costs of a public expenditure represent real opportunity returns forgone at the margin only if all of the resources used had alternative employs. If there is unemployment, however, some labor used is likely to be drawn from the idle pool. This labor has no comparable opportunity cost. Similarly, the opportunity rate of return on otherwise idle capital drawn into use by the expenditure is zero. However, because capital services are largely storeable, depreciation charges are a real cost properly imputed to the expenditure even when otherwise idle industrial capacity is drawn into use.

On this basis, the occupational, industrial, and regional breakdowns of monetary costs can be modified to the extent that the units of labor and capital represented would have been otherwise idle. To estimate the extent to which any labor and capital demand employs otherwise unused resources, it is necessary to trace each unit of labor and capital employed to its source and to inquire concerning its alternative use. In the absence of data necessary to implement this counsel of perfection, the model discussed here assumes that the levels of occupational unemployment (or, in the case of capital, industrial excess capacity) are significant determinants of the proportion of labor drawn from any occupation and region (capital drawn from any industry) which would have, in the absence of the expenditure, been idle. For example, this approach treats an increase in the demand for labor at low levels of unemployment as simply shifting workers among jobs without reducing unemployment below the frictional minimum. However, as the rate of unemployment (excess capacity) rises, so too does the probability that the incremental demand will draw otherwise unemployed labor (idle capital) into use. Because accurate knowledge on the pattern of labor and capital market response does not exist, a set

of synthetic response functions is employed. These functions relate the probability that a given increment in the demand for labor and capital will be drawn from otherwise unemployed resources to the level of occupational unemployment and industrial excess capacity on the basis of reasonable assumptions concerning market operation.

In figure 1, the kind of relationships used to estimate the extent to which labor demands are supplied from otherwise unutilized resources

Figure 1



in this model are shown.[9] The set of synthetic functions inscribed within the area between the two curves states that the higher the unemployment rate, the greater the proportion of labor from any given occupation which is hired from the idle pool. The region labeled r_f describes the range of unemployment rates at which each of the major occupational categories is said to be fully employed.[10] Full employment for each occupation is defined by the national unemployment rate experienced by that occupation in 1953—a year with minimum unemployment without undue inflationary stress. The point labeled r_a signifies the rate of unemployment at which an increment of demand would be entirely supplied from otherwise unutilized resources. For the set of relationships included in the shaded area of figure 1, this unemployment rate is .25, which is the estimated rate of unemployment at the height of the depression of the thirties. It is assumed that under such conditions, increments to the demand for labor and capital are satisfied with no displacement of alternative outputs. The relationships incor-

[9] The area between the two curves is the region within which the response functions, one for every major occupational category, fall. A separate set of functions, not shown here, was used to estimate the proportion of capital demands, by industry, which were satisfied by otherwise idle capacity.

[10] There is a single rate for each occupational category within r_f.

porated into the curves which lie in the shaded area are offered as an accurate portrayal of actual labor market behavior.

These relationships (and similar ones for estimating the withdrawal of capital from the idle pool) are used with detailed data on the level of occupational unemployment by region and industrial excess capacity to provide the basis for estimating the real costs of public expenditure. By combining the labor and capital response relationships with detailed evidence on the occupational, industrial, and regional patterns of unemployment, an estimate of the proportion of the labor and capital withdrawn from the idle pool in each pertinent occupation, industry, and region is obtained. By multiplying these percentages by the dollars of monetary cost in each category, the amount of monetary cost which, because of the use of otherwise unemployed resources, is not matched by social cost is estimated. When the monetary costs are adjusted for the idle resource use which is incorporated in them, the remainder represents the true social cost of the public expenditure.[11]

V

In tables 3 and 4, some estimates of social cost and its relationship to market cost are shown for a sample of public expenditures. These estimates are based on the unemployment conditions experienced in 1960. As noted, the unemployment rate was 5.6 percent in that year. Consequently, the adjustment to market cost required for investments undertaken in that year was substantially greater than for investments undertaken in more recent periods with unemployment levels below 4 percent. In table 3, the variation in the percentage which social costs form of total *labor* costs is shown for five public expenditure categories in the water resources area. While this data shows the influence of regional unemployment differentials on the degree to which *total* monetary labor cost requires adjustment, the model described above also generates tables which highlight the variation in social cost as a percentage of monetary cost for numerous detailed occupational and industrial categories.

In table 4, estimates of social cost as a percent of the total *expenditure* are shown for the same public projects constructed in each of the 10 regions, again with unemployment conditions prevailing in 1960. Table 4 demonstrates the substantial variation in the required cost adjustment which exists among project types. It also shows that the variation in adjustment for any single project type as its geographic location changes is even more significant than the variation among project types. In no case does the range for the former variation fail to exceed 15 percentage points. The influence of geographic unemployment on required cost adjustment is clearly seen by comparing the cost adjustments for projects constructed in the high unemployment lower Atlantic region with similar data for project construction in other regions. For every project type, the cost adjustment required for construction in this region is at least 10 percentage points below the median adjustment for all regions.

[11] On the basis of this formulation, it is seen that the exercise of adjusting nominal costs for the unemployed labor and idle capital which is used is an example of "shadow pricing." See the paper by Margolis, in this volume.

TABLE 3.—ESTIMATE OF SOCIAL LABOR COST AS A PERCENT OF MARKET LABOR COST FOR 5 REPRESENTATIVE PUBLIC EXPENDITURES IN 10 REGIONS OF PROJECT LOCATION, 1960

Region	Large earthfill dams	Local flood protection	Medium concrete dams	Large multiple-purpose projects	Dredging
New England	88	82	88	87	83
Mid-Atlantic	80	74	82	81	76
East North Central	90	89	92	92	89
West North Central	87	84	89	89	88
Southeast	93	92	94	94	88
Lower Atlantic	75	65	74	73	73
Kentucky-Tennessee	81	75	81	80	77
West South Central	92	91	93	93	86
Mountain	91	92	93	93	94
West Coast	85	82	86	86	74
Range of percentages	75-93	65-92	74-94	73-94	73-94.0
Median percentage	87.5	83	88	88	84.5

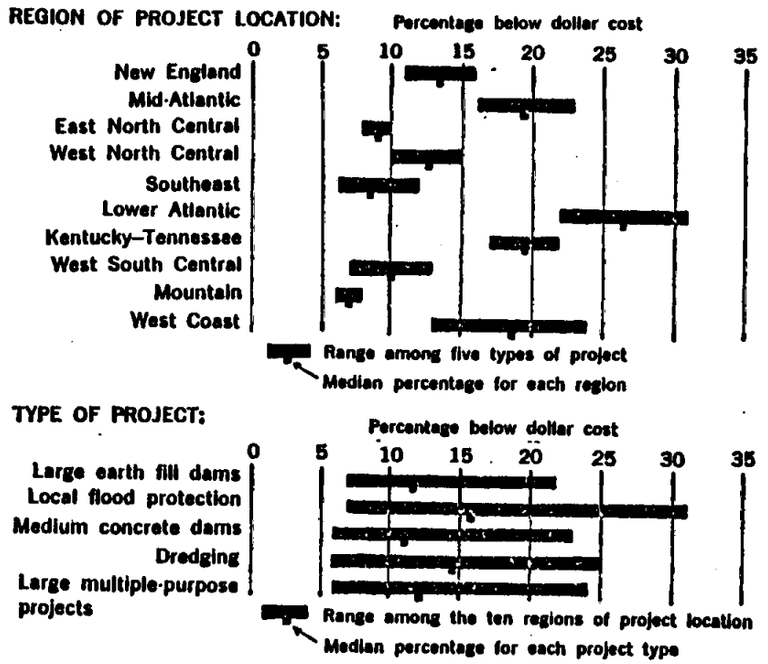
TABLE 4.—ESTIMATE OF TOTAL SOCIAL COST AS A PERCENTAGE OF TOTAL EXPENDITURE FOR 5 REPRESENTATIVE PROJECT TYPES IN 10 REGIONS OF PROJECT LOCATION, 1960

Region	Large earthfill dams	Local flood protection	Medium concrete dams	Large multiple-purpose projects	Dredging	Range of percentages	Median percentage
New England	89	84	88	87	84	84-89	86.5
Mid-Atlantic	82	77	84	82	78	77-84	80.5
East North Central	91	90	92	92	90	90-92	91.0
West North Central	88	85	90	89	89	85-90	87.5
Southeast	93	93	94	94	88	88-94	91.5
Lower Atlantic	78	69	77	76	75	69-78	73.5
Kentucky-Tennessee	83	78	83	81	79	78-83	80.5
West South Central	92	92	93	93	87	87-93	90.0
Mountain	92	92	93	93	94	92-94	93.0
West Coast	86	84	87	87	76	76-87	81.5
Range of percentage	78-93	69-93	77-94	76-94	75-94	.....	.....
Median percentage	88.5	84.5	89	88	85.5	.....	.....

The results of both tables 3 and 4 are summarized in figure 2. The charts shown there display the percentages by which the dollar costs of the selected public expenditures undertaken under economic conditions similar to those of the 1957–64 period—of which 1960 is taken to be typical—would overstate the social costs. The differences vary with the unemployment levels and other economic conditions in the region where a project is located, and also with the amounts, kinds, and origins of labor and materials required for each type of project.

Examination of this data suggests that the social cost of public expenditures for investment projects undertaken in 1960—and by inference from 1957–64—is between 70 and 90 percent of nominal monetary expenditures. The precise percentage depends on the category of expenditure, the region in which it is undertaken, and the nature of the relationship used to relate the rate of idle resources to the proportion of resources demanded by the public expenditure which will be withdrawn from the idle pool.

Figure 2



VI

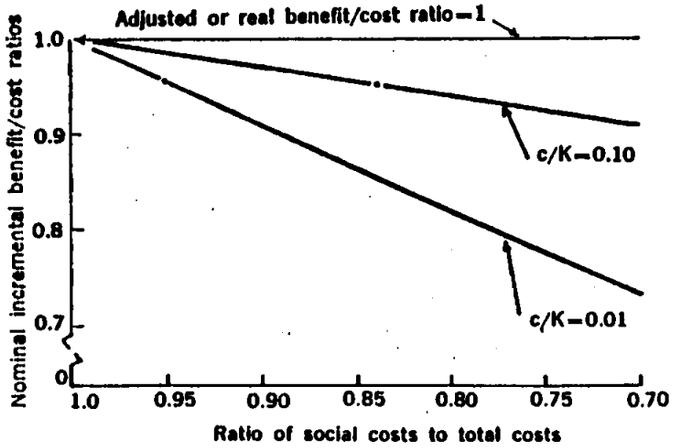
Given the estimated social costs, the question remains as to the extent to which the "nominal" benefit-cost ratios computed for projects constructed during the slack conditions between 1957–64, for example, or for chronically depressed areas, diverge from the more appropriate "opportunity cost" benefit-cost ratios.

While nominal capital (construction) costs overstate opportunity costs by the magnitude suggested, the effect on the benefit-cost investment criterion will be dampened to the extent that future operating, maintenance, and interim replacement costs occur in a fully employed economy. It is convenient, although not essential, to assume that investments made under conditions of unemployment do not operate in a less than fully employed economy. With this assumption, the component of annual project costs requiring adjustment will be only the capital charges—that is, the interest and amortization component of annual costs. The required adjustment in annual costs, therefore, will be a function of the ratio of annual operating, maintenance, and interim replacement costs (c) and the capital (or construction) costs (K).

The impact of construction cost adjustment on benefit-cost ratio calculations is shown graphically in figure 3 on the assumption that only construction costs require adjustment. Here the divergence in the nominal benefit-cost ratio from the true social benefit-cost ratio is analyzed for capital intensities (c/K) of .01 and .10. The upper curve shows the relationship of the social to the nominal benefit-cost ratio at different ratios of social capital costs to total capital costs for a public expenditure in which the annual operating costs (c) are 10 percent of initial construction costs (K). The lower curve shows the same relationship for a more capital-intensive expenditure—one in which annual operating costs are only 1 percent of initial capital costs. From these relationships, it is seen that when social costs for initial project construction are, say, 75 percent of total monetary costs, the nominal benefit-cost ratio for an economically efficient project can be as low as .78:1 if the undertaking is very capital-intensive (say, c/K=.01). On the other hand, for a less capital-intensive expenditure (say c/K=.1), a ratio of social capital costs to total costs of 75 percent would require a nominal benefit-cost ratio of at least .9:1 for the investment to be efficient. On the basis of this evidence, it can be asserted that most proposals for heavy construction projects bearing an unacceptable benefit-cost ratio from .85–.99 when evaluated under full employment assumptions would be deemed efficient under the conditions of unemployment and excess capacity of the sort prevailing in the 1957–64 period.

Figure 3

Ratio of Social Capital Costs to Total Market Costs



VII

From the analysis of this paper, it is clear that the level and distribution of unemployed resources in the economy does affect the evaluation of the social cost imposed on the economy by public expenditures. Moreover, the pattern of unemployment and excess capacity should influence the *design*, *location*, and *priorities* of public investments to be constructed during any time period. While the general proposition which follows from the study is that the monetary cost of public expenditures overstates the true social cost when otherwise unemployed resources are drawn into use by the expenditure, there are a number of more specific conclusions which are corollaries to this general proposition:

- If the national unemployment rate exceeds the frictional minimum or if there is variation of occupational or regional unemployment around a national full employment rate, it is likely that more of all expenditures, public and private, can be justified than would be implied by the efficiency criterion using monetary benefit and cost estimates.
- If either of the idle resource conditions described above exist, the ranking of projects by the standard benefit-cost ratio using social value estimates would differ from the ranking which would occur if monetary estimates were used. Those expenditures, either public or private, which place heavy demands on occupational, industrial, and regional sectors showing idle resource rates above, the frictional minimum would rise in the ranking relative to those which place predominant demands on other sectors.
- If either of the idle resource conditions exist, the design of projects relying on social benefit-cost computations will differ from the design resulting from adoption of the full employment assumption. Those projects placing relatively heavy demands on occupational, industrial, and regional sectors showing high idle resources rates will be oversized relative both to their full employment design and to the scale of projects which place demands on other sectors. Moreover, all expenditures, public and private, which rely on social benefit-cost calculations for design, will make relatively heavier demands on occupations, industries, and regions showing relatively high idle resource rates than if the design criterion were based on the full employment assumption.
- Because of the implications of the above propositions, the problem of unemployment, regional stagnation, and high unemployment occupations and industries would tend to be eased by use of the social benefit-cost design criterion rather than the market cost design criterion based on the full employment assumption. This is so because unused resources are evaluated at a very low cost in the social benefit-cost criterion. Use of these resources is, consequently, encouraged.

As a word of caution, it should be emphasized that the results of this study should not be taken to imply that every public expenditure project which has been rejected because of an inadequate benefit-cost ratio should be undertaken when the unemployment rate rises above 4 percent. The conclusion to be drawn is that there is an operational framework by which to re-evaluate projects in terms of their opportunity costs when regional or national unemployment rates depart

from frictional minima.[13] Moreover, to avoid biasing public expenditures in the direction of a single program, all public investments (including tax cuts) should be similarly analyzed to determine what, if any, differences exist among them. A second warning concerns the extent of adjustment required in the benefit-cost ratio when otherwise unutilized resources are a part of monetary costs. As seen in the calculations of tables 3 and 4, the level of social costs typically falls only about 10 to 15 percent—at most 25 percent—even when the rate of unemployment is 8 to 9 percent, as it was in a number of regions in 1960. At a time when there is much expectation that the incorporation of "redevelopment benefits" or "secondary benefits" into benefit-cost analysis will lead to the justification of many projects not otherwise meeting the efficiency criterion, this conclusion should be sobering.

Only through substituting social opportunity costs for nominal monetary costs in the expenditure criterion can public decisionmakers isolate expenditures which are both intrinsically economic and substantial employment generators. Through such shadow pricing efforts, more discriminating judgment can be applied to public expenditure policy in general and especially to public expenditure policy in the chronically depressed, high unemployment, and declining areas of the Nation.*

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[13] See Haveman and Krutilla, *op. cit.*

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

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