*Regional Science Perspectives*

# A NOTE ON THE COST PER JOB CREATED BY FEDERAL REGIONAL DEVELOPMENT PROGRAMS*

### Randolph C. Martin**

## Introduction

Cost per job measures have become very important to Federal, state, and local agencies involved in economic development. During periods of fiscal constraint, such measures can be useful in allocating limited funds to those programs which generate the greatest benefits per dollar spent. Since 1965, the Economic Development Administration (EDA) has been encouraging economic expansion in declining areas through business loans, technical assistance, and public works grants.[1] EDA has also either commissioned or internally conducted several studies designed to measure the cost per job created by these development programs. Without exception, each of these studies involved an "on-site" or field survey of a sample of EDA funded projects. This paper develops an alternative to such surveys.

The methodology is aggregate in nature since it utilizes a reduced form regression model to determine the effect of these programs on changes in economic activity for all U.S. counties. It is also indirect in that the regression model is estimated using real total labor and proprietor's income and the estimated employment impact is derived from this income effect. The indirect approach is necessary due to the lack of a consistent employment series at the county level.

## Model and Data

The model used to estimate EDA's influence on real income growth is a variation of that found in Martin and Graham (1980). This model relies on the well-known economic base theory of small area income change which argues that some activities are "basic" in the sense that their growth leads or determines a region's overall development.[2] These are activities which produce goods and services for export to the "outside world." EDA programs are thus viewed as one set of factors which could influence the level of basic and thus, total activity in a region.

The precise form of the model is as follows:

(1)  CHTLPG = f(MULT, STATLPG, MIX, SHARE, RELLAG, RELAID, PERPW, TIME)

**Professor, Department of Economics, The University of South Carolina.

[1] Regional development efforts at the Federal level actually started with the activities of the Area Redevelopment Administration in 1962.

[2] For a good discussion of economic base theory see Hoover [3, p. 221-224].

Where:

CHTLPG = (compound annual growth rate in real total labor and proprietors' income: 1962-1974)-(compound annual growth rate in real labor and proprietors income: 1950-1962).

MULT = (1 + nonbasic income/basic income). Using 1962 data, basic income is defined to include income from agriculture, manufacturing, mining, and that portion (if any) of government, contract construction, wholesale-retail trade, finance-insurance-real estate, and service income above the ratio of income from each source to total income for the entire U.S. Non basic income is all other income.

STATLPG = compound annual growth rate in real total labor and proprietors' income for all counties in the state in which the county is located: 1962-1974.

MIX = [(% county total labor and proprietor's income (TLP) from agriculture x ratio of annual growth in real U.S. agricultural income to annual growth in real U.S. TLP: 1962-1974) + (% county TLP from manufacturing x ratio of annual growth in the real U.S. manufacturing income to annual growth in real U.S. TLP: 1962-1974) + (% county TLP from mining x ratio of annual growth in real U.S. mining income to annual growth in real U.S. TLP: 1962-1974) + (% county TLP from basic government x ratio of annual growth in real U.S. government income to annual growth in real U.S. TLP: 1962-1974)]

SHARE = [(annual growth in real agricultural income for county ÷ annual growth in real agricultural income for U.S.: 1962-1972) + (annual growth in real manufacturing income for county ÷ annual growth in real manufacturing income for U.S.: 1962-1974) + (annual growth in real mining income for county ÷ annual growth in the real government income for U.S.: 1962-1974) + (annual growth in real government income for county ÷ annual growth in real government income for U.S.: 1962-1974]

RELLAG = (annual growth in real TLP for county: 1950-1962) ÷ (annual growth in real TLP for BEA Region in which the county is located: 1950-1962).

RELAID = (total real disbursements to the county) ÷ (real 1970 TLP for the county).

PERPW = percent of total disbursements going to public works projects.

The dependent variable reflects changes in growth rates of real total labor and proprietors' income (TLP) between the 1950-62 and 1962-74 period, (Federal regional development efforts began in 1962). The first five independent variables represent non-EDA factors which are expected to influence changes in real TLP growth rates. MULT is a simple version of the economic base multiplier[3] and STATLPG indicates whether a county is in a fast or slow growing region (i.e., a regional demand proxy). MIX and SHARE measure the industrial mix (representation of the level of nationally fast or slow growing

---

[3] Hoover [3, p. 224].

industries) and competitiveness (relative growth performance of the county's basic firms) of the county.[4] RELLAG reflects the relative growth performance of the county prior to EDA programs.

The remaining two variables represent the amount and type of EDA assistance over the 1962 to 1974 period. It is hypothesized that changes in real TLP may be influenced by two aspects of EDA program activity. First, by how much they receive (in real terms). Second, by what the aid was used for (program type). RELAID and PERPW are variables reflecting aspects of EDA's activity.[5]

Data for estimating equation (1) was obtained from two sources. EDA made available annual expenditure data by type of program at the county level for both ARA (Area Redevelopment Administration) and EDA Programs. The second data source was the Bureau of Economic Analysis (BEA) of the Department of Commerce. BEA provided the needed income data for each U.S. county for selected years from 1929-1974.

## Estimating the Cost Per Job Created by EDA Programs

As the first step in generation a cost per job estimate, the model is estimated with ordinary least squares (OLS) using values generated for all U.S. counties. It should be noted that counties which received no EDA assistance will have zero values for the aid variables (RELAID, PERPW).[6]

The results are:

$$(2) \quad CHTLPG = -.011^* + .004 \ MULT^* + .392 \ STATLPG^* + .018 \ MIX^*$$
$$(-2.99) \quad (11.13) \quad (9.96) \quad (3.20)$$
$$+ .0001 \ SHARE^* - .018 \ RELLAG^* + .040 \ RELAID^*$$
$$(4.73) \quad (-49.99) \quad (2.07)$$
$$+ .002 \ PERPW^{**}$$
$$(1.85)$$

$R^2 = .50$
t values in parentheses
* significant at least at the 5% level
** significant at the 10% level

In general, these results are as one sould expect on a priori grounds. All coeficients are significant and the $R^2$ is respectable given the cross sectional nature of the regression.

The next step is to utilize the above results to estimate EDA's influence on TLP and employment growth over the twelve year period (1962 to 1974). This

---

[4] The specification of these two variables imply a shift-share approach to "explain" changes in county income growth rates. While it is not argued that these factors in any way represent a "theory" of regional income change, the approach does provide a convenient vehicle with which to empirically specify non-EDA contirubtions to changes in county income growth rates. For a readable description of shift-share analysis see Hoover [3, pp. 292-295].

[5] The model in Martin and Graham [5] contained an additional program variable reflecting the timing of aid received over the period of concern. Such a variable was not found to have a significantly different from zero effect on changes in real income growth rates so it was not utilized for this estimation.

[6] Out of approximately 3100 counties, 1513 have received some kind of ARA and/or EDA assistance during the 1962 to 1974 period.

is done by first substituting the mean values for all explanatory variables into the estimated regression model. This will yield the model's estimation of the change in real TLP growth rates for the "mean" county, Next, an estimated CHTLPG is again calculated, but this time the EDA program variables are given values of zero. The difference between these two calculations can then be interpreted as the contribution of EDA programs to the change in real TLP growth rates.

Calculation (3) below then shows the model's estimation of CHTLPG ($CHTLPG_1$) when all significant explanatory variables are included. The results when the program variables are given zero values ($CHTLPG_2$) are found in (4). Finally, the estimated effect of EDA on CHTLPG ($CHTLPG_{eda}$) is shown in statement (5).[7]

(3) $CHTLPG_1 = -.011 + .004(3.582) + .392(.042) + .018(.364)$
$+ .0001(49.914) - .018(.382) + .040(.007) + .002(.308)$
$= .0254$

(4) $CHTLPG_2 = -.011 + .004(3.582) + .392(.042) + .018(.364)$
$+ .0001(49.914) - .018(.382) = .0245$

(5) $CHTLPG_{eda} = CHTLPG_1 - CHTLPG_2$
$= .0254 - .0245$
$= .0009$

The calculations imply that .09 percentage points of the change in real TLP growth rates can be attributed to EDA activities. Over 12 years (1962-1974), this would generate a 1.09 percent change in real TLP from the base year.[8]

The third step in this procedure is to translate the estimated real TLP changes resulting from EDA activities into an employment effect. The approach taken is to use a measured income elasticity of employment. Such an elasticity can be written as:

(6) $N_{ye} = \dfrac{dE}{dY} \dfrac{\overline{Y}}{\overline{E}}$

where

$N_{ye}$ = income elasticity of employment
$Y$ = real total labor and proprietors' income
$E$ = total employment
$\overline{Y}$ = mean real TLP
$\overline{E}$ = mean employment

Since the above estimated influence of EDA on real TLP utilized all U.S. counties, the appropriate $N_{ye}$ would be one calculated from U.S. totals (real TLP and employment). Thus, to find dE/dY in (6), total U.S. employment (E) was regressed against real TLP (Y) over the 1962 to 1974 period. The results are:

---

[8] In each calculation, the values in the parentheses are mean values of the appropriate explanatory variable. See the estimated results in (2).

[9] This calculation is possible using any compound interest table.

$$(7) \quad E = 17084.5^* + .079Y^*$$
$$(10.92) \quad (33.14)$$

$R^2 = .99$
t values in parentheses
\* significant at least at the 5% level.

The Y coefficient is then the dE/dY value. With $\overline{Y} = 652380$ and $\overline{E} = 68446$, the income elasticity of employment is:

$$(8) \quad N_{ye} = \frac{dE}{dY} \frac{Y}{\overline{E}}$$
$$= .079 \left(\frac{652380}{68446}\right)$$
$$= .7530$$

So for every 1 percent increase in real TLP, employment increases by .753 percent.[9]

With this elasticity value, we are in a position to estimate EDA's employment effect over the 1962 to 1974 period. If EDA increased real TLP by 1.09 percent, this would translate into a .82 percent employment effect (.7530 x 1.21). Since total U.S. employment was approximately 57.2 million in 1962, a .82 percent increase would be 468.785 jobs (.0082 x 57,168,900).

The final task in arriving at a cost per job figure is to determine the program costs. Table 1 shows real annual expenditures by both ARA and EDA over the period of concern. These figures are from the Federal Budget for each year. As seen, nearly $2 billion (1972 dollars) was expended by these agencies between 1962 and 1974. If we take this figure as reflective of program costs, then the cost per job value is this amount divided by the employment effect. With an estimated employment creation of 468.785 jobs, the costs shown in Table 1 imply a cost per job figure of $4238 ($1,986,809,000/468,785).

## Some Comparisons

To put the roughly $4200 cost per job figure into perspective with other work done on this subject, Table 2 compares this figure with those taken from two other sources. Shaikh and Salinas [6] discuss in general terms issues involved with cost per job figures and present the results of surveys conducted in 1970 and 1977 on samples of EDA supported public works projects. Taking their broadest definition of employment effect and adjusting the estimates to 1972 dollar values, one finds a range of cost per job values for these projects of $3710 to $4277.

Miller, Gaskins and Liner [4] utilize a variety of sources (see not 2 to Table 2) in calculating cost per job estimates for business loan projects. Adjusting their reported figures to a 1972 dollar base, yields a range of values from $1864 to $4094.

[9] The U.S. Employment figures used here are non-agricultural employment from the Bureau of Labor statistics plus agricultural employment provided by the Department of Agriculture.

The cost per job value generated in this report is just outside the $2,000 to $4,000 range found utilizing the results of various surveys conducted by EDA or its contractors. This fact generates a belief that the methodology developed here has promise as an alternative to these costly survey efforts.

**TABLE 1. Total Expenditures by the Area Redevelopment Administration and the Economic Development Administration**

| Year | $000 Current[1] | Deflator[2] | $000 Real (1972 = 1) |
|------|----------------|-------------|----------------------|
| 1962 | $ 7,339 | .723 | $ 10,151 |
| 1963 | 38,964 | .729 | 53,449 |
| 1964 | 69,211 | .736 | 94,037 |
| 1965 | 76,002 | .745 | 102,016 |
| 1966 | 66,989 | .768 | 87,335 |
| 1967 | 110,486 | .793 | 139,327 |
| 1968 | 137,684 | .826 | 166,688 |
| 1969 | 162,670 | .866 | 187,841 |
| 1970 | 184,529 | .913 | 202,113 |
| 1971 | 200,365 | .964 | 207,848 |
| 1972 | 265,365 | 1.0 | 265,834 |
| 1973 | 277,723 | 1.04 | 267,041 |
| 1974 | 235,757 | 1.16 | 203,239 |
| Total | 1,833,553 | — | 1,986,809 |

[1] Current dollar expenditures were taken from the federal budget for each year.

[2] Implicit price deflator for Non-Residential Fixed Investment.
Source: *National Income and Product Accounts of the U.S. 1929-1974 Statistical Tables.*

**TABLE 2. Comparison With Other Cost Per Job Estimates**

| Source | Programs | Cost/ (1972 base) |
|--------|----------|-------------------|
| This Report | All | $3819 |
| Shaikh and Salinas[1] | Public Works | $3710-4277 |
| Miller, Gaskins and Liner[2] | Business Loans | $1864-4094 |

[1] Employment figures from Boise Cascade Center for Community Development survey (1970) and Centaur Management Inc. survey (1977).

[2] Employment figures from EDA Special Impact survey (1967-1968), Office of Program Analysis and Economic Research survey (1968), EDA National and Field Office files data (through March 1968), and Office of Audit Review (through June, 1967).

## REFERENCES

1. Boise Cascade Center for Community Development, "An Evaluation of EDA Public Works Projects" a report prepared for EDA, 1970 .

2. Centaur Management Consultants, Inc., "EDA Title I Public Works Program Evaluation" a report prepared for EDA, 1977 .

3. Hoover, E. M., *An Introduction to Regional Economics,* Alfred A. Knopf, New York, 1971 .

4. Miller, S., D. Gaskins, and C. Liner, "Evaluation of the ARA-EDA Loan Program" *Papers of the Regional Science Association,* Volume 23, 1969 .

5. Martin, R. C. and R. E. Graham, "The Impact of Economic Development Administration Programs: Some Empirical Evidence," *Review of Economics and Statistics,* 62, (1), 1980 .

6. Shaihk, A. Q. J. and P. W. Salinas, "Evaluating Economic Development Programs: The Subjectivity of Cost Per Job Measures" a paper prepared by the authors while with the Policy Office of EDA, 1979 .