A MODEL FOR DETERMINING THE IMPACT OF FEDERAL OUTLAYS ON COUNTY WELL-BEING

by

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Since the Great Depression, the federal government has taken an ever larger role in promoting domestic economic development. Billions of dollars are spent by the federal government each year on programs to enhance regional income, employment, and rural-urban population balance which in turn contribute to ultimate goals such as quality of life and well-being. Motivation for the outlays may be need (as indicated by lagging income and employment), efficiency (as indicated by favorable investment opportunities), or expediency (as indicated by raw political power). Whatever the motivation, a major concern in a nation troubled by diminishing natural resources, limited federal funds, and stagflation is the contribution of outlays to development goals.

The general objective of this study is to develop a model evaluating the impact of domestic federal spending on selected development goals in the United States. An application is illustrated. Special emphasis is on the differential impact of outlays on counties by rural-urban status. Emphasis is also placed on the cost effectiveness of federal programs, i.e., the goal attainment (income, employment, and population growth) achieved per unit of federal outlays.

The effects of federal programs have been evaluated in some previous research but results have been unimpressive:

> The impact of activities that cost the public millions, sometimes billions, of dollars has not been measured. One cannot point with confidence to the difference, if any, that most social programs cause in the lives of Americans (Wholey et. al. p. 15).

Most studies have evaluated the impact of public spending on a pro-

ject-by-project basis. Unanticipated impacts on a geographic area are often unmeasured, and a program not considered by the researchers may affect the area more than the program under evaluation. Also, results of an area-specific study are unlikely to generalize to other areas. This study alleviates several shortcomings of previous work by including a comprehensive set of federal programs for all counties in a simultaneous econometric growth model described below.

Model Development

Ultimate domestic development goals such as well-being of people are not easily measured; practical considerations dictate the use of measurable ends-in-view. Ends-in-view or proximate goals examined herein are personal income per capita, employment rate (the number employed as a percent of total county population), and population change by county (Butz).

To single out these three targets is not intended to deny the existence of other goals of federal domestic development policy. Some federal programs have goals such as conservation of resources and regulation of activity and are not designed to raise income or employment. Evaluating the contribution of federal programs to conservation, safety, and the like is important, but we confine this analysis to the contribution of programs to income, employment, and population distribution--whatever the immediate purpose of the programs. Contributions to net investment are also analyzed.

Post-Keynesian growth theory of the Harrod-Domar genre (cf. Richardson, ch. 10) highlighting the development role of aggregate saving, investment, and exports provides the conceptual foundation for the econometric model. In export-base theory (cf. Richardson, ch. 13), an area's income is determined by the level of exports from that area to other areas. Export indus-

tries can be defined as activities which bring dollars in from outside areas. As such, federal government outlays for welfare, military installations, and other purposes can be regarded as export industries which generate local income. Areas seek to increase local income by encouraging growth of export industries, including federal government activities, in their areas. Each dollar of income (output) of basic export industries generates secondary and tertiary income which increases income more than one dollar. Combining the conclusions of the export-base theory and the Harrod-Domar model results in a joint emphasis on external and internal sources of area growth--the basis for the model developed here.

The effects of federal outlays are depicted in this study by the following system of equations:

State and Local Government Outlays:

$$O_{L,t} = f_L \left(\Sigma\Sigma_{ij} O_{F_i,\, t-j},\ Y_t,\ E_t,\ \text{Taxes}_t,\ S_t,\ \text{Rurality},\ \text{Region}\right) \qquad (1)$$

$$i = 1, 2, \ldots, n;\ j = 1, 2, \ldots, m$$

Federal Government Outlays:

$$O_{F_i,t} = f_{F_i} \left(O_{L,t},\ Y_t,\ S_t,\ \text{Rurality},\ \text{Region}\right), \qquad (2)$$

$$i = 1, 2, \ldots, n$$

Change in Investment:

$$\Delta K_t = f_K \left(O_{L,t},\ \Sigma\Sigma_{ij} O_{F_i,\, t-j},\ Y_t,\ K_{t-1},\ C_t,\ \text{Rurality},\ \text{Region}\right) \qquad (3)$$

$$i = 1, 2, \ldots, n;\ j = 1, 2, \ldots, m$$

Investment Identity:

$$K_t = K_{t-1} + \Delta K_t \qquad (4)$$

Migration Identity:

$$M_t = N_t - N_{t-1} - \text{Births}_t + \text{Deaths}_t \tag{5}$$

Employment Rate:

$$E_t = f_E \left(O_{L,t}, \underset{ij}{\Sigma\Sigma} O_{F_i}, t-j, K_t, C_t, S_t, \text{Rurality}, \text{Region}\right) \tag{6}$$

$$i = 1, 2, \ldots, n; \; j = 1, 2, \ldots, m$$

Per Capita Income:

$$Y_t = f_Y \left(O_{L,t}, \underset{ij}{\Sigma\Sigma} O_{F_i}, t-j, \Delta K_t, S_t, \text{Rurality}, \text{Region}\right) \tag{7}$$

$$i = 1, 2, \ldots, n; \; j = 1, 2, \ldots, m$$

Change in Population:

$$\Delta N_t = f_N \left(O_{L,t}, \underset{ij}{\Sigma\Sigma} O_{F_i}, t-j, E_{t-1}, \Delta K_t, M_t, S_t\right) \tag{8}$$

$$i = 1, 2, \ldots, n; \; j = 1, 2, \ldots, m$$

Variables in this model are defined as:

$O_{L,t}$ = state and local government outlays in the county in period t;

$O_{F_i,t-j}$ = federal government outlays for program i in the county in period t-j;

ΔK_t = change in capital stock from investment activity in the county from period t-1 to period t;

M_t = migration from the county from period t-1 to period t;

E_t = employment rate, the number employed as a percentage of total county population, in period t;

Y_t = per capita personal income in period t for county residents;

ΔN_t = change in county population from period t-1 to period t;

$Taxes_t$ = state and local government taxes collected in the county in period t;

S_t = selected socio-demographic characteristics of the county's population in period t;

C_t = selected economic conditions in period t;

Rurality = a measurement of county population density and closeness to (remoteness from) urban areas; and

Region = a region of the United States.

The system of seven plus n equations determines the values of the seven plus n endogenous variables: state and local government outlays O_L; federal government outlays O_{F_i} for each program, i = 1, 2, ..., n; net investment ΔK; total investment K; migration M; the employment rate E; income per capita Y; and population change ΔN. Other variables in the system are predetermined--either exogenous or lagged values of the endogenous variables.

The quality of life experienced in an area is both directly and indirectly influenced by federal spending. It is hypothesized that federal outlays increase income, investment, and employment opportunities at the county level unless their effects are offset by the effects of taxes in the area.

The impacts of the federal government outlays are hypothesized to differ by type of program, however. Transfer payments are largely made for consumption purposes and will have direct, short-term effects on income. Investment programs are expected to have greater long-term income and employment effects than are transfer payments for consumption purposes.

Equations predicting federal outlays per capita on the basis of socio-demographic and other explanatory variables are included to identify

elements that determine local federal spending. These equations also depict local demand for services of the federal government in the simultaneous system. Program outlays by state and local governments influence federal outlays as well as local income, employment, and population. A variable measuring state and local government spending is included in the simultaneous equation system to account for such effects and to better isolate effects of spending at these levels of government.

Finally, the distribution of federal funds among counties depends in part on political considerations not included in this analysis. Impacts associated with these and other elements not included in the system are assumed to be randomly distributed among counties.

Model Estimation

The Data

Data are from Federal Outlays, Human Resource Profile (a subset of the 1970 Census of Population), 1972 Census of Governments, and Local Area Personal Income series compiled by the Bureau of Economic Analysis. The sample consists of the 3,064 counties, or county equivalents, of the 48 coterminous United States.

Outlay Categories. Comprehensive data on federal outlays are reported for over 70 agencies and 84 functions. To make the data manageable and reduce statistical error, those functions are aggregated into 15 categories selected to delineate relatively homogeneous categories of spending for analyzing impacts on development goals.

Data Limitations. Federal outlay data are flawed by failure to specify (1) latest versus preliminary estimates, (2) net outlays or resource costs rather than the face value of loans, (3) obligations rather

than actual spending, and (4) actual incidence of location of spending. Results reported herein are for 1975 outlays which contain a number of preliminary estimates. However, results were not improved by using data from earlier years which contained fewer preliminary outlay estimates.

Most categories of outlays were reported expenditures rather than loans. Aggregation of loans with cash outlays may distort estimates of cost effectiveness for some categories; e.g., community development. In some cases the dollar amounts reported for particular programs reflect obligations incurred rather than actual expenditures in the current fiscal year. However, "most obligations reported as current fiscal year outlays accurately represent the level of federal spending during that year" (United States Community Services Administration, p. 2).

Some funds pass through state governments or other intermediaries, such as prime contractors, before reaching their ultimate recipients. Even where the location of first incidence expenditures is properly identified, the locus of impact will not totally coincide with the locus of expenditure. "A timely and economically feasible means of tracking these outlays to the final recipient has not been developed" (United States Community Services Administration, p. 2).

Some counties receive larger shares of funds than others simply because they contain public institutions which are recipients of large amounts of federal monies. The "county" encompassing the District of Columbia, for example, receives the largest number of federal dollars for agricultural and natural resource research largely because the United States Department of Agriculture is located there. In this study, the District of Columbia was excluded to avoid bias its presence might cause.

The Results

Theoretical considerations along with some insights obtained from preliminary ordinary least squares (OLS) estimates determined sociodemographic and economic variables to be included in a final empirical system. Federal spending data for each of several years were included in initial modeling. Models incorporating lagged values of the outlay variables were attempted but problems with multicollinearity were encountered. Estimations combining annual time series from 1971-75 with cross-sectional pooling were also attempted. These efforts did not improve on results presented below.

Results reported below are for the equations of the development target variables only. These estimates include outlay variables on a per capita basis. Earlier estimates were in terms of total outlays to a county. A smaller coefficient of variation for the per capita variables provides some evidence that these allocations are not randomly made, but made according to population. Only variables on a per capita basis were used.

In the approach to estimation presented below, an attempt was made to correct for the demand or need factors in estimating the contribution of federal outlays to the "supply" of employment, income, and population. To correct for these factors, OLS equations related each of the 15 federal spending (dependent) variables to various socio-demographic and economic (independent) variables. These regression results are not presented here to save space (Nelson). All equations contained some significant coefficients, but performance of the variables in accounting for variation in the dependent variables was mixed. This specification problem was particularly acute for seven outlay variables: rural housing and public facilities, pollution control, business advancement and regulation, area and

regional development, housing, education, and transportation. One solution may have been to estimate equations with data in county totals rather than per capita units and repeat this approach. This was not attempted here. The reported approach to estimation treated these seven variables as exogenous to the system to avoid serious loss of information, specification errors, and statistical inefficiency. The remaining eight federal outlay variables were endogenous in the structural equations shown in Table 1.

In the income per capita equation, farm income stabilization and community development had positive effects on income per capita while education spending had a negative effect. Increasing educational opportunities could serve as an incentive to decrease time in the labor force and, therefore, decrease income while investing in human capital improvement. The employment rate was positively affected by federal outlays for agricultural land and water and health. Negative, significant coefficients were found for business advancement and regulation, area and regional development, income security, and general government outlays. Net investment (change in contract construction income per capita, 1974-75) was positively affected by education and defense and space outlays in a county. Community development spending had a negative, significant coefficient in this equation.

In the population change equation, agricultural research, community development, and housing each had a positive coefficient. It should be cautioned that increased housing outlays may be caused by increased population and the two variables may be jointly determinant. Income security, education, and general government outlays all had negative coefficients. General government spending may entail regulation and admin-

Table 1. Two-Stage Least Squares Estimates of the Structural Parameters of Selected Federal Outlay Variables Endogenous

Selected Explanatory Variables	Endogenous Variables			
	Income Per Capita, 1975	Employment Rate, 1975	Change in Contract Construction Income Per Capita, 1974-75	Population Change, 1974-75
	(dollars)	(percent)	(dollars)	(actual numbers)
Farm Income Stabilization per capita, 1975[a]	21.0735 (9.7837)[b]	-.0326 (.0220)	-.4280 (.2462)	-1.4649 (5.4553)
Rural Housing/Public Facilities per capita, 1975	-2.8695 (8.7656)	.0149 (.0175)	.0185 (.1934)	.0646 (5.0475)
Agricultural Land and Water per capita, 1975[a]	-126.6174 (77.0657)	.3508 (.1451)	3.5216 (1.8100)	3.2547 (28.4354)
Agricultural Research per capita, 1975[a]	12.9001 (12.8362)	-.0037 (.0131)	-.4126 (.2859)	5.8040 (2.3048)
Pollution Control per capita, 1975	-3.7371 (4.2726)	.0033 (.0073)	.0579 (.0962)	1.2070 (2.0547)
Business Advancement and Regulation per capita, 1975	.8919 (12.7601)	-.0514 (.0251)	-.2584 (.2822)	-6.0146 (7.7232)
Area/Regional Development per capita, 1975	5.5766 (4.2840)	-.0241 (.0083)	-.0860 (.0994)	-2.3167 (2.5835)
Community Development per capita, 1975[a]	159.0728 (46.4129)	.0375 (.1591)	-3.8242 (1.4323)	176.1507 (45.5728)
Housing per capita, 1975	-46.3433 (290.4599)	-.3960 (.5930)	.3132 (6.4240)	821.2932 (171.8270)
Health per capita, 1975[a]	-10.6055 (13.4930)	.0967 (.0345)	.1612 (.3072)	7.0898 (10.2531)
Income Security per capita, 1975	4.1398 (3.0928)	-.0181 (.0083)	-.0602 (.0722)	-6.9931 (2.2570)
Education per capita, 1975[a]	-7.6264 (3.8041)	-.0020 (.0070)	.1770 (.0923)	-3.6050 (1.7051)
Defense and Space per capita, 1975	-.6842 (.4973)	.0012 (.0007)	.0264 (.0114)	-.0300 (.1768)
Transportation per capita, 1975[a]	-.5839 (.8369)	.0010 (.0013)	.0252 (.0185)	-.6441 (.3522)
General Government per capita, 1975	8.5435 (10.8880)	-.0172 (.0085)	-.1276 (.2425)	-5.624 (2.4244)
State and Local Government per capita, 1972	10.5733 (3.7880)	-.0205 (.0125)	-.1210 (.1109)	1.4345 (2.8754)
Income per capita, 1974		5.8462 (.6918)	11.1948 (6.0555)	
Change in Contract Construction Income Per Capita, 1973-74	1.7412 (1.7799)	-.0001 (.0037)		
Youth (%)				35.1018 (50.3360)
Elderly (%)				113.3877 (99.4010)
High School (%)		-.0353 (.0669)		

Table 1. (Continued)

Selected Explanatory Variables	Endogenous Variables			
	Income Per Capita, 1975	Employment Rate, 1975	Change in Contract Construction Income Per Capita, 1974-75	Population Change, 1974-75
	(dollars)	(percent)	(dollars)	(actual numbers)
College (%)		-.3302 (.3127)		
Unemployed (%)	-965.3455 (592.0783)	.6440 (.8961)	23.4925 (13.7630)	
Nonwhite Population (%)		.0327 (.0310)		
State and Local Taxes per capita, 1972				
Sum of Federal Outlays per capita, 1974				
Northeastern U.S.	-1,609.8730 (2,348.7859)		-12.6214 (52.7894)	
Northcentral U.S.	894.0885 (1,425.0168)		-35.2482 (31.4096)	
Southern U.S.	598.3572 (1,052.9832)		-30.9219 (23.2059)	
Employment Rate, 1975[a/]				-4,493.4447 (3,072.7354)
Change in Contract Construction Income Per Capita, 1974-75[a/]				.5182 (6.5254)
Intercept	-1,723.9602 (1,603.7600)	27.4105 (4.3376)	46.2549 (37.9190)	2,293.1175 (2,128.7273)

a/ Endogenous variables.

b/ Values in parentheses are the standard deviations of the estimates.

istrative activities which detract from the economic base and, hence, do not increase employment or population.

Summary

This analysis provides insufficient basis for rejecting the general hypothesis that federal spending does not significantly contribute to the goals of rural development. Failure to reject the hypothesis does not necessarily mean that it is true. Although this study utilizes more comprehensive data and methods than previous studies, additional research using more refined data and methods is necessary before making firm conclusions. However, it is well to recognize many previous, less comprehensive studies tend to be consistent with the above hypothesis. Even with its shortcomings, the model used in this study is expected to detect major impacts of federal programs if in fact they are present. Based on results of this and previous research, it appears that federal programs are not highly effective in promoting the goals examined herein and ways need to be explored to improve their performance.

Areas for further research and model development are suggested. The Federal Outlays series needs improvements: standardized program definitions; and improved allocation techniques. Modifications in the specification of the equations for the federal outlay variables could improve the analysis: improved indicators of the demand for federal government services; migration data; including measures of under-employment, quality of education, and cost of living differences among counties; use of the state capital county as a dummy variable to improve results with regard to local incidence of spending channeled through state government; and a measure of taxes flow from counties to state and federal governments.

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