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ESTIMATING THE ECONOMIC AND DEMOGRAPHIC IMPACTS OF SOLAR TECHNOLOGY COMMERCIALIZATION ON U. S. REGIONS

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Solar Energy

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I. INTRODUCTION

In response to the tenuous conditions of foreign oil supply, scientists, engineers, and government policy-makers have embarked on a major research and development program to find alternative means of satisfying our nation's future energy needs. One alternative energy source which has received major attention and a substantial commitment of funds is solar energy. The National Energy Act established broad goals for research and development into solar energy technology, and The National Plan for the Accelerated Commercialization of Solar Energy, mandated by Congress in P.L. 94-385, provided guidelines by which these goals could be accomplished. The major objective of these programs, is for solar energy to provide 20 percent of U.S. energy supply by the year 2000. In order to accomplish this objective, not only will scientific efforts in improving solar technology be required, but the economic, social, political, and institutional infrastructures of the U.S. must be enhanced to accomodate an atmosphere in which solar energy can become competitive with other energy sources. Such changes will have significant economic and demographic impacts on the U.S. and its regions. The income and employment generated by solar-related research and commercialization efforts is likely to vary from region to region, depending on demand and resource factors. It is therefore useful to provide an assessment of these differential regional impacts of solar technology commercialization.

Accordingly, the purpose of this study is to develop a framework through which these regional economic and demographic impacts of solar technology commercialization can be analyzed. Two models developed by the Bureau of Economic Analysis, U.S. Department of Commerce comprise the basis of this framework -- a national input/output model and an interregional econometric model, the National-Regional Impact Evaluation System (NRIES). These models are used to convert Department of Energy (DOE)-projected sales of solar energy systems to gross output concepts, and to evaluate the impacts associated with these sales. Analysis is provided for the nine Census regions and 50 States and the District of Columbia for the years 1980 through 1990. Impacts on major economic aggregates such as output, employment, income, and population are described in this report.

The following section describes the methodology used in this study. Section III presents the economic and demographic impacts of solar technology commercialization on U.S. regions and States, and Section IV summarizes the major conclusions of the study and provides direction for further research. Detailed tables of regional and State solar energy expenditures and their impacts appear in the Appendix.

II. METHODOLOGY

General Overview

The objective of this study, to provide estimates of the regional impacts of solar technology commercialization, is accomplished by employing information on regional demand and resource characteristics in combination with certain simplifying assumptions, a national input/output model, and an interregional econometric model. This approach, in contrast to that of developing a single comprehensive modeling system, is somewhat necessitated by the prohibitive costs that would be associated with developing a single comprehensive system, as well as by the lack of regional data required for such a comprehensive analysis. Figure 1 depicts this procedure of linking regional demand and resource information, a national input/output model, and an interregional econometric model to provide estimates of the spatial distribution of impacts from solar technology commercialization.

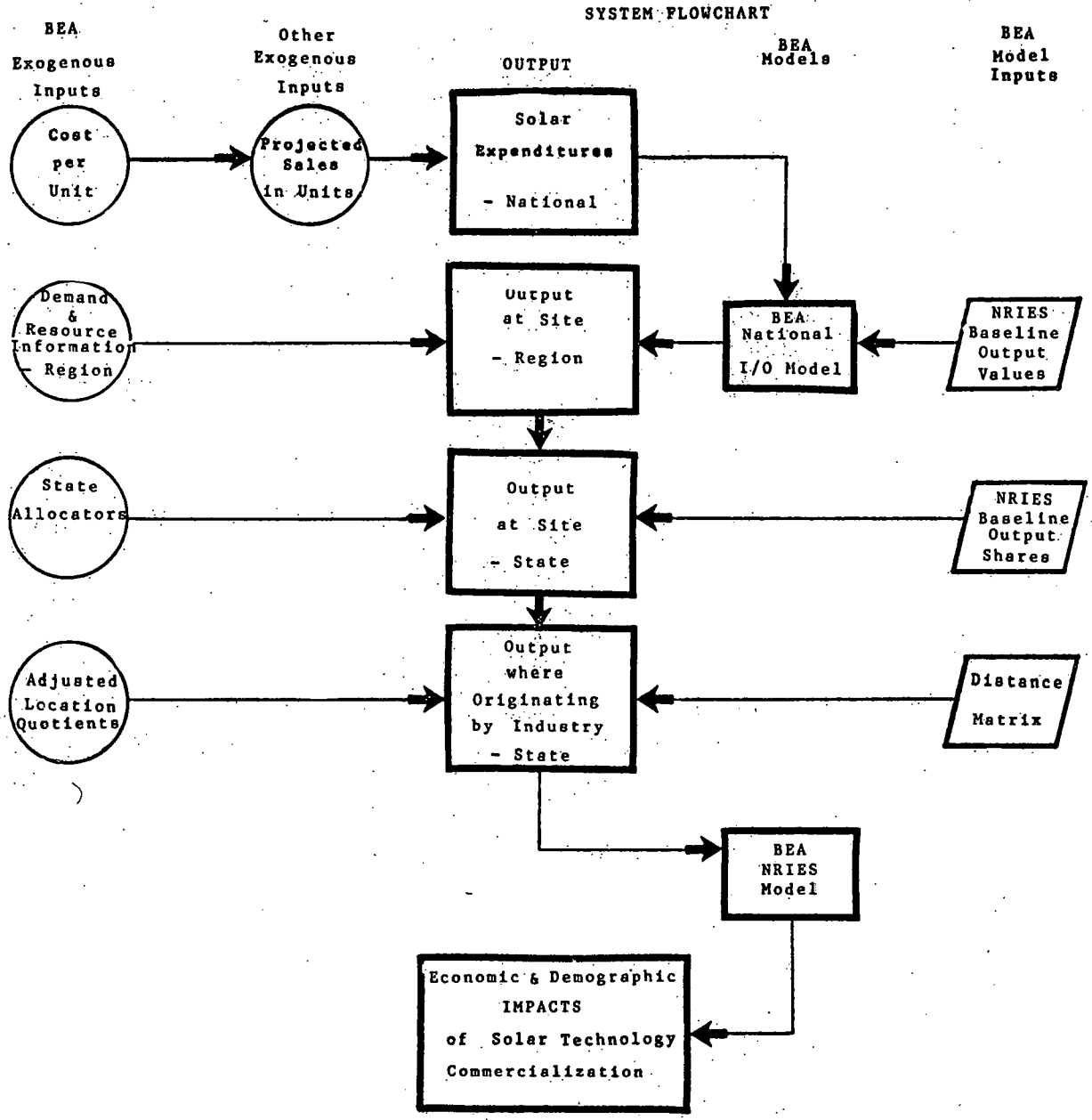
The procedure may be divided into six phases. In the first phase, projections of the number and type of solar energy systems sold, along with associated costs per unit, are obtained from DOE for the years 1980, 1985, and 1990. These expenditures are converted into real terms (1972 dollars) and annualized at the national level based on a simplifying assumption. In the second phase, these constant dollar (real) expenditures are converted to a gross output concept[1/], and the BEA national input/output model is used to estimate the input requirements of the given levels of production of solar energy systems. These (national) estimates are then distributed to the nine Census regions based on exogenous demand and resource information. These regional totals are then allocated to States in the next phase of the methodology, based primarily on the relative importance of each industry in a State compared with the national industrial structure. Location quotients and interregional economic activity linkages are then used to estimate the extent to which a given State receives inputs from other States for the production of solar energy systems. In the next phase, the resultant output values by State are incorporated into NRIES --the interregional econometric model of the U.S. --and several simulations are conducted to assess the impacts of solar-related activity. The last phase is comprised of a comparison of control (or baseline) solution values of the NRIES model with the solar-impact or alternative solution values for major economic aggregates.

Since the NRIES model and its resources are the major components of this procedure, it is useful to provide an overview of the model. A description of the BEA national input/output model appears in Ritz (1979). Description of NRIES will then be followed by a detailed presentation of the six phases that comprise the methodology of this study.

[1/] This step is necessary since the NRIES model uses real output as its major economic activity indicator, rather than the I/O concept of final demand changes.

FIGURE 1

ESTIMATING THE ECONOMIC AND DEMOGRAPHIC IMPACTS OF SOLAR TECHNOLOGY COMMERCIALIZATION ON REGIONAL ECONOMIES: SYSTEM FLOWCHART



Overview of NRIES[2/]

NRIES is a multiregional econometric forecasting and impact model composed of 51 individual State econometric models[3/], a national variable sub-model, and explicit interregional linkages. Its primary use is to estimate through time the spatial distribution of impacts resulting from policy alternatives. The model may also be used for medium-range (5-12 years) forecasts of regional economic activity.

The general structure of NRIES is depicted in Figure 2. The center column illustrates the core of the model--the 51 individual State econometric models. Within each State model there are 230 variables estimated annually using ordinary least squares. These include output, employment, wage and nonwage sources of income, state and local government expenditures and revenues, population by age group, and retail sales. Economic activity in a particular State is generally expressed as a function of three types of variables: economic activity in related sectors of the State, economic or demographic interaction among States, and certain nationally-determined levels of economic activity.

Examples of the first type of variable include the use of disposable income in an output equation for a local consumption-oriented industry, or the use of output in an employment equation. These types of variables form the internal linkages within each State, similar to single-region econometric models.

Interregional linkages among States, depicted in the first column of Figure 2, are explicitly incorporated into the NRIES model through a set of interaction indexes. Based on the gravity-potential concept, these interaction variables represent distance-deflated economic or demographic activity in all States, and are defined by the following equation:

$$ {}^{r}G_{jt} = \sum_{\substack{k=1 \\ k \neq r}}^{n} \frac{{}^{k}X_{jt}}{{}^{rk}D} \qquad (1) $$

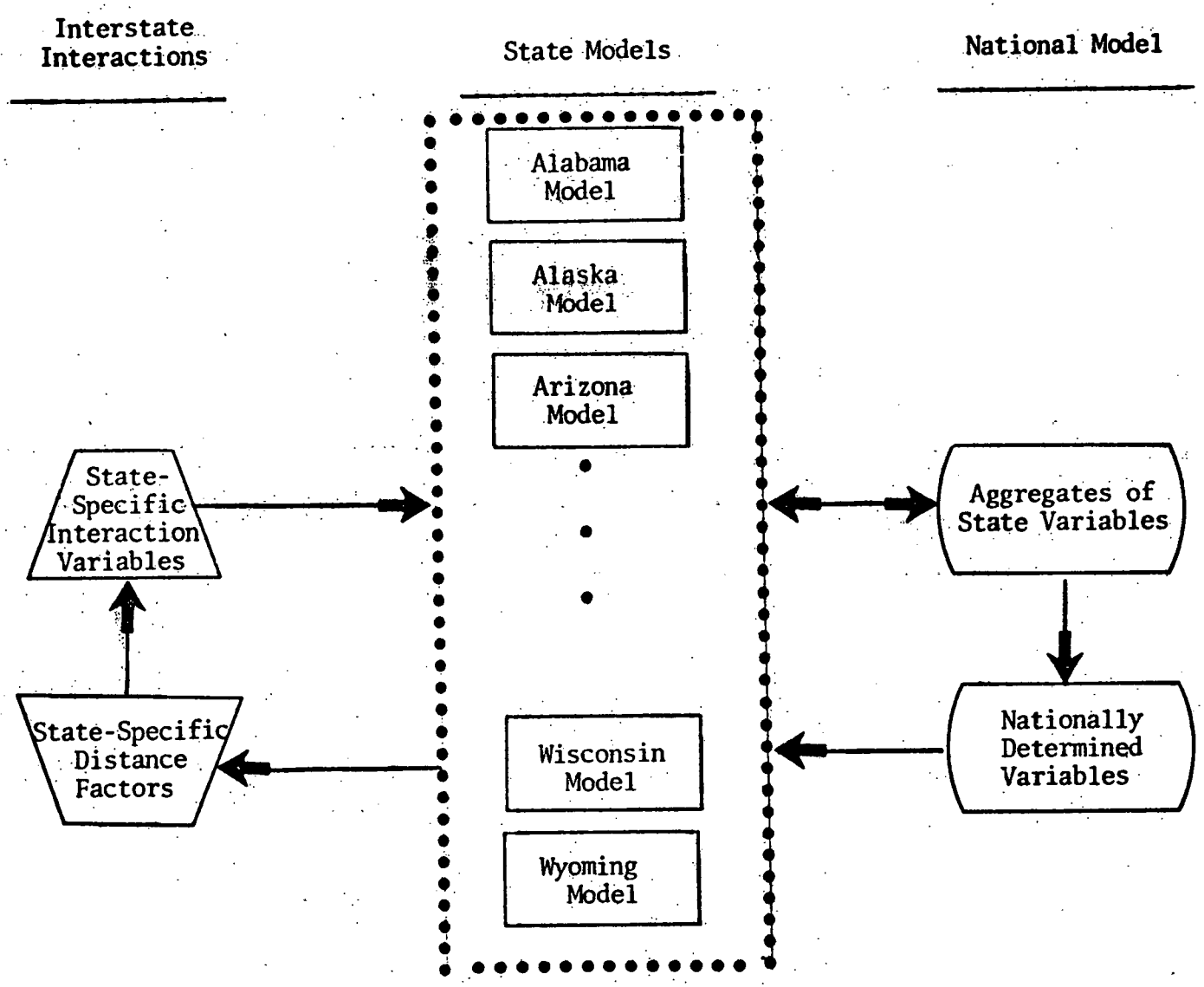
The economic or demographic interaction (${}^{r}G_{jt}$) of State r with every other State k, k = 1, ..., n, ($k \neq r$) for a particular variable j (total output, population, or retail sales, for example) is defined as the summation of activity levels in all other States (${}^{k}X_{jt}$), scaled by the distance ${}^{rk}D$ from the home State r to all other States k. The distance scalars ${}^{rk}D$ are defined as the simple linear distance between the population centroids of each State.

[2/] For a more complete discussion, see Ballard, Gustely, and Wendling (1980). Portions of this subsection are excerpted from Kort and Gustely (1980).

[3/] For simplicity, the District of Columbia is referred to as a State.

FIGURE 2

NRIES Model System Flow Diagram



While economic interaction among States is best represented by trade flow data, such information is currently unavailable on an annual basis. Since interstate trade is most likely affected by proximity and mass, a gravity-potential variable such as that in equation (1) is usually used as an appropriate substitute measure. Thus, for example, while economic activity in New York affects the economies of both Pennsylvania and Georgia, because of common trade borders New York exerts greater influence on Pennsylvania. Further, while Vermont and Pennsylvania are both adjacent to New York, because of the larger size of its economy, Pennsylvania exerts a greater influence on New York.

The remaining type of variable in the NRIES model is represented in the third column of Figure 2. There are two subcategories: Those national variables that typically exhibit no regional variation and are therefore estimated at the national level, and those national variables that are expressed as the sum of the variables in the 51 States. The second type of national variable, the aggregated-State variable, represents a unique feature of NRIES--its "bottom-up" nature. Most single-region econometric models are constructed as "satellites" to national econometric models and there is, therefore, a unidirectional relationship between the national economy and the State economy. Changes in economic activity of a particular State have no effect on the national economy. Similarly, in many multiregional models, a "top-down" approach is often taken where regional attractiveness variables are used to "share-out" national control totals. Thus, for example, analyzing the impact of alternative distributions of a given amount of Federal aid or expenditures is difficult in these top-down multiregional models since the national control totals remain the same. In contrast to this unidirectional focus of most other single-region and multiregion models, national and State economic activity in NRIES is simultaneously determined. Regional economic activity determines national economic activity, which in turn has a secondary effect on regional activity.

Solar Expenditures Estimation

As one of the initial phases of achieving the administration's solar energy utilization goal, the Department of Energy recently funded a study (conducted by the MITRE Corporation) to provide sales projections of solar energy systems consistent with the goals outlined in the National Plan for the Accelerated Commercialization of Solar Energy. Three sets of projections were provided for 27 user/technology groups[4/] --one assuming a normal commercialization rate, one assuming a medium rate of commericialization, and one assuming a high rate of commercialization--and for five-year intervals between 1980 and 2000.

For the purpose of this study, the 27 user/technology groups indentified in the MITRE study were aggregated to 16 categories, and the number of projected units of solar energy systems sold was taken as an average of the MITRE normal and medium commercialization rate cases. Table 1 presents the 16 user/technology types analyzed in this study.

4/ There are 11 identifiable solar technologies and 4 user groups--residential, commercial, industrial and utilities. Not all of the technologies, of course, are applicable to every user group.

TABLE 1

Solar Energy User/Technology Groups

1	Thermal Hot Water - Residential
2	Thermal Hot Water - Commercial
3	Thermal Cooling, Heating And Hot Water - Residential
4	Thermal Cooling, Heating And Hot Water - Commercial
5	Passive Heating
6	Small Scale Wind - Residential
7	Small Scale Wind - Commercial
8	Small Scale Wind - Industrial
9	Large Scale Wind - Utilities
10	Solar Thermal Electric - Industrial
11	Solar Thermal Electric - Commercial
12	Photovoltaics - Residential
13	Photovoltaics - Commercial
14	Photovoltaics - Utilities
15	Biomass Electric
16	Solar Thermal - Industrial

With the number of units of solar energy systems sold in the U.S. in 1980, 1985, and 1990 provided by DOE through the MITRE Corporation[5/], an assumption about the temporal flow of these sales must be made to accomodate the annual framework of the NRIES model. In order to simplify the analysis in this pilot study, it was assumed that the annual increment in sales between the five-year intervals is constant. That is, the annual change in sales of solar energy systems, which may be alternatively viewed as a change in final demand, is calculated as follows:

$$\Delta U_{jt} = \frac{U_{J**} - U_{j*}}{5} \qquad (2)$$

where U_{jt} is the number of units of solar energy systems sold in year t to user/technology group j, and ΔU_{jt} is the change in these sales units, or the annual increment. For the years between 1980 and 1985, the subscript ** refers to 1985, while * refers to 1980. For the years between 1985 and 1990, ** refers to 1990, while * refers to 1985.

To estimate the cost per unit for each of the solar user/technology groups, DOE-estimated costs (in 1976 dollars) for 1980 were first converted to 1972 dollars using a simple ratio of the 1972 to 1976 GNP implicit price deflators. A cost trend to 1990 was then applied to the 1980 values to yield projected costs for the forecast period.

Constant dollar expenditures on each solar user/technology type can then be computed as the product of the cost per unit times the (projected) number of units sold, as in the following equation:

$$\Delta Z_{jt} = C_{jt} * \Delta U_{jt} \qquad (3)$$

where Z_{jt} is expenditures for solar user/technology type j in time t, and C_{jt} is the cost per unit. Table 2 presents these real solar expenditures for the 16 user/technology groups for 1980 through 1990.

Expenditures-to-Output Conversion

The next step in the analysis involved the conversion of these solar expenditures (in Table 2) into output or value added changes by industry to be used in the NRIES model. This step was necessary for two reasons. First, the most important measure of economic activity in NRIES is real output by industry; the solar expenditures, by themselves, represent only changes in final demand. Second, production of these solar energy systems implies that changes in production levels of supportive (or input) industries such as those involved in the production of steel, aluminium, copper, glass and concrete, as well as those involved in the actual construction of solar energy systems, will be required. Estimates of the production of these input goods must be provided in order to conduct a complete analysis of the total impacts of solar technology commercialization.

[5/] Since NRIES' ending forecast period is 1990, information on sales in 2000 was excluded from this study. 1980 sales values were obtained directly from the Department of Energy.

TABLE 2
Solar Expenditures Associated With Increased
Solar Energy Commercialization

User/Technology Group	Annual expenditures for the U.S. 1980-84	1985-90
	(millions of 1972 dollars)	
Thermal Hot Water - Residential	906.8	1150.0
Thermal Hot Water - Commercial	85.8	80.2
Thermal Cooling Heating & Hot Water - Residential	3776.1	3653.9
Thermal Cooling Heating & Hot Water - Commercial	3988.2	3224.0
Passive Heating	120.9	644.8
Small Scale Wind - Residential	221.2	1319.2
Small Scale Wind - Commercial	2.0	43.3
Small Scale Wind - Industrial	.9	110.8
Large Scale Wind - Utilities	.1	1146.4
Solar Thermal Electric - Industrial		32.7
Solar Thermal Electric - Utilities	.1	1851.0
Photovoltaics - Residential	22.7	690.8
Photovoltaics - Commercial		57.6
Photovoltaics - Utilities	.1	188.2
Biomass Electric	181.3	206.1
Solar Thermal - Industrial	370.2	943.3
TOTAL	9677.0	15342.0

SOURCE: Derived from DOE-projected sales and cost information and NRIES-projected price information.

In order to convert the solar expenditures to output by industry, the 16 solar user/technology types first had to be converted into commodity groups useable in an I/O accounting framework. For example, the photovoltaics user/technology group has no equivalent in the industry groups identified in I/O tables. Thus, assumptions had to be made about the proportion of solar expenditures in each user/technology group that would be accounted for by the various industries in an I/O table. This was done in consultation with DOE; the assumed proportions appear in Table 3. The table may be interpreted as follows: for the thermal hot water and thermal cooling, heating, and hot water groups, 50 percent of the activity associated with these solar energy systems is in I/O commodity group 11--new construction--and 50 percent is in commodity group 40--heating, plumbing and structural metal products. Small and large scale wind technologies are assumed to be represented by activity in the aircraft industry, in the engine and turbine industry, in other metal products industry, as well as in the new construction industry. The Biomass electric technology group is associated with activity in the agriculture, forestry and fishery industry--commodity groups 1 through 4.

Given these assumed proportions relating solar user/technology groups to I/O commodity groups, solar expenditures may be converted to real output values by industry using the BEA national input/output model, as in the following equation:

$$\Delta Q^{n}_{it} = \left(\frac{Q_i}{O_i}\right)^{n} \sum_{j} b^{n}_{ij} * \Delta Z^{n}_{jt} \qquad (4)$$

where:

ΔQ^{n}_{it} = national output (GNP definition) change in industry i.

$(Q_i / O_i)^{n}$ = national ratio of output (GNP definition) to output (I/O definition) for industry i.

b^{n}_{ij} = the direct and indirect national requirements for the output (I/O definition) of industry i used as input for solar technology type j.

ΔZ^{n}_{jt} = dollar amount of final demand change for solar technology type j.

TABLE 3

Percent of Solar Expenditures By User/Technology Group Allocated To BEA Input/Output Commodity Groups

Commodity Number	Commodity Group	Solar Energy User/Technology Group*					
		1 -4	5	6 - 9	10 - 11, 16	12 -14	15
1	Livestock and livestock products						40
2	Other agricutural products						10
3	Forestry and fishery products						40
4	Agricultural, forestry, and fishery services						10
11	New construction	50	100	40	50	20	
40	Heating, plumbing and structural metal products	50			25		
42	Other fabricated metal products			20	25		
43	Engines and turbines			20			
57	Electronic Components and accessories					80	
60	Aircraft and parts			20			
	Total	100%	100%	100%	100%	100%	100%

*Refer to Table 1 for a list of user/technology groups and their corresponding numbers.

SOURCE: Derived from consultations with DOE and the BEA national input/output tables.

Equation (4) states that solar expenditures (Z^n_{jt}) which are viewed as a change in final demand, induce increases in the levels of national output or value added (ΔQ^n_{it}) in all industries. The levels of the industry-specific changes in output were estimated using national I/O coefficients (b^n_{ij}), and the national ratio of value added (Qi) to sales (Oi) from the BEA national I/O table. The value added to sales ratio adjustment was necessary due to the different gross output concepts in an I/O framework versus an econometric model framework.[6/] The resultant real gross output changes for the nation appear in Table 4 for the 11 industries in NRIES for 1980 through 1990. Note that the total gross domestic output (in Table 4) is slightly less than the total solar expenditures (in Table 2) due to imports from outside the nation (which produce no direct benefit to the U.S. economy). Specifically, for 1985-90 for example, real solar expenditures for the nation are $15.342 billion, while real gross output for the nation is $15.175 billion. This difference of $167 million reflects the value of imports from outside the nation.

The last step in the second phase of the methodology (expenditures - to -output conversion) involved the allocation of national gross domestic product values (Table 4) by industry to the nine Census regions. This was done by using exogenous demand and resource information for each of the regions to derive a constant (scalar) factor which was applied to the national totals. The following equation outlines this procedure:

$$\Delta Q^r_{it} = k^r * \Delta Q^n_{it} \tag{5}$$

where ΔQ^n_{it} is the change in real output for industry i, time period t, region r, and k^r is the scalar reflecting the demand and resource characteristics of region r ; k^r was derived through consultations with DOE. These regional gross domestic product values by industry appear in the appendix.

Region - to - State Conversion

The third phase in the methodology was to distribute these regional gross output totals to States, to derive State industry output at site. This was accomplished by using certain State allocators and information on the relative importance of an industry in a State relative to the industrial structure of the region of which the State is a part. In particular, the following equation illustrates the procedure of distributing regional output totals to component States:

$$\Delta Q^s_{it} = \Delta Q^r_{it} * \left(\frac{P^s_{at}}{P^r_{at}} \right) \tag{6}$$

[6/] This procedure was used in another application of the NRIES model in Ballard, Cartwright, Gustely, and Kort (1980).

TABLE 4

Change in Output Resulting From Solar Expenditures

Industry Group	Annual Change in real Output for the U.S. 1980-84 (millions of 1972 dollars)	1985-90 (millions of 1972 dollars)
Agriculture, Forestry & Fisheries	165.4	212.2
Mining	280.4	416.2
Construction	2116.7	3260.6
Manufacturing, Durables	472.7	768.6
Manufacturing, Nondurables	4215.5	6930.1
Transportation, Communications & Utilities	639.1	973.1
Wholesale & Retail Trade	666.7	1015.3
Finance, Insurance & Real Estate	404.7	621.1
Services	547.3	875.0
Federal Government	32.4	51.4
State & Local Government	34.0	51.8
TOTAL	9575.0	15175.0

SOURCE: Derived from DOE-projected solar expenditure information and the BEA national input/output model results.

where ΔQ^s_{it} is the change in real output at site for industry i, time t, State s, Q^r_{it} is the regional counterpart described previously, P^s_{at}/P^r_{at} is the proportion of regional economic activity in variable a, region r, time t (P^r_{at}) accounted for by State s (P^s_{at}).

The activities (a) and their proportions were defined for each of the 16 solar technology types as they relate to each of the 11 industry groups in NRIES (see Table 3). For example, for those solar energy systems that are sold to mostly residential customers, population proportions (State relative to the region) for time t (t = 1980, ..., 1990) were the relevant State allocators. Table 5 presents these State allocators for all solar user/technology types.

State Output Allocation[7/]

At this point, it is useful to summarize the methodology used thus far to derive impact estimates of solar technology commercializaton. First, projections of expenditures on solar energy systems for the entire nation were obtained for 1980, 1985, and 1990. These expenditures projections were then annualized at the national level since NRIES is an annual model. Next, expenditures were converted to a gross output concept using results from the BEA national input/output study. Real output values for the nation were then allocated to the nine Census regions based on exogenous demand and resource information. For each technology type and industry, these regional totals were then distributed to their component States based on State allocators. The end result of these phases of the methodology is the derivation of estimates of changes in real output by State, industry, and time period resulting from the projected expenditures on solar energy systems. These procedures, however, do not complete the process of estimating the direct impacts of solar technology commercialization. In particular, the output (at site) values derived from equation (6) (Q^s_{it}) do not represent total direct impacts since the estimated changes in output for a particular industry in a particular State are comprised of (or derived from) changes in output from other States that produce inputs for solar energy system production in that particular State. For example, a photovoltaic solar energy system built in Texas results in additional economic activity (production) in that State; but not all of the inputs (electronic components for example) necessary to produce this photovoltaic solar energy system are produced in Texas. The State may import capital equipment from other, more manufacturing-oriented States.

[7/] Portions of this section were excertped from Ballard (1980).

Table 5

State Allocators for Conversion of Regional Output at Site to State Output at Site

NRIES Variable	Solar User/Technology Type*	Description
Population	1,3,5,6,12	mostly residential
Retail Sales	2,4,7,13	mostly commercial
Total Output	8,9,10,11,14,16	industrial and utilities
Agriculture Output	15	biomass electric

*See Table 1 for a definition of these user/technology numbers.

SOURCE: Derived from consultations with DOE staff.

To account for this spatial phenomenon, the changes in output by State (ΔQ_{it}^{s} -- see equation 6) are divided into two components. First, the changes in output that are a result of local production (L_{it}^{s}) are calculated. Second, the changes in output that result from production in other States (M_{it}^{s}) which is imported into the solar energy-producing State are calculated. Equation (7) depicts this accounting identity -- changes in output resulting from the sum of local production plus imports equals total changes in output.

$$\Delta Q_{it}^{s} = \Delta L_{it}^{s} + \Delta M_{it}^{s} \tag{7}$$

This section describes the methods used to obtain estimates of L and M.

To estimate what portion of the total increase in output results from production within a State, the technique of location quotients was used. First, an unadjusted location quotient was calculated as industry i's share of total output in State s, divided by the corresponding share for the Nation:

$$LQ_{it}^{s} = \frac{X_{it}^{s}}{X_{t}^{s}} * \frac{X_{t}^{us}}{X_{it}^{us}} \tag{8}$$

This approach is based on the premise that if regions consume similar amounts of a given commodity per dollar of income, then a region with a larger than average share of production of that commodity will necessarily be an exporter of that commodity. Alternatively, a region with a smaller than average share of production in that commodity will need to import a portion of its consumption requirements.

The location quotient is frequently used in regional analysis primarily because of the limited availability of specific regional trade data. While the methodology has been widely used in other similar applications, the reader should note its limitations. A basic drawback results from the assumption that a specific regional industry is self-sufficient when its share of regional production is identical to the share of national production in a particular industry. Therefore, a location quotient of greater than one implies that the region is able to meet local demand and export the remainder of its production. Alternately, a location quotient of less than one indicates a difficulty in meeting current regional requirements, thereby requiring purchases outside the region.

The limitiation of location quotients results from their failure to account for cross-hauling: the movement of the same general type of goods between regions. There are two possible reasons for such activity. The first reason results from product or "brand name" recognition. For example, one brand of toothpaste may be produced in abundance in one region but several different brands consumed. The second reason results from product differentiation. Here, for instance, a steel mill may produce and export one type of casting in a region while regional firms import other types. Consequently, even if a region produced more than its own consumption needs in total terms, it would not be expected to meet all new demands for each specific product type.

Therefore, in this analysis, the location quotients LQ^s_{it} were adjusted to reflect the effects of cross-hauling. In particular, the value of any location quotient was limited to a maximum of 0.9 to account for brand name recognition, and an industry deflator B_i[8/] was created to adjust for differences in product differentiation:

$$H^s_{it} = LQ^s_{it} \div B_i \qquad (9)$$

where,

$$B_i \geq 1$$

and,

$$H \leq 0.9$$

Finally, these adjusted location quotients H^s_{it} were applied to the total output increase ΔQ^s_{it} to estimate what portion of ΔQ^s_{it} is a result of local (within State s) production:

$$\Delta L^s_{it} = \Delta Q^s_{it} * H^s_{it} \qquad (10)$$

As indicated earlier, by identity, what is not produced locally (within State s), is imported. That is,

$$\Delta M^s_{it} = \Delta Q^s_{it} - \Delta L^s_{it} \qquad (11)$$

8/ The deflators for this analysis were assumed to be 1.6 for manufacturing durables, 1.5 for manufacturing nondurables, 1.5 for transportation-communication-utilities, 1.2 for wholesale-retail trade, 1.4 for finance-insurance-real estate, and 1.1 for services. While their absolute magnitudes are somewhat arbitrary, their relative magnitudes are intended to reflect relative levels of product differentiation across industry.

Given the method of estimating L in equation (10),

$$\Delta M^{s}_{it} = \Delta Q^{s}_{it} - \left[\Delta Q^{s}_{it} * H^{s}_{it}\right] \quad (12)$$

$$= \Delta Q^{s}_{it} * (1 - H^{s}_{it}) \quad (13)$$

Thus, equations (11) - (13) indicate that, for example, if an energy-producing State produces, say, 80 percent of the additional output locally (H = 0.8), it must import 20 percent (1-H).

Given the (known) value of increases in output resulting from total imports (M^{s}_{it}), one must next determine from what other States these imports come, and how much is imported from each State, by the energy-producing States. State s's increases in output resulting from all imports are, of course, equal to the sum of the exports of all other States to State s:

$$M^{s}_{it} = \sum_{q \neq s} X^{qs}_{it} \quad (14)$$

where X^{qs}_{it} is exports of State q to State s for industry i. The task is to determine the value of these exports. To accomplish this, the gravity-potential concept is used.[9/] In particular, total imports of State s, M^{s}_{it}, are weighted by a gravity variable to determine what amount each State q (q≠s) exports to energy-producing State s:

$$X^{qs}_{it} = M^{s}_{it} * G^{qs}_{it} \quad (15)$$

where,

$$G^{qs}_{it} = \frac{\frac{Y^{q}_{it}}{D_{qs}}}{\sum_{v \neq q} \frac{Y^{v}_{it}}{D_{vs}}} \quad (16)$$

and Y is output in an historical period (1978), D_{qs} is the distance between State q and State s, and D_{vs} is the distance between State v and State s, where State v is every other State except q.[10/]

9/ For a more detailed discussion of this approach, see Ballard, Cartwright, Gustely, and Kort, "Developing a Spatial Comprehensive Impact Modeling System: A Feasibility Study," cited previously.

10/ For the report this 1978 value of output was applied for all of the time periods in the equation 16 calculations. The use of a single year was to reduce the obviously lengthy computations. Because we are dealing with State shares, the annual differences should be slight. For the future, however, calculations using the forecasted (baseline solution) output values for 1979 to 1990 would be suggested.

Equation (16) simply defines the gravity variable as the distance-deflated share of State q's output in industry i relative to distance-deflated output in industry i in all other States. Equations (15) and (16) indicate that the share of energy-producing State s's total imports accounted for by a particular State q (State q's exports to s) is determined by the physical distance from the energy-producing State to the export (supplying) State, and by the importance of industry i in State q, relative to all States.

From equations (13) through (16), by substitution, it is easy to see that,

$$\Delta M_{it}^{s} = \sum_{q \neq s} \Delta Q_{it}^{s} \ (1 - H_{it}^{s}) * G_{it}^{qs} \qquad (17)$$

Thus, the change in real output for each State (ΔQ_{it}^{s}) resulting from solar technology commercialization has been allocated to its two (by identity) components: that portion of the change in output resulting from changes in local (within-State) production (ΔL_{it}^{s}), and that portion of the change in output resulting from changes in imports outside the State (ΔM_{it}^{s}). This procedure was based on the use of adjusted location quotients and a gravity -potential variable. The results appear in the Appendix.

NRIES Impact Estimation

Given the estimated values of national and State changes in real output by industry and time period resulting from the projected levels of expenditures on solar energy systems for 1980 to 1990, the fifth phase of the methodology is to conduct two forecast simulations with the NRIES model in order to derive estimates of the total (direct, indirect, induced and interregional) impacts of solar technology commercialization. These estimates are derived in a two-step process. First, NRIES is simulated over the 1980-1990 period to produce a control or baseline solution that reflects likely trends in economic and demographic activity in the nation and all States, in the absence of efforts to increase solar technology commercialization. Second, NRIES is again simulated over the 1980-1990 period to produce an alternative or solar-impact solution that reflects likely trends in national and State economic activity with the changes in economic activity resulting from the solar program incorporated into the model.

Differences of major economic aggregates between the solar-impact and control solution are then calculated. These differences represent the total --direct, indirect, induced, and interregional--impacts of solar technology commercialization on the U.S. and its component States. Description and analysis of these differences represents the sixth, or last phase of the methodology used in this study. The following section describes these total impacts.

III. ECONOMIC AND DEMOGRAPHIC IMPACTS OF SOLAR TECHNOLOGY COMMERCIALIZATION

This section describes the economic and demographic impacts of solar technology commercialization on major economic aggregates for the U.S., nine Census regions and the 51 States. Impacts on output, employment, income, unemployment and population are presented. As indicated earlier, these impacts are defined as the difference between the values of a major economic aggregate in the NRIES control or baseline solution, and the values of a major economic aggregate in the NRIES alternative, or solar-impact solution that incorporated the solar expenditure projections appearing in Table 3. In addition to presenting the absolute magnitudes of these impacts, impact multipliers, defined as the total change in an economic aggregate divided by the direct effect or initial change in the variable, are presented for real output.

Output

Table 6 presents the impacts of solar technology commercialization on real output (gross domestic product in millions of 1972 dollars) for the U.S., nine Census regions and 51 States for the period 1980-1990. As Table 6 (in comparison with Table 2) indicates, an annual real expenditure of $9.7 billion on solar energy systems between 1980 and 1984 induces a real total output impact for the U.S. ranging from $18.7 billion in 1980 to $24.5 billion in 1984. For 1985-1990, an annual real expenditure of $15.3 billion induces increases in U.S. total real output of between $35.9 billion in 1985 and $44.8 billion in 1990. It is important to note that even though solar expenditures are constant in the two five-year intervals 1980-84 and 1985-89, it is not expected that the impacts associated with these expenditures will be constant, nor will they be of the same magnitude as the expenditures. This is due to the familiar multiplier and accelerator principles in economics. Lag effects (the influence of a previous year's economic events on the current year's) are built into the U.S. economy (and therefore the NRIES model) and cause a build-up of the total effects of changes in economic variables. This is the major reason for the observed increase in the impact of solar expenditures on total real output in the U.S. over the 1980-84 and 1985-90 periods.

These real total output impacts vary significantly from region to region (see Figure 3 for a definition of the nine Census regions). The largest impact occurs in the South Atlantic region, which includes Florida and Georgia, for example. The South Atlantic region alone accounts for about 20 percent of the total U.S. impact on real output throughout the forecast period. The West South Central, East North Central, and Pacific regions also exhibit relatively large real output impacts. However, the underlying causes of these impacts perhaps differ among the three regions. Specifically, the Pacific and West South Central regions on the one hand, lie in the "Sun Belt" region of the U.S. and are likely to be relatively large "consumers" of solar energy systems. On the other hand, the East North Central region (which includes Michigan, Ohio and Indiana, for instance) is a highly manufacturing - oriented area, and perhaps exhibits relatively large output impacts due to the increased activity associated with the manufacture of solar energy system components. Almost all States in the region have a relative concentration of economic activity in the production of manufactured durable goods -- goods that are major inputs of solar energy systems. Thus, the utility of the NRIES model in this application (with its interregional linkages) becomes evident: although an area of the U.S. may not be a particularly important consumer of some good or service, its economy is nevertheless affected by increased demand for the good or service (occurring in other parts of the country) because it produces and exports (between regions) some or all of the inputs necessary to produce that good. The region may be affected, in other words, because it is a supplying region.

Figure 3.

Census Regions of the United States

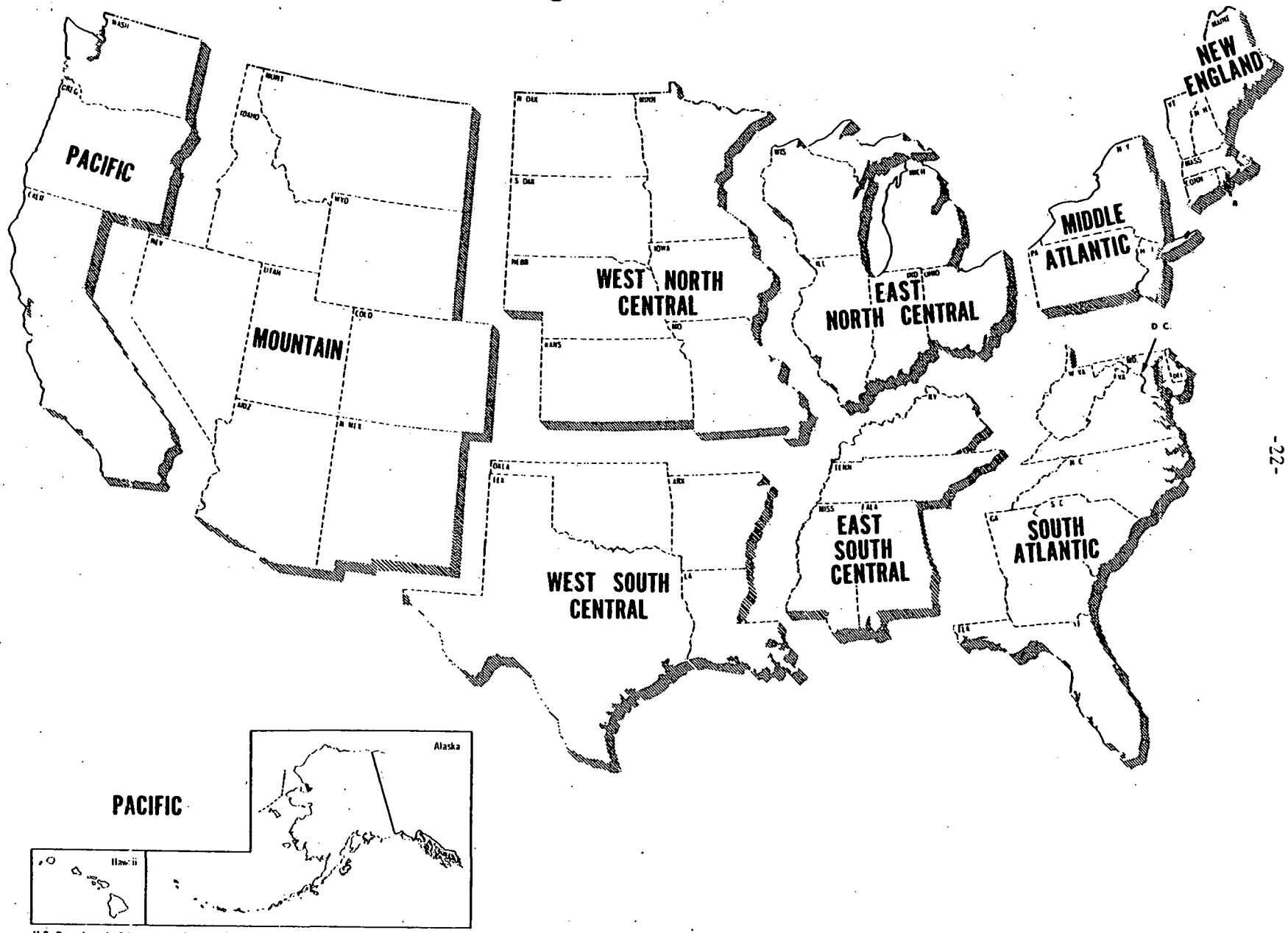


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TABLE 6

SUMMARY OF TOTAL N.R.I.E.S. IMPACTS FOR GROSS DOMESTIC OUTPUT (MIL. 1972 $)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
UNITED STATES	18734.	23407.	24034.	24382.	24515.	35976.	38594.	39676.	41408.	43154.	44827.
NORTH EAST	817.4	987.5	1002.6	996.1	975.6	1494.6	1589.6	1634.7	1692.0	1745.1	1793.5
MID ATLANTIC	2433.4	3076.7	3200.2	3193.2	3120.8	4871.2	5314.2	5581.4	5822.0	6047.7	6245.3
SOUTH ATLANTIC	3306.7	4347.1	4525.1	4712.0	4859.2	6876.5	7425.5	7626.0	7932.4	8317.9	8699.9
EAST NORTH CENTRAL	2078.3	2874.6	3025.1	3080.3	3113.6	4530.4	4916.4	5070.1	5454.7	5809.3	6147.3
EAST SOUTH CENTRAL	1255.0	1617.9	1717.3	1762.7	1779.7	2594.0	2818.9	2938.4	3073.7	3205.1	3330.2
WEST NORTH CENTRAL	1337.1	1558.1	1565.7	1606.6	1616.1	2404.6	2545.4	2609.2	2720.5	2824.0	2920.9
WEST SOUTH CENTRAL	2548.5	3036.2	3019.6	3105.1	3170.4	4906.4	5300.4	5503.6	5797.6	6091.6	6377.4
MOUNTAIN	2155.0	2605.4	2685.9	2652.7	2607.8	3583.6	3788.7	3869.2	3939.7	4008.2	4079.9
PACIFIC	2802.2	3303.7	3292.3	3273.3	3274.8	4714.3	4894.9	4843.2	4975.0	5104.9	5232.9
ALABAMA	378.3	475.7	527.4	565.7	596.8	822.2	889.8	935.4	973.7	1007.7	1037.6
ALASKA	16.7	16.5	19.0	18.8	18.7	32.8	35.0	36.0	36.7	37.2	37.8
ARIZONA	465.5	674.3	770.9	775.4	733.6	925.4	995.7	1044.5	1079.8	1103.4	1123.5
ARKANSAS	222.4	250.2	252.0	255.3	259.8	402.0	427.9	445.7	470.8	497.1	523.0
CALIFORNIA	2171.1	2525.4	2480.9	2424.8	2404.8	3398.5	3454.6	3322.0	3348.7	3379.6	3414.2
COLORADO	699.2	772.9	764.2	745.4	734.8	1057.8	1097.7	1101.2	1102.0	1103.7	1107.4
CONNECTICUT	184.2	230.8	230.3	224.2	211.9	347.0	370.6	380.9	397.7	413.9	429.3
DELAWARE	94.1	117.7	121.0	122.7	123.5	188.9	204.5	211.8	218.4	224.6	230.3
DIST OF COLUMBIA	32.6	24.6	8.3	-.5	-5.1	19.9	16.5	6.7	-.5	-6.4	-12.5
FLORIDA	824.8	1205.4	1319.0	1409.0	1422.2	1666.2	1682.6	1601.2	1584.5	1635.4	1701.5
GEORGIA	745.8	1021.1	1108.3	1164.9	1224.1	1738.9	1925.5	2021.5	2109.8	2196.2	2274.3
HAWAII	58.5	71.7	77.7	83.6	88.7	126.2	137.4	145.1	152.1	158.3	164.0
IDAHO	168.1	190.6	203.1	213.2	222.6	315.7	337.3	355.6	375.2	394.8	414.2
ILLINOIS	566.9	783.1	845.1	888.7	878.9	1343.1	1484.1	1574.1	1695.2	1801.5	1899.9
INDIANA	247.2	394.8	401.9	404.8	404.3	537.5	575.4	576.4	620.3	660.5	699.4
IOWA	226.1	262.1	264.6	267.3	262.1	397.6	419.4	430.1	448.3	466.8	487.1
KANSAS	212.0	238.8	221.9	220.3	216.1	327.2	338.1	332.3	341.1	348.7	355.8
KENTUCKY	298.4	400.7	388.2	359.5	331.4	530.5	575.8	575.4	586.3	602.7	620.4
LOUISIANA	410.5	487.6	513.5	549.7	592.0	914.5	1031.7	1136.8	1253.2	1379.1	1509.9
MAINE	83.5	99.6	105.4	108.4	110.4	161.1	172.8	180.0	187.1	193.1	198.2
MARYLAND	269.7	323.2	330.8	334.3	336.1	521.0	570.5	600.3	627.6	652.1	674.9
MASSACHUSETTS	382.7	451.3	462.6	462.6	459.3	693.1	733.4	755.1	777.4	797.7	815.1
MICHIGAN	395.0	519.3	603.7	600.0	623.9	867.2	949.7	987.8	1099.3	1204.0	1307.7
MINNESOTA	313.3	362.8	358.6	361.1	353.4	531.2	551.4	555.1	569.6	581.4	592.2
MISSISSIPPI	162.3	205.9	208.5	204.4	191.3	282.5	296.1	295.7	300.6	304.7	309.0
MISSOURI	428.7	521.1	542.4	575.4	599.9	876.2	951.4	998.6	1059.0	1115.3	1165.0
MONTANA	111.5	122.2	119.7	116.4	112.8	158.6	160.6	158.4	157.4	156.7	156.2
NEBRASKA	96.2	110.5	118.2	123.4	125.6	183.3	193.5	201.3	208.9	215.6	222.0
NEVADA	163.5	199.7	160.3	129.7	123.4	197.6	212.9	197.0	185.4	182.2	182.5
NEW HAMPSHIRE	75.9	93.4	95.3	97.0	96.8	142.3	152.7	158.0	166.1	173.8	181.1
NEW JERSEY	436.9	545.8	554.1	538.1	515.0	845.9	900.0	952.6	984.6	1020.7	1045.3
NEW MEXICO	230.3	279.5	286.7	275.0	265.8	349.3	365.6	369.4	369.1	368.6	368.9
NEW YORK	1416.2	1824.3	1948.6	1981.0	1972.0	2947.9	3241.1	3413.6	3549.3	3667.8	3769.7
NORTH CAROLINA	564.3	710.6	760.3	811.3	857.4	1300.0	1450.8	1573.2	1707.2	1840.3	1968.9
NORTH DAKOTA	32.2	33.9	32.9	33.2	33.8	50.8	53.0	54.1	55.9	58.1	60.6
OHIO	559.3	770.2	770.9	781.9	802.7	1163.9	1241.9	1243.5	1314.9	1381.8	1444.6
OKLAHOMA	272.5	309.7	304.6	310.6	312.7	472.9	495.9	500.1	513.1	524.9	536.3
OREGON	234.5	280.0	280.7	283.2	283.2	441.4	475.9	496.6	529.0	559.2	586.5
PENNSYLVANIA	580.2	706.6	697.5	674.1	633.9	1077.4	1165.1	1215.2	1288.2	1359.3	1430.3
RHODE ISLAND	61.4	73.8	71.3	68.7	65.2	103.8	109.6	110.7	114.0	117.1	120.4
SOUTH CAROLINA	280.8	395.6	412.6	415.0	417.0	638.1	676.7	708.1	734.8	761.8	789.7

TABLE 6

SOUTH DAKOTA	28.6	28.9	27.1	25.9	25.2	38.3	38.5	39.0	37.9	38.0	38.2
TENNESSEE	416.0	535.6	593.3	633.1	660.2	958.7	1057.2	1131.9	1213.1	1289.9	1363.2
TEXAS	1643.0	1988.6	1949.6	1989.5	2005.8	3117.1	3344.9	3421.0	3560.4	3690.5	3808.5
UTAH	244.2	282.5	307.4	327.2	343.1	467.1	498.7	524.9	552.1	578.1	603.5
VERMONT	29.8	38.6	37.8	35.1	32.1	47.4	50.4	50.0	49.7	49.4	49.3
VIRGINIA	393.9	449.2	371.0	358.6	387.6	670.8	729.4	729.4	765.8	817.2	863.5
WASHINGTON	321.4	407.9	434.1	462.9	482.5	715.5	791.9	843.5	908.6	970.6	1030.3
WEST VIRGINIA	92.8	99.7	96.7	97.6	96.5	162.8	168.9	173.7	184.9	196.9	209.4
WISCONSIN	310.0	407.3	403.5	405.0	400.9	618.6	665.3	688.4	725.0	761.5	795.7
WYOMING	72.6	83.8	73.6	70.2	71.8	112.3	120.3	118.0	118.7	120.8	123.6

The smallest real output impacts among the nine Census regions occur in the North East, West North Central and East South Central regions. Impacts in these regions range from between $1 billion and $ 3 billion, annually.

Among the States, California, Texas, New York and Florida -- the four most populous States in the nation -- registered the largest real output impacts, while the District of Columbia, North Dakota, Alaska and Vermont registered the smallest impacts. Annual impacts range from $3.8 billion (Texas in 1990) to $16 million (Alaska in 1980).[11/]

Impact multipliers (defined previously) for U.S. real output by industry appear in Table 7. With an all-industry average ranging from 1.96 in 1980 to 2.95 in 1990, the largest multiplier effects occur in the durable goods manufacturing industry. Again, this reflects the durable goods intensity of solar energy system production. Substantial impact multiplier effects also occur in the service-related industries, such as wholesale and retail trade, finance-insurance-real estate, and transportation-communication-utilities. Smallest impact multiplier effects occur in the mining, construction, and nondurable goods industries.

Total real output impact multipliers are also presented for the nine Census regions and 51 States in Table 8 and Figure 4. As Table 8 indicates, the Middle Atlantic region, dominated by New York, registered the largest total real output multipliers in 1980, 1985 and 1990, followed by the South Atlantic and East North Central regions. However, in contrast to the results presented in Table 6 on the absolute magnitudes of the real output impacts, the Pacific region (which ranked second in total impacts for 1980 in absolute terms) registered one of the smallest real output impact multipliers. This result emphasizes the impact contribution of the second and third-round effects that increased manufacturing activity can have on a local economy. In particular, although California (a Pacific-region State) is relatively concentrated in the manufacture of aircraft parts (which comprise a major portion of solar wind technology), and although California is one of the nation's most populous States, this does not imply that large impact multiplier results are expected. Other manufacturing-oriented regions of the U.S. (such as the East North Central region) may (and in this case do) exhibit larger multipliers because of the existence of a broader-based manufacturing industry, where perhaps a greater variety of solar energy system inputs are manufactured. As is evident from Table 7, the multiplier effects are far greater in durable goods manufacturing than in some of the service and other industries -- in retail and wholesale trade, for instance, where the sale of a solar energy system would appear in an an accounting context. Thus, this result is not unusual.

Figure 4 graphically illustrates the distribution of real output impact multipliers for States for 1985. States are grouped into three categories: those with impact multipliers above the U.S. average of 2.4, those near average, and those below average. As the figure illustrates, the greatest multiplier results occur in the Eastern portion of the U.S., particularly in the South Atlantic region. The effects of a manufacturing-orientation are also illustrated by the results for the Middle Atlantic and East North Central regions.

[11/] Negative output impacts occurred in D.C.

TABLE 7

Real Output Impact Multipliers by Industry, U.S.

	1980	1985	1990
Mining	1.00	1.00	1.00
Construction	1.34	1.45	1.69
Durable Goods	5.60	6.41	8.63
Nondurable Goods	1.38	1.47	1.63
Transportation, Communicaton, and Utilities	2.51	3.56	4.62
Wholesale and Retail Trade	3.53	4.68	6.24
Finance, Insurance, and Real Estate	3.56	4.14	5.17
Services	2.29	3.19	4.18
TOTAL	1.96	2.37	2.95

SOURCE: Derived from DOE inputs and NRIES model simulations.

TABLE 8

Impact Multipliers for Total Real Output
U.S., Regions, and States, 1980, 1985, and 1990

	1980	1985	1990
United States	1.96	2.37	2.95
North East	1.71	1.97	2.36
Mid Atlantic	2.73	3.19	4.10
South Atlantic	2.45	3.14	3.98
East North Central	1.74	2.35	3.19
East South Central	1.85	2.44	3.13
West North Central	1.65	1.97	2.39
West South Central	1.88	2.22	2.88
Mountain	1.75	1.99	2.27
Pacific	1.77	1.90	2.11
Alabama	2.25	3.20	4.11
Alaska	0.86	0.91	1.00
Arizona	1.78	2.27	2.65
Arkansas	1.57	1.86	2.50
California	1.81	1.83	1.87
Colorado	1.88	1.93	2.03
Connecticut	1.50	1.74	2.19
Delaware	1.79	2.15	2.61
District of Columbia	1.88	0.60	-
Florida	3.06	4.08	4.16
Georgia	3.24	4.52	5.87
Hawaii	1.68	2.24	2.84
Idaho	1.54	2.01	2.62
Illinois	1.54	2.26	3.21
Indiana	1.61	2.18	2.81
Iowa	1.71	1.99	2.45
Kansas	1.94	2.09	2.41
Kentucky	1.64	1.81	2.11
Louisiana	1.78	2.41	4.04
Maine	1.83	2.19	2.55
Maryland	2.06	2.51	3.31
Massachusetts	1.76	2.04	2.42
Michigan	1.82	2.47	3.72
Minnesota	1.47	1.64	1.84
Mississippi	1.71	2.01	2.25
Missouri	1.73	2.29	2.92
Montana	1.36	1.48	1.60
Nebraska	1.42	1.78	2.19
Nevada	2.22	1.96	1.93
New Hampshire	1.88	2.22	2.67

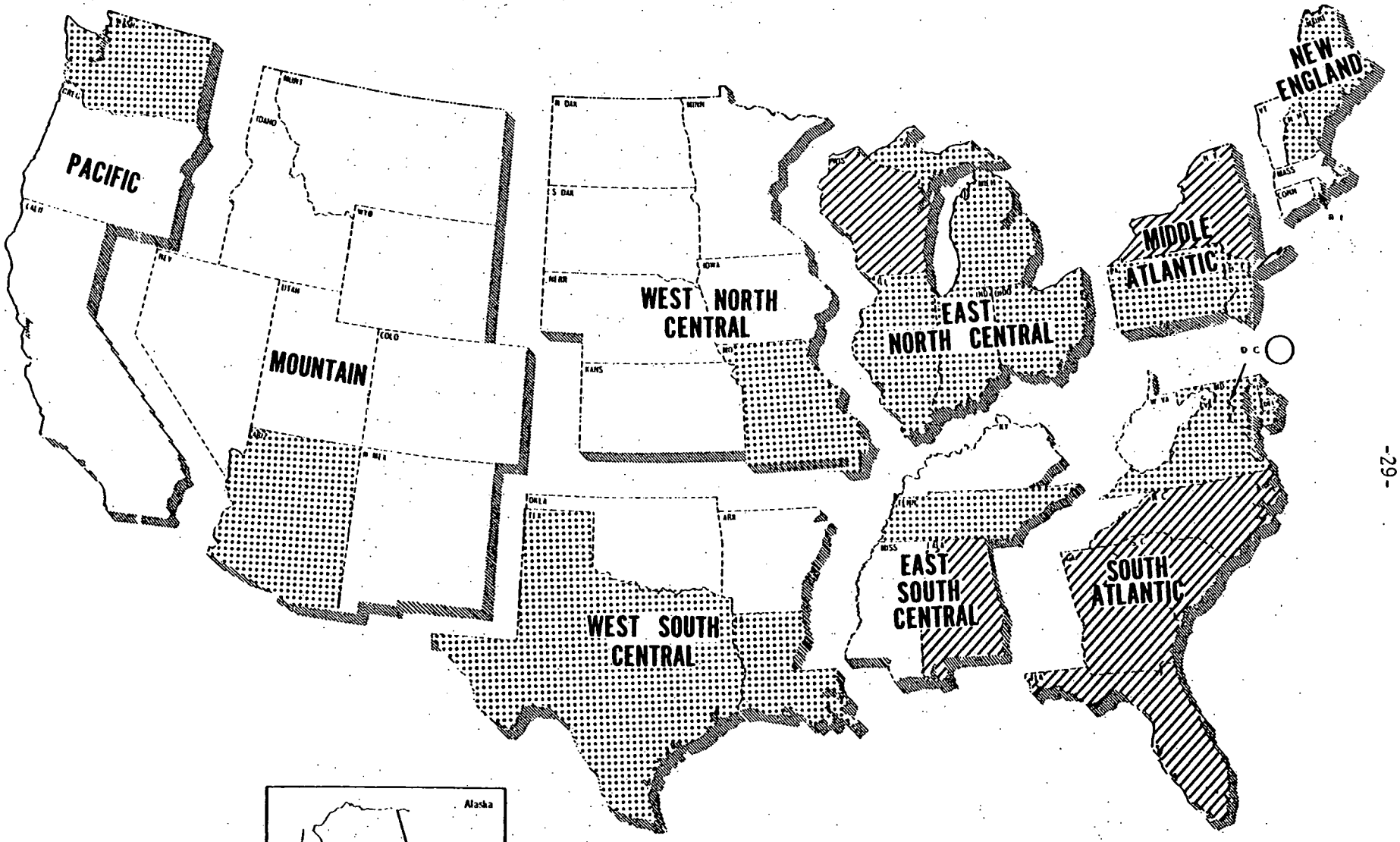
TABLE 8 (continued)

New Jersey	2.08	2.34	2.88
New Mexico	1.79	1.97	2.12
New York	3.42	4.16	5.38
North Carolina	2.17	3.02	4.52
North Dakota	1.63	1.81	2.21
Ohio	1.76	2.26	2.81
Oklahoma	1.70	1.90	2.20
Oregon	1.77	2.06	2.64
Pennsylvania	2.15	2.36	3.10
Rhode Island	1.72	1.81	2.11
South Carolina	2.22	2.87	3.69
South Dakota	1.42	1.36	1.42
Tennessee	1.78	2.57	3.58
Texas	2.00	2.28	2.75
Utah	1.55	2.05	2.63
Vermont	1.74	1.82	1.88
Virginia	2.04	2.16	2.84
Washington	1.68	2.30	3.09
West Virginia	1.36	1.45	1.82
Wisconsin	2.21	2.79	3.59
Wyoming	1.55	1.53	1.68

SOURCE: NRIES solar impact solution and DOE-projected solar expenditures.

Figure 4.

Impact Multiplier Distribution for Total Real Output - 1985



U.S. Department of Commerce, Bureau of Economic Analysis

Employment

The second most important economic aggregate for which impact estimates are of interest is employment. These impact results are presented in Table 9. Unfortunately, the initial changes in employment associated with the given levels of solar expenditures are unknown, so multiplier results cannot be calculated. In absolute terms, however, the employment impact of solar energy technology commercialization ranges from 570 thousand in 1980 to 2.8 million in 1990, for the U.S. The 1980 employment change represents about a 0.6 percent increase over the baseline forecast value, while the 1990 employment impact reflects a 2 percent increase over the baseline forecast value. These employment increases accord with expectations.

As expected, the regional distribution of employment impacts corresponds to those of output. Specifically, the largest impacts occur in the South Atlantic, West South Central and East North Central regions, while the smallest impacts occur in the North East, East South Central and West North Central regions. As with output, the South Atlantic region accounts for about 20 percent of the total U.S. employment impact throughout the forecast period.

Similar conclusions apply to the State results, although there is some variation relative to State output impacts. By the end of the forecast period, Texas gains the most employment -- about 236 thousand, almost half the initial (1980) increase for the entire U.S. The most populous States exhibit employment gains in excess of 100,000, including California, Florida, Georgia, Illionis, New York, North Carolina, as well as Texas. The smallest employment impacts (less than 5,000) occur in Alaska, North and South Dakota, and Vermont.[12/]

Income

Table 10 presents the impacts on total personal income (unadjusted for inflation) for the U.S., regions and States. The impact on the U.S. ranges from $19.3 billion in 1980 to $124.7 billion in 1990. The relative impact on each of the regions and States is quite similar to that of real output. The South Atlantic region exhibits the largest total income impact -- $4.1 billion in 1980 to $27.2 billion in 1990 -- while the North East region registers the smallest impact --$779 million in 1980 to $4.2 billion in 1990. Among the States, Texas ranked first with an income impact ranging from $1.7 billion in 1980 to $11.0 billion in 1990. Next to the District of Columbia's negative impact, the smallest impact on income occurred in Alaska -- $18 million in 1980 to $62 million in 1990. Although not shown here, little change in income in per capita terms occurred. For the U.S., per capita personal income was only $100 higher in 1980 in the solar-impact solution compared with the baseline solution, and only $600 higher by 1990. Similar results were apparent for each of the States.

12/ Employment impacts by industry for the U.S. and States are presented in the Appendix.

TABLE 9

SUMMARY OF TOTAL N.R.I.E.S. IMPACTS FOR EMPLOYMENT (THOUSANDS OF MAN YEARS)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
UNITED STATES	570.	1014.	1231.	1360.	1439.	1876.	2159.	2337.	2502.	2657.	2803.
NORTH EAST	24.0	40.0	47.3	51.3	53.5	72.7	83.3	89.8	95.5	100.3	104.5
MID ATLANTIC	65.0	119.5	147.1	158.9	162.8	217.1	254.3	278.3	295.5	309.8	321.9
SOUTH ATLANTIC	131.1	230.7	279.1	311.7	334.7	429.4	490.3	525.5	558.7	594.4	630.2
EAST NORTH CENTRAL	38.2	110.2	148.8	171.6	184.8	236.0	278.2	306.0	335.1	362.4	387.9
EAST SOUTH CENTRAL	44.0	77.7	94.4	104.4	110.2	144.9	167.4	181.9	194.8	206.3	216.9
WEST NORTH CENTRAL	35.9	61.5	75.0	83.8	88.8	116.1	133.1	144.3	154.3	163.3	171.4
WEST SOUTH CENTRAL	73.4	126.4	152.5	172.1	187.1	254.4	300.7	334.9	367.8	399.3	429.4
MOUNTAIN	80.8	124.8	143.6	152.0	155.6	196.9	219.9	232.9	242.8	251.3	259.1
PACIFIC	77.4	123.6	143.7	154.2	161.8	209.0	231.8	243.4	257.2	270.1	282.3
ALABAMA	17.5	28.2	34.2	38.6	42.0	54.3	61.8	67.0	71.2	74.8	78.0
ALASKA	.7	.6	.5	.4	.3	.7	.6	.5	.4	.4	.3
ARIZONA	18.4	34.6	44.5	48.7	48.6	57.5	64.2	69.1	72.8	75.5	77.8
ARKANSAS	6.5	10.5	13.2	15.6	17.8	24.3	28.8	32.9	37.1	41.1	45.1
CALIFORNIA	59.5	91.2	102.6	107.0	110.3	140.5	151.3	153.6	158.6	163.3	167.8
COLORADO	27.2	37.1	39.9	40.3	40.2	53.0	57.8	59.6	60.3	60.8	61.3
CONNECTICUT	3.6	6.9	8.4	9.2	9.4	13.0	15.2	16.6	18.0	19.1	20.1
DELAWARE	2.3	3.5	4.1	4.4	4.7	6.5	7.5	8.1	8.6	9.0	9.4
DIST OF COLUMBIA	-.4	-1.5	-2.5	-2.9	-3.1	-3.2	-3.9	-4.5	-5.0	-5.4	-5.8
FLORIDA	36.6	72.7	92.0	103.9	109.4	122.9	129.7	128.4	128.4	132.3	138.1
GEORGIA	32.9	53.1	62.1	67.6	71.9	96.6	110.9	119.3	126.1	132.2	137.8
HAWAII	1.9	2.8	3.4	4.0	4.3	5.7	6.5	7.1	7.6	8.0	8.4
IDAHO	4.7	7.8	9.9	11.7	13.3	17.2	20.2	22.7	25.0	27.3	29.5
ILLINOIS	10.2	33.2	48.9	53.4	56.0	71.8	87.5	98.0	107.8	116.4	124.2
INDIANA	.5	10.2	14.6	16.9	18.3	21.7	24.7	26.3	29.2	32.3	35.4
IOWA	5.2	8.7	10.4	11.5	11.9	15.8	18.0	19.4	20.8	22.1	23.3
KANSAS	7.1	11.0	12.8	13.8	14.1	18.5	20.6	21.8	22.8	23.7	24.5
KENTUCKY	6.4	13.7	16.2	16.7	16.3	22.0	25.9	27.6	29.2	30.7	32.1
LOUISIANA	14.6	22.9	27.6	32.2	36.9	52.3	64.4	75.7	87.6	100.2	113.3
MAINE	4.7	6.9	8.0	8.7	9.1	12.3	13.8	14.8	15.5	16.1	16.6
MARYLAND	10.6	18.0	21.7	23.7	24.8	33.5	39.4	43.2	46.0	48.4	50.4
MASSACHUSETTS	9.6	16.9	20.0	21.6	22.5	30.1	34.9	37.5	39.6	41.3	42.6
MICHIGAN	6.6	18.1	26.3	30.5	34.6	46.2	52.2	55.1	64.5	70.8	76.9
MINNESOTA	6.0	11.9	14.6	16.1	16.6	21.5	24.6	26.4	28.0	29.3	30.5
MISSISSIPPI	6.1	10.8	12.0	12.3	11.7	15.5	17.3	17.7	18.1	18.4	18.7
MISSOURI	12.9	22.7	28.8	33.3	36.6	47.6	55.4	61.3	66.4	71.0	75.1
MONTANA	3.0	4.8	4.3	4.5	4.6	6.1	6.6	6.8	7.0	7.2	7.3
NEBRASKA	2.4	4.6	5.8	6.5	6.8	8.8	10.1	11.0	11.7	12.4	12.9
NEVADA	6.0	8.9	8.1	7.2	7.0	9.9	11.3	11.0	10.7	10.7	10.8
NEW HAMPSHIRE	2.8	4.6	5.7	6.5	7.0	9.3	10.7	11.8	12.8	13.8	14.5
NEW JERSEY	11.4	23.0	28.3	30.1	30.4	41.4	49.1	53.9	57.0	59.5	61.2
NEW MEXICO	10.3	15.7	17.5	18.1	18.4	22.8	25.4	26.5	27.2	27.6	27.9
NEW YORK	36.5	64.7	78.8	84.7	86.7	114.4	133.0	144.8	153.0	159.5	164.9
NORTH CAROLINA	21.5	39.8	51.8	61.8	70.3	94.1	113.3	129.5	145.1	159.9	173.9
NORTH DAKOTA	1.0	1.3	1.3	1.4	1.5	2.1	2.4	2.5	2.7	2.9	3.1
OHIO	12.7	31.5	39.7	44.4	47.7	61.5	70.8	75.9	81.5	87.2	92.4
OKLAHOMA	8.0	13.4	16.4	18.1	19.2	24.9	28.5	30.7	32.3	33.7	34.8
OREGON	6.3	10.7	12.9	14.5	15.6	21.3	24.9	27.6	30.4	33.1	35.5
PENNSYLVANIA	17.0	31.8	40.0	44.1	45.7	61.2	72.2	79.6	85.6	90.8	95.7
RHODE ISLAND	2.6	3.4	3.6	3.9	4.0	5.8	6.4	6.8	7.2	7.6	7.9
SOUTH CAROLINA	13.6	23.3	27.3	29.1	30.3	40.8	47.9	52.4	56.1	59.6	63.1

TABLE 9

SOUTH DAKOTA	1.3	1.4	1.3	1.3	1.2	1.8	1.9	1.9	1.9	1.9	1.9
TENNESSEE	13.9	25.1	32.0	36.8	40.2	53.1	62.4	59.6	76.3	92.3	88.0
TEXAS	44.3	79.6	95.4	106.2	113.2	152.9	179.0	195.6	210.8	224.2	236.3
UTAH	8.5	12.8	15.4	17.4	19.0	24.4	27.6	30.0	32.2	34.3	36.2
VERMONT	.8	1.3	1.5	1.5	1.4	2.0	2.3	2.4	2.5	2.5	2.6
VIRGINIA	12.0	19.3	19.6	20.5	22.3	32.1	38.1	40.5	43.3	46.5	49.5
WASHINGTON	9.1	18.3	24.2	28.4	31.3	40.8	48.5	54.5	60.1	65.3	70.3
WEST VIRGINIA	2.0	2.6	2.9	3.6	4.0	6.4	7.5	8.6	10.2	11.9	13.7
WISCONSIN	8.2	17.2	22.4	26.0	28.2	36.7	43.0	47.7	51.9	55.7	59.1
WYOMING	2.7	3.9	4.1	4.2	4.4	6.0	6.9	7.3	7.5	7.8	8.1

TABLE 10

SUMMARY OF TOTAL N.R.I.E.S. IMPACTS FOR PERSONAL INCOME (MILLIONS OF DOLLARS)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
UNITED STATES	19335.	31182.	36693.	41067.	45257.	65357.	78193.	88109.	99057.	111350.	124676.
NORTH EAST	779.2	1195.0	1358.7	1462.3	1582.6	2354.6	2808.1	3134.5	3482.9	3865.8	4270.2
MID ATLANTIC	2614.7	4292.1	5049.6	5443.9	5761.4	8636.7	10413.6	11804.5	13072.4	14452.8	15891.2
SOUTH ATLANTIC	4151.3	6689.1	7820.9	8999.4	10131.6	14298.5	16960.7	18965.6	21277.9	24092.8	27218.8
EAST NORTH CENTRAL	1608.8	3814.3	4928.3	5675.9	6307.2	8798.9	10907.9	12429.0	14263.8	16277.4	18458.6
EAST SOUTH CENTRAL	1232.3	2021.7	2458.3	2811.1	3139.9	4555.0	5503.0	6295.0	7127.8	8025.6	8990.3
WEST NORTH CENTRAL	1148.0	1855.6	2195.6	2478.1	2739.5	3959.0	4757.5	5391.9	6049.9	6783.0	7569.0
WEST SOUTH CENTRAL	2514.6	3848.6	4515.3	5207.1	5900.0	8937.6	10899.3	12624.8	14538.0	16656.4	18958.8
MOUNTAIN	2508.2	3622.7	4102.9	4397.6	4684.5	6596.8	7670.2	8475.8	9274.7	10149.6	11108.5
PACIFIC	2777.6	3843.1	4263.9	4591.3	5009.9	7219.6	8272.2	8998.1	9969.5	11047.2	12211.0
ALABAMA	428.0	658.7	819.6	965.8	1110.5	1557.9	1847.8	2106.6	2359.2	2623.7	2902.5
ALASKA	18.7	26.6	27.2	25.5	25.2	46.0	53.5	55.0	56.2	59.0	62.1
ARIZONA	606.2	1115.9	1358.6	1455.0	1476.8	1923.3	2295.5	2582.0	2856.8	3140.3	3442.5
ARKANSAS	179.0	267.1	325.0	382.2	453.4	672.0	825.1	974.8	1148.4	1341.7	1555.1
CALIFORNIA	2229.7	2868.4	3047.3	3151.8	3344.6	4775.0	5206.2	5398.6	5759.7	6180.5	6641.0
COLORADO	938.0	1136.7	1241.1	1319.1	1410.2	2109.5	2370.8	2569.0	2756.4	2962.4	3191.4
CONNECTICUT	139.7	270.6	306.4	327.8	344.1	520.5	646.1	726.7	819.8	922.1	1031.0
DELAWARE	76.1	120.2	137.1	149.8	162.0	242.9	285.7	317.4	347.8	381.3	417.0
DIST OF COLUMBIA	25.3	9.1	-19.8	-36.6	-46.5	-25.7	-38.2	-64.4	-85.5	-104.5	-126.5
FLORIDA	1473.1	2500.2	2921.0	3361.5	3644.5	4462.4	4896.3	4997.7	5236.7	5735.4	6347.5
GEORGIA	878.2	1413.0	1685.0	1917.5	2170.3	3179.1	3796.7	4285.8	4774.0	5305.8	5872.8
HAWAII	50.7	89.8	109.3	125.0	141.5	198.4	241.8	274.7	305.8	338.8	373.2
IDAHO	125.4	199.1	250.6	300.4	354.2	490.8	595.6	697.9	807.5	927.8	1059.1
ILLINOIS	449.4	1121.6	1501.6	1752.2	1894.3	2689.9	3423.4	3985.0	4585.7	5217.1	5888.0
INDIANA	140.8	451.1	568.1	644.8	710.3	909.5	1096.0	1198.0	1381.3	1595.9	1835.7
IOWA	207.8	311.8	338.2	361.1	381.6	573.4	677.2	748.1	831.9	930.9	1043.9
KANSAS	211.8	300.6	339.1	374.0	400.4	586.1	675.5	741.5	818.5	901.2	990.0
KENTUCKY	244.9	422.6	468.5	483.1	487.6	754.1	912.0	1003.4	1109.0	1230.3	1363.4
LOUISIANA	404.0	634.9	763.3	923.2	1107.5	1738.0	2235.3	2767.2	3385.4	4122.6	4964.4
MAINE	107.0	153.5	184.6	207.9	231.3	339.3	398.9	449.8	499.7	551.8	605.9
MARYLAND	347.3	520.3	608.3	669.4	729.9	1114.7	1353.0	1548.4	1733.1	1927.5	2129.9
MASSACHUSETTS	350.2	508.7	578.5	613.9	672.4	987.5	1169.3	1297.3	1426.6	1570.7	1720.7
MICHIGAN	237.5	656.1	965.3	1183.7	1354.9	1857.9	2333.8	2712.5	3184.7	3710.9	4288.0
MINNESOTA	209.3	385.6	449.0	489.8	515.6	727.7	868.2	955.7	1051.8	1157.3	1269.7
MISSISSIPPI	145.0	240.4	267.6	278.8	276.0	398.8	462.6	493.7	528.5	568.1	613.2
MISSOURI	396.8	634.5	810.0	969.3	1131.9	1628.7	1995.2	2332.5	2678.6	3050.1	3441.2
MONTANA	93.3	134.7	145.6	153.9	163.6	235.6	267.7	286.6	306.4	329.5	354.8
NEBRASKA	68.0	142.6	175.9	198.0	218.6	305.7	378.8	428.4	478.2	533.0	591.4
NEVADA	170.4	250.1	218.3	194.7	199.4	310.2	366.1	366.7	370.6	388.3	413.0
NEW HAMPSHIRE	79.4	121.3	146.1	168.7	189.2	272.0	323.3	369.5	420.5	475.5	534.3
NEW JERSEY	470.5	879.2	1038.2	1151.6	1220.1	1851.7	2265.6	2575.6	2855.3	3145.4	3428.0
NEW MEXICO	247.8	333.8	364.6	380.9	404.7	563.2	638.7	690.4	737.2	787.0	841.9
NEW YORK	1536.8	2394.1	2847.1	3025.4	3193.5	4724.1	5603.2	6331.0	6940.9	7613.6	8309.0
NORTH CAROLINA	526.2	915.0	1217.3	1543.6	1904.0	2853.4	3681.8	4531.8	5473.5	6512.9	7650.4
NORTH DAKOTA	26.5	41.2	45.0	49.0	53.9	78.8	94.8	104.9	116.5	130.4	146.4
OHIO	464.5	1027.4	1231.6	1371.2	1507.5	2111.2	2565.4	2823.1	3166.0	3550.5	3969.7
OKLAHOMA	261.1	370.9	438.6	496.3	547.2	799.3	929.2	1037.0	1143.7	1255.1	1372.2
OREGON	214.6	332.4	380.8	431.6	486.4	744.0	924.8	1076.2	1257.1	1451.7	1651.7
PENNSYLVANIA	607.4	1018.8	1167.3	1266.9	1347.8	2060.9	2544.8	2897.9	3276.2	3693.8	4154.3
RHODE ISLAND	73.7	95.0	95.3	96.9	99.1	165.6	188.6	204.2	224.6	248.4	274.9
SOUTH CAROLINA	318.5	523.3	601.3	658.7	722.6	1063.8	1305.3	1480.0	1652.1	1843.3	2055.7

TABLE 10

SOUTH DAKOTA	27.8	39.4	38.4	36.9	37.4	58.8	67.9	70.8	74.5	79.9	86.5
TENNESSEE	414.4	700.0	902.4	1083.5	1265.8	1844.2	2280.6	2691.2	3131.2	3603.5	4111.2
TEXAS	1670.4	2575.7	2988.3	3405.5	3791.8	5728.3	6909.7	7845.9	8860.6	9937.0	11067.0
UTAH	254.3	342.1	411.8	477.6	546.6	767.1	897.7	1024.2	1157.9	1304.0	1463.1
VERMONT	29.1	45.9	47.7	47.1	46.4	69.7	81.9	86.9	91.6	97.3	103.4
VIRGINIA	433.7	579.8	551.2	598.0	687.5	1140.2	1352.7	1477.7	1665.4	1897.4	2145.2
WASHINGTON	264.0	525.9	699.2	857.4	1012.3	1456.3	1846.0	2203.6	2590.6	3017.2	3483.0
WEST VIRGINIA	79.0	108.0	119.5	137.3	157.2	267.7	327.5	391.2	480.7	593.7	726.8
WISCONSIN	316.6	558.1	661.7	753.9	840.2	1230.4	1489.3	1710.4	1946.2	2203.1	2477.2
WYOMING	72.8	110.4	112.3	117.1	129.2	197.2	238.2	259.0	281.9	310.3	342.7

Unemployment

Another economic indicator of some interest is the unemployment rate. Table 11 presents the differences in the unemployment rate between the solar-impact solution and the baseline solution for each of the States. As indicated for each year and every State, unemployment is lower in the solar-impact scenario compared with the baseline case. States in which unemployment is affected the greatest include New Jersey, New Mexico, Oregon, Tennesse, and Pennsylvania -- these States exhibited unemployment rates of about 1 percentage point less than those in the baseline scenario, under the solar-impact scenario. Those States whose unemployment rates were least affected by the stimulus provided by solar technology commercialization include Arizona, Minnesota, South Dakota, and Wyoming. Note that there is not a direct correspondance between those States experiencing the greatest (least) real output impact and those State experiencing the greatest -- most negative --(least) unemployment rate impact. This observation provides indirect evidence that the larger, more self-sufficient States (those that are likely to register relatively large output impacts) are not necessarily those States that are relatively highly cyclically sensitive (those whose unemployment rate is relatively sensitive to stimulus or contraction). In another application of NRIES, (Kort and Gustely (1980)) this phenomenon is discussed further.

Popluation

The final economic aggregate for which solar impacts are of interest is population. The assumption was made that for the U.S., the solar energy commercialization stimulus would induce no inmigration from outside the U.S. That is, the change in population for the U.S. between the baseline and solar-impact solution was forced to zero for each year. Thus, the impact on population is solely affected in interregional (interstate) population movements. Table 12 and Figure 5 present these interregional movements (impacts of solar technology commercialization on population by State). As indicated, most of the States in the Sun-Belt region of the U.S. experience inmigration as a result of solar technology commercialization. These include States in the South Atlantic, East South Central, West South Central, Mountain, and to some extent Pacific regions. Those States experiencing out-migration (in which population was less under the solar-impact scenario relative to the baseline case) included States in the West North Central, East North Central, Middle Atlantic, and to a lesser extent New England regions -- generally those States in the Frost-Belt region of the U.S. The largest inmigration of people occurred in States such as Florida, North Carolina and Texas, while the largest outmigration of people occurred in States such as California, Pennsylvania, Michigan and Indiana. It should be noted that although California experienced outmigration high in absolute terms, because of its relatively large population base, the relative position of population in the State remained about the same between the baseline and solar-impact solutions (the change represents less than 0.5 percentage point difference between the two solutions for 1990).

IV. SUMMARY

The purpose of this research was to develop a framework by which interregional and national economic and demographic impacts of solar energy commercialization could be estimated, and to report on such estimates. The objective was accomplished in a six-step process: (1) estimate national solar energy expenditures for a forecast period (1980-1990); (2) convert solar expenditures (through an input/output technique) to a gross output concept useable in an interregional econometric modeling framework (NRIES); (3) distribute the direct impact estimates of the U.S. and nine Census Regions to States; (4) allocate the output changes among States to account for interstate trade

TABLE 11
Unemployment Rate Impacts

42	UR	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		-.630	-.803	-.764	-.664	-.594	-.830	-.830	-.749	-.665	-.593	-.529
2		-.120	-.274	-.371	-.423	-.441	-.519	-.577	-.605	-.614	-.612	-.603
3		-.609	-1.349	-.794	-.282	.059	-.053	-.297	-.160	-.065	-.005	.033
4		-.442	-.544	-.515	-.460	-.396	-.584	-.581	-.541	-.507	-.477	-.452
5		-.419	-.562	-.489	-.404	-.334	-.469	-.461	-.375	-.319	-.276	-.238
6		-.465	-.480	-.433	-.381	-.331	-.491	-.477	-.441	-.406	-.377	-.354
7		-.458	-.668	-.678	-.833	-.558	-.778	-.794	-.754	-.712	-.669	-.629
8		-.422	-.660	-.678	-.620	-.538	-.720	-.755	-.715	-.667	-.626	-.591
9		-.055	-.147	-.231	-.308	-.378	-.485	-.592	-.694	-.796	-.893	-.991
10		-.662	-.785	-.677	-.578	-.463	-.624	-.629	-.564	-.538	-.530	-.515
11		-.658	-.796	-.698	-.601	-.509	-.764	-.771	-.587	-.624	-.579	-.541
12		-.222	-.227	-.192	-.159	-.128	-.218	-.194	-.159	-.128	-.103	-.083
13		-.296	-.328	-.228	-.152	-.097	-.197	-.188	-.135	-.099	-.076	-.061
14		-.150	-.368	-.316	-.238	-.165	-.243	-.296	-.246	-.208	-.181	-.155
15		-.488	-.605	-.519	-.445	-.376	-.542	-.567	-.517	-.491	-.462	-.438
16		-.085	-.170	-.101	-.050	-.020	-.055	-.083	-.049	-.028	-.019	-.013
17		-.190	-.326	-.178	-.074	-.030	-.113	-.154	-.082	-.043	-.032	-.024
18		-.601	-.649	-.459	-.297	-.181	-.475	-.433	-.325	-.259	-.213	-.177
19		-.432	-.377	-.281	-.222	-.181	-.403	-.366	-.326	-.303	-.290	-.280
20		-.300	-.624	-.578	-.484	-.390	-.486	-.561	-.490	-.414	-.347	-.286
21		-.219	-.500	-.392	-.269	-.177	-.258	-.360	-.289	-.221	-.171	-.133
22		-.524	-.705	-.722	-.675	-.600	-.835	-.842	-.798	-.748	-.699	-.654
23		-.665	-.991	-.999	-.874	-.756	-.975	-1.054	-.997	-.948	-.892	-.843
24		-.094	-.236	-.134	-.059	-.021	-.057	-.100	-.051	-.022	-.011	-.003
25		-.250	-.493	-.409	-.288	-.178	-.254	-.290	-.216	-.158	-.115	-.080
26		-.165	-.466	-.398	-.297	-.218	-.260	-.333	-.262	-.194	-.148	-.110
27		-.083	-.180	-.153	-.109	-.071	-.085	-.102	-.079	-.054	-.037	-.023
28		-.024	-.063	-.034	-.017	-.008	-.016	-.029	-.015	-.008	-.005	-.003
29		-.718	-.814	-.626	-.530	-.503	-.819	-.822	-.710	-.644	-.615	-.593
30		-.276	-.654	-.596	-.486	-.384	-.471	-.556	-.484	-.413	-.356	-.303
31		-.313	-.528	-.662	-.759	-.835	-1.124	-1.279	-1.408	-1.520	-1.629	-1.728
32		-.554	-.705	-.805	-.847	-.857	-1.085	-1.150	-1.180	-1.190	-1.189	-1.178
33		-.175	-.569	-.514	-.397	-.286	-.333	-.486	-.423	-.344	-.276	-.219
34		-.614	-.652	-.580	-.527	-.467	-.771	-.746	-.696	-.660	-.623	-.586
35		-.001	-.001	-.000	-.000	-.000	-.001	-.000	-.000	-.000	.000	.000
36		-.286	-.471	-.463	-.442	-.424	-.561	-.594	-.569	-.566	-.558	-.545
37		-.221	-.346	-.356	-.327	-.285	-.372	-.394	-.375	-.353	-.332	-.314
38		-.439	-.678	-.789	-.830	-.766	-.892	-.707	-.634	-.646	-.754	-.991
39		-.368	-.487	-.499	-.496	-.480	-.747	-.809	-.842	-.881	-.918	-.952
40		-.364	-.677	-.332	-.100	.005	-.197	-.317	-.158	-.075	-.046	-.031
41		-.487	-.577	-.487	-.409	-.341	-.566	-.554	-.491	-.447	-.418	-.396
42		-.010	-.016	-.012	-.009	-.006	-.009	-.010	-.008	-.006	-.005	-.004
43		-.616	-.728	-.742	-.727	-.690	-.990	-1.012	-1.003	-.994	-.978	-.962
44		-.366	-.660	-.545	-.418	-.323	-.463	-.532	-.443	-.363	-.303	-.251
45		-.485	-.653	-.547	-.444	-.352	-.467	-.468	-.386	-.319	-.265	-.220
46		-.369	-.627	-.662	-.614	-.534	-.683	-.738	-.713	-.674	-.635	-.602
47		-.274	-.397	-.376	-.343	-.303	-.420	-.435	-.402	-.378	-.358	-.339
48		-.386	-.553	-.495	-.420	-.341	-.509	-.524	-.456	-.401	-.352	-.307
49		-.682	-.654	-.542	-.445	-.337	-.649	-.551	-.452	-.383	-.318	-.259
50		-.202	-.332	-.327	-.309	-.283	-.407	-.443	-.432	-.423	-.415	-.404
51		-.189	-.127	-.045	-.020	-.013	-.097	-.063	-.024	-.010	-.005	-.003

NOTE: For a definition of State numbers, see the Appendix

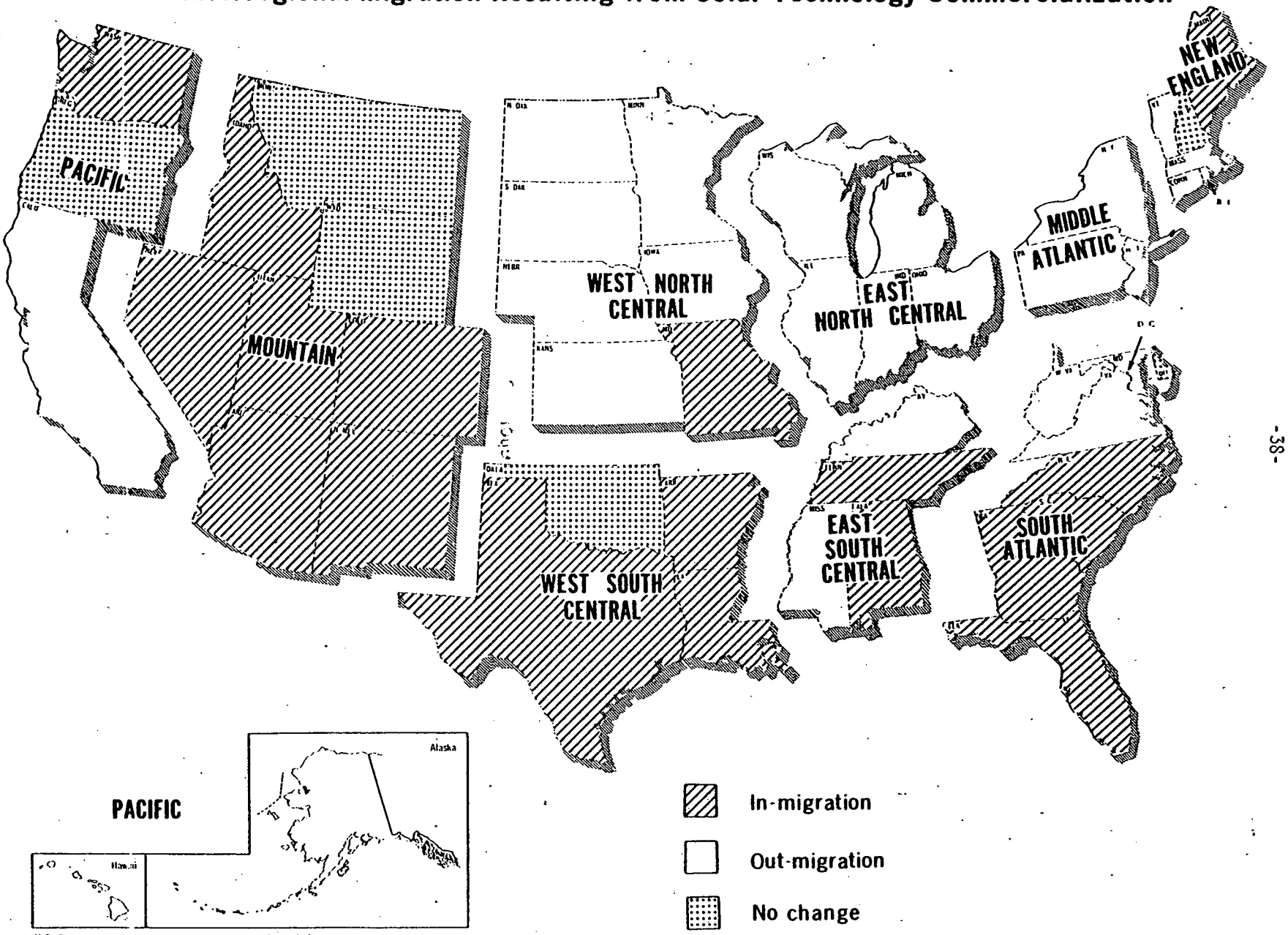
Units are differences in unemployment rate as a percent of the labor force

TABLE 12
Total Population Impacts

146	P	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		4.479	9.575	13.618	17.780	21.554	25.979	30.736	34.465	37.549	39.738	41.207
2		-.137	-.704	-1.122	-1.443	-1.712	-2.056	-2.436	-2.732	-2.968	-3.172	-3.345
3		5.988	23.514	38.129	46.503	48.584	49.951	54.352	58.387	61.402	63.052	63.792
4		.465	2.179	1.860	2.640	3.815	5.594	7.726	9.176	11.122	13.038	14.736
5		-5.523	-8.170	-17.148	-25.709	-33.085	-42.677	-55.263	-68.879	-81.373	-92.620	-103.530
6		19.640	24.434	21.567	18.042	15.468	21.206	21.859	19.650	16.958	14.435	12.342
7		-.851	-4.015	-6.409	-8.415	-10.168	-12.105	-14.346	-16.050	-17.357	-18.411	-19.279
8		.398	.652	.648	.653	.695	.979	1.367	1.533	1.637	1.691	1.729
9		-.720	-4.723	-7.211	-8.320	-9.665	-9.571	-11.401	-12.805	-13.716	-14.375	-14.947
10		6.070	30.844	50.684	63.330	70.605	71.026	68.027	61.488	52.909	45.980	41.629
11		8.937	20.457	29.604	36.757	42.867	53.228	63.712	71.779	78.012	82.906	86.734
12		-.121	-1.201	-1.656	-1.699	-1.645	-1.828	-2.175	-2.346	-2.422	-2.554	-2.704
13		2.292	4.911	6.412	7.813	9.144	11.056	13.148	14.727	16.145	17.323	18.309
14		-14.426	-20.668	-19.365	-17.873	-18.276	-23.130	-24.812	-23.215	-21.416	-20.135	-19.337
15		-6.610	-11.137	-13.585	-15.644	-17.233	-20.450	-24.742	-28.464	-31.730	-34.414	-36.635
16		-1.088	-2.358	-3.933	-3.233	-3.508	-4.319	-5.028	-5.427	-5.664	-5.961	-6.989
17		-.319	-.585	-.919	-1.189	-1.409	-1.818	-2.134	-2.480	-2.767	-3.037	-3.307
18		-1.785	-2.322	-2.673	-3.785	-5.377	-7.148	-8.477	-9.596	-10.966	-12.180	-13.306
19		2.955	3.084	3.647	5.184	7.459	12.254	16.960	22.631	29.156	36.302	43.919
20		1.639	2.890	2.736	2.761	2.768	3.525	4.354	4.364	4.322	4.108	3.757
21		-.066	-3.000	-5.077	-6.679	-8.040	-8.628	-8.928	-9.221	-9.953	-11.163	-12.557
22		-1.272	-3.508	-4.896	-5.962	-6.873	-8.473	-10.080	-11.311	-12.308	-13.241	-14.109
23		-7.873	-20.460	-28.205	-32.356	-35.268	-39.496	-46.486	-50.765	-53.301	-54.563	-54.963
24		-2.422	-4.225	-5.146	-5.714	-6.269	-8.091	-9.502	-10.451	-11.205	-11.937	-12.614
25		-.517	-.520	-.660	-1.205	-2.008	-3.018	-3.892	-4.778	-5.624	-6.403	-7.122
26		.253	-.191	-.499	1.280	3.966	6.545	9.362	12.249	15.527	18.403	20.725
27		.820	.533	-.321	-.771	-.972	-1.072	-1.415	-1.876	-2.167	-2.411	-2.613
28		-.705	-2.250	-2.864	-3.041	-3.119	-3.643	-4.350	-4.622	-4.717	-4.811	-4.885
29		3.464	6.828	6.381	4.112	2.758	3.419	4.438	3.918	2.661	1.660	.997
30		-.262	-.317	-.307	-.227	-.091	-.031	.107	.294	.537	.813	1.107
31		-3.879	-9.103	-12.073	-14.639	-17.229	-20.245	-22.746	-24.587	-26.557	-28.944	-31.649
32		6.173	13.739	14.191	12.198	10.224	13.338	11.476	10.898	9.569	8.036	6.623
33		-1.699	-11.662	-14.481	-15.966	-18.900	-21.423	-20.564	-18.937	-18.191	-19.703	-21.789
34		1.157	4.709	9.501	15.356	21.984	30.265	41.125	52.952	65.161	77.365	89.093
35		-.116	-.809	-1.270	-1.505	-1.615	-1.841	-2.181	-2.409	-2.538	-2.635	-2.707
36		-10.412	-21.355	-25.621	-28.293	-30.092	-33.699	-39.937	-44.122	-47.598	-50.063	-52.124
37		-.101	-.225	-.550	-.759	-.883	-1.293	-1.505	-1.801	-2.056	-2.379	-2.791
38		-.671	-1.368	-2.180	-2.460	-2.426	-2.189	-1.767	-1.125	.020	1.297	2.444
39		-3.884	-13.254	-19.046	-23.402	-27.729	-33.797	-40.029	-44.853	-48.995	-53.179	-57.172
40		.100	-.421	-1.709	-2.846	-3.817	-4.626	-5.446	-6.520	-7.409	-8.190	-8.894
41		.604	1.142	1.330	1.211	1.129	1.509	2.292	2.804	3.154	3.466	3.891
42		-.152	-1.165	-1.975	-2.468	-2.784	-3.227	-3.833	-4.335	-4.701	-5.018	-5.286
43		-.841	1.588	3.925	6.711	9.361	11.922	15.768	19.635	23.658	27.317	30.480
44		1.708	8.584	13.767	17.386	20.183	23.771	29.081	33.673	37.478	40.328	42.130
45		1.919	3.944	4.758	5.420	5.955	6.891	7.819	8.303	8.702	8.972	9.173
46		-.156	-.586	-.911	-1.183	-1.421	-1.722	-2.051	-2.323	-2.566	-2.808	-3.044
47		-.006	-5.940	-11.995	-16.906	-17.849	-17.825	-18.510	-20.191	-21.912	-22.513	-22.643
48		-.758	-2.282	-1.152	.966	3.253	5.495	8.301	12.031	16.082	20.091	24.008
49		-1.490	-4.824	-7.480	-8.766	-9.370	-10.372	-11.878	-12.818	-12.884	-12.460	-11.730
50		-1.086	-2.490	-3.228	-3.742	-4.159	-5.013	-5.809	-6.295	-6.560	-6.736	-6.830
51		.908	1.366	1.031	.505	.229	.363	.519	.327	-.005	-.316	-.550
52		.022	-.860	-.874	.513	.009	.491	.804	-.147	.114	.091	.374

NOTE: In thousands of persons; for a definition of State numbers, refer to the Appendix.

Figure 5. **Interregional Migration Resulting from Solar Technology Commercialization**



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and distinguish between supplying-States and demanding States; (5) conduct two simulations of the NRIES model -- one reflecting likely trends in economic activity in the next decade (control or baseline solution), and one reflecting these likely trends plus the additional stimulus provided by solar energy commericalization (solar-impact solution); and (6) compare the values of major economic aggregates between the two solutions to provide estimates of the total (direct, indirect, induced and interregional) impacts of solar energy commercialization.

To summarize the empirical results of this application of NRIES, several conclusions are noteworthy. First, meeting the administration's goal of 20 percent solar energy utilizaton by 2000 implies a significant impact on real economic activity in the nation. Specifically, solar energy commercialization is estimated to add about $45 billion to our gross domestic product by 1990; employment is expected to be over 2 million higher under the solar energy program by 1990; and income (in current dollars) is forecasted to be about $125 billion higher. Those regions most likely to experience the greatest stimulus from this program lie in the Sun-Belt region of the U.S. and include the South Atlantic, West South Central and Pacific regions. However, regions which are typically characterized as manufacturing-oriented and lie in the Frost-Belt region of the U.S. are also affected because of their concentration in the production of solar energy system inputs (mostly durable goods manufactured products). The Middle Atlantic and East North Central regions fall under this category. Impact multipliers for real output in the U.S. ranged from 1.96 in 1980 to 2.95 in 1990 -- results which generally correspond to those of other NRIES applications.[13/] Interregional population migration is expected to occur as a result of the solar commercialization program, where the Middle Atlantic, East North Central and West North Central regions are forecasted to lose population to the South Atlantic, East South Central, West South Central and Mountain regions.

Directions for Further Research

As indicated in the introduction to this report, a solar energy commercialization program such as that suggested by the National Energy Act and the congressionally-mandated National Plan for the Accelerated Commericalization of Solar Energy is likely to have profound effects on the future economic and demographic trends of the various States and regions of the U.S. In order to provide spatially and methodologically consistent estimates of these effects, two models developed by BEA were linked with one another and with certain exogenous information on the demand, resource, and interregional trade characteristics of regions. Because of the unique structure of the NRIES modeling system -- its interregional linkages and its "bottom-up" nature -- the spatial distribution of solar impacts was able to be estimated simultaneously with the total impact on the national economy. The approach is clearly preferred to that of using single-region econometric models to separately estimate the impact on each State (region) with little or no interregional linkages or national feedbacks. However, because of the (necessarily) aggregate nature of NRIES, this approach has certain limitations that indicate directions for improvement in the model and in the underlying methodology of this research.

13/ See Ballard (1980) p.58.

First, because the BEA national input/output model was used to convert solar expenditures to a gross output concept, it was implicitly assumed that input/output relationships are indentical across regions and States. While the development of a multiregional (interregrional) survey-based input/output model for this application would be cost-prohibitive, there is a multiregional nonsurvey-based input/output model available for the U.S. that could be used to "regionalize" the I/O information necessary in this study. This model, RIMS II, was also developed by BEA and has been used in an application where it is linked to the NRIES model. 14/

Second, because of the lack of regional investment behavior in NRIES, it was assumed that the tradeoff between solar energy investment and nonsolar energy investment is reflected in constant national investment values between the baseline and solar-impact solution. That is, substitution between solar and nonsolar energy systems could only be accounted for at the national level. Accordingly, development of a regional investment sector in NRIES would enhance the methodology used in this study.

Finally, because of the lack of interstate trade flow data, the allocation of solar energy production was based on location quotients and a gravity-potential variable with distance as the measure of transportation cost. If more data were available on interstate trade flows in general, or on regional solar energy supply and demand conditions in particular, estimates of the total impact of solar energy commercialization on regions could have been more accurate.

Note that all three identified limitations result from the lack of regional data, rather than from any inherent deficiency in either the BEA I/O model or NRIES. Given an improvement in the quality and types of regional data available, research such as this, which is designed to estimate interregional as well as national impacts of policy alternatives, could provide answers to a variety of questions important to the future economic well-being of the U.S. with a relatively high degree of confidence in the results.

14/ See Ballard, Cartwright, Gustely and Kort (1980).

REFERENCES

Ballard, K. P., "The Economic and Demographic Impacts of Department of Energy Policy Scenarios," Springfield, Virginia: National Technical Information Service (forthcoming 1980).

_____, Cartwright, J. V., Gustely, R.D., and Kort, J.R., "Developing a Spatially Comprehensive Impact Modeling System: A Feasibility Study," Springfield, Virginia: National Technical Information Service (1980).

_____, Wendling, R.M., and Gustely, R.D., NRIES Structure, Performance, and Application of a Bottom-up Interregional Econometric Model, Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C. (1980).

Kort, J.R., and Gustely, R.D., "Regional Cyclical Sensitivity and Federal Grants: An Analysis of the Allocation and Impact of Countencyclical Aid, " paper presented at the Southern Economic Association meetings, November 5-7, 1980.

MITRE Corportation, Toward a National Plan for The Accelerated Commercialization of Solar Energy; The Implications of a National Commitment, (McLean, Virginia) 1980.

Ritz Phillip, "The Input-Output Structure of The U.S. Economy, 1972," Survey of Current Business, (February, 1979) pp. 34-72.

APPENDIX

NUMBERS CORRESPONDING TO STATE NAMES

1	ALABAMA
2	ALASKA
3	ARIZONA
4	ARKANSAS
5	CALIFORNIA
6	COLORADO
7	CONNECTICUT
8	DELAWARE
9	D.C.
10	FLORIDA
11	GEORGIA
12	HAWAII
13	IDAHO
14	ILLINOIS
15	INDIANA
16	IOWA
17	KANSAS
18	KENTUCKY
19	LOUISIANA
20	MAINE
21	MARYLAND
22	MASSACHUSETTS
23	MICHIGAN
24	MINNESOTA
25	MISSISSIPPI
26	MISSOURI
27	MONTANA
28	NEBRASKA
29	NEVADA
30	NEW HAMPSHIRE
31	NEW JERSEY
32	NEW MEXICO
33	NEW YORK
34	NORTH CAROLINA
35	NORTH DAKOTA
36	OHIO
37	OKLAHOMA
38	OREGON
39	PENNSYLVANIA
40	RHODE ISLAND
41	SOUTH CAROLINA
42	SOUTH DAKOTA
43	TENNESSEE
44	TEXAS
45	UTAH
46	VERMONT
47	VIRGINIA
48	WASHINGTON
49	WEST VIRGINIA
50	WISCONSIN
51	WYOMING
52	UNITED STATES

Mining Output Impacts

	XMIN	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		4.270	4.250	4.225	4.200	4.176	6.005	5.971	5.942	5.914	5.881	5.846
2		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
3		12.584	12.816	13.058	13.295	13.508	18.786	19.004	19.184	19.343	19.505	19.670
4		3.860	3.798	3.761	3.723	3.681	5.430	5.375	5.326	5.287	5.253	5.222
5		41.674	41.568	41.433	41.278	41.093	60.884	60.593	60.301	60.007	59.722	59.445
6		14.943	14.951	14.942	14.928	14.914	20.898	20.904	20.904	20.887	20.850	20.801
7		3.498	3.485	3.482	3.471	3.453	5.374	5.351	5.323	5.292	5.259	5.222
8		.718	.726	.729	.732	.734	1.138	1.140	1.145	1.149	1.154	1.159
9		.571	.541	.520	.507	.498	1.203	1.184	1.165	1.148	1.131	1.113
10		10.325	10.395	10.382	10.413	10.457	14.753	14.764	14.748	14.737	14.750	14.773
11		5.285	5.312	5.390	5.440	5.476	8.427	8.464	8.505	8.526	8.529	8.521
12		1.647	1.665	1.672	1.679	1.686	2.558	2.575	2.591	2.606	2.618	2.629
13		4.237	4.159	4.120	4.082	4.050	5.788	5.772	5.770	5.777	5.790	5.806
14		6.305	6.289	6.276	6.262	6.250	9.711	9.697	9.678	9.654	9.634	9.614
15		3.032	3.043	3.059	3.073	3.085	4.615	4.626	4.635	4.648	4.666	4.684
16		3.750	3.761	3.756	3.760	3.759	5.326	5.317	5.303	5.294	5.292	5.296
17		3.121	3.099	3.080	3.051	3.015	4.087	4.021	3.953	3.886	3.819	3.753
18		4.077	4.068	4.073	4.082	4.092	6.152	6.159	6.166	6.174	6.179	6.183
19		7.079	7.011	6.953	6.907	5.863	10.921	10.873	10.934	10.791	10.753	10.720
20		1.221	1.233	1.245	1.258	1.274	1.854	1.876	1.900	1.929	1.958	1.988
21		4.180	4.134	4.096	4.061	4.031	6.164	6.133	6.105	6.077	6.046	6.013
22		6.575	6.544	6.506	6.480	6.459	9.569	9.543	9.520	9.497	9.477	9.461
23		5.115	5.121	5.145	5.159	5.164	7.821	7.827	7.839	7.861	7.870	7.881
24		5.571	5.590	5.608	5.617	5.620	7.940	7.939	7.928	7.911	7.892	7.872
25		2.753	2.722	2.701	2.683	2.661	3.758	3.735	3.709	3.679	3.657	3.638
26		6.502	6.530	6.560	6.603	6.664	9.406	9.510	9.537	9.765	9.889	10.005
27		3.869	3.771	3.675	3.575	3.473	4.794	4.688	4.589	4.498	4.413	4.333
28		2.014	2.001	1.992	1.984	1.975	2.891	2.883	2.871	2.858	2.843	2.827
29		3.780	3.711	3.611	3.510	3.425	4.896	4.809	4.728	4.662	4.602	4.547
30		1.138	1.164	1.188	1.208	1.229	1.696	1.720	1.746	1.772	1.797	1.823
31		2.901	2.914	2.944	2.970	2.986	4.889	4.912	4.931	4.945	4.956	4.962
32		6.547	6.520	6.511	6.512	6.516	8.615	8.583	8.550	8.522	8.495	8.466
33		6.671	6.656	6.614	6.562	6.521	11.270	11.211	11.157	11.105	11.055	11.010
34		5.429	5.403	5.397	5.393	5.388	8.467	8.503	8.537	8.577	8.615	8.655
35		.835	.821	.811	.800	.789	1.126	1.117	1.108	1.099	1.091	1.085
36		5.603	5.790	5.767	5.752	5.739	8.876	8.871	8.865	8.855	8.851	8.853
37		5.392	5.366	5.339	5.302	5.263	7.871	7.823	7.777	7.728	7.683	7.641
38		4.407	4.440	4.483	4.528	4.556	6.817	6.872	6.930	6.991	7.050	7.109
39		4.693	4.695	4.708	4.733	4.759	7.706	7.742	7.777	7.815	7.854	7.893
40		.996	1.000	1.005	1.006	1.006	1.491	1.491	1.491	1.490	1.488	1.486
41		2.919	2.916	2.914	2.911	2.914	4.449	4.457	4.469	4.481	4.492	4.504
42		.818	.810	.803	.796	.789	1.094	1.082	1.069	1.057	1.044	1.031
43		5.632	5.692	5.733	5.767	5.803	8.419	8.470	8.518	8.568	8.618	8.668
44		25.954	26.110	26.232	26.353	26.479	41.273	41.424	41.558	41.689	41.806	41.912
45		6.654	6.854	6.848	6.853	6.865	9.405	9.419	9.444	9.471	9.498	9.526
46		.582	.583	.585	.587	.589	.831	.834	.835	.835	.835	.836
47		5.158	5.148	5.133	5.091	5.035	7.772	7.715	7.665	7.621	7.577	7.532
48		7.081	7.120	7.184	7.267	7.373	10.981	11.172	11.372	11.574	11.775	11.973
49		1.857	1.866	1.880	1.895	1.907	2.866	2.884	2.903	2.923	2.946	2.970
50		2.611	2.623	2.619	2.620	2.628	3.897	3.900	3.903	3.903	3.899	3.887
51		2.426	2.457	2.474	2.485	2.489	3.648	3.651	3.660	3.670	3.677	3.680
52		279.258	279.243	279.222	279.196	279.158	414.609	414.582	414.564	414.547	414.535	414.526

NOTE: Output impacts by industry are in millions of 1972 dollars

Construction Output Impacts

57	XCC	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		45.334	55.786	63.454	69.058	73.620	99.145	106.774	112.445	116.715	120.302	123.324
2		-.420	.000	.836	1.682	2.184	3.999	5.341	6.601	7.437	8.053	8.661
3		128.569	186.811	213.937	191.387	158.352	191.341	202.193	213.062	213.331	210.690	208.527
4		29.161	29.307	28.839	29.040	31.217	49.387	53.236	57.463	62.358	68.241	74.501
5		321.505	317.183	307.533	299.158	300.268	472.806	467.912	460.559	459.741	464.767	472.224
6		150.007	160.305	149.586	141.306	139.323	203.669	209.504	207.091	205.481	205.949	207.399
7		28.010	33.358	32.236	30.103	28.161	45.621	48.077	47.615	47.396	47.657	48.171
8		10.400	12.503	12.611	12.586	12.851	19.458	20.951	21.451	21.687	22.131	22.585
9		4.398	1.221	-2.677	-1.964	-.394	6.864	6.556	4.619	4.735	5.191	5.476
10		218.768	266.824	273.322	294.754	286.883	281.693	237.330	170.956	152.956	165.705	181.301
11		101.867	127.930	136.146	141.725	147.281	214.402	230.872	239.276	247.393	255.668	263.114
12		14.915	14.473	14.826	16.298	17.245	26.279	26.787	27.457	28.253	28.785	29.165
13		36.294	37.686	38.110	38.020	37.999	54.496	55.340	55.931	56.685	57.691	58.793
14		29.225	13.989	13.601	22.701	32.011	68.693	76.472	90.119	105.711	119.829	132.232
15		18.891	45.819	46.609	42.822	40.174	55.659	60.186	59.367	59.460	61.389	63.014
16		30.108	30.685	31.034	31.301	31.649	46.867	47.314	47.602	47.981	48.366	48.808
17		26.459	26.715	26.016	25.889	26.080	37.492	37.833	37.723	37.944	38.297	38.631
18		40.506	65.898	58.724	45.628	55.992	55.847	63.727	57.501	51.922	49.233	47.953
19		69.050	76.943	84.210	97.776	116.888	184.806	223.074	263.819	308.355	356.508	407.055
20		11.701	12.710	13.289	13.635	13.973	20.552	21.426	22.041	22.605	23.148	23.663
21		37.933	36.658	36.421	38.048	39.965	65.115	69.622	72.970	75.172	76.583	77.798
22		71.130	71.897	74.066	76.964	80.159	118.638	123.239	127.172	131.113	134.892	138.105
23		29.511	47.073	39.707	36.133	35.291	64.771	72.052	73.977	79.049	86.627	93.582
24		44.110	44.249	38.764	40.301	41.249	63.577	63.545	61.960	63.191	63.914	64.190
25		24.951	33.436	32.351	29.835	27.177	37.966	39.868	37.915	36.178	35.068	34.244
26		42.687	36.701	29.474	34.308	41.567	64.879	65.468	66.099	69.491	72.498	73.679
27		30.039	29.747	29.118	28.257	27.332	38.625	37.786	37.002	36.378	35.933	35.614
28		15.616	14.061	14.529	16.037	16.815	25.640	25.559	26.207	27.026	27.430	27.690
29		50.403	57.420	29.395	15.872	15.988	41.707	45.884	35.083	30.149	30.145	31.569
30		15.880	19.190	20.676	21.677	22.403	30.772	32.934	34.527	36.270	37.992	39.635
31		27.717	37.357	30.253	23.355	18.155	40.040	49.470	48.571	49.180	49.552	49.680
32		63.982	73.329	73.024	66.992	63.320	84.453	86.973	87.148	85.976	85.332	85.297
33		133.647	145.012	156.913	169.905	172.830	275.948	299.935	318.092	329.845	338.160	345.598
34		78.735	90.468	94.786	98.844	102.516	157.841	169.443	178.688	188.845	199.063	209.788
35		6.205	5.281	5.029	5.425	5.743	8.867	8.705	8.775	8.989	9.157	9.290
36		42.952	52.802	42.585	60.825	112.892	79.945	78.029	62.167	67.745	73.547	76.774
37		42.785	44.150	44.899	45.137	45.104	67.864	68.878	68.396	68.434	68.542	68.491
38		37.863	37.797	37.886	38.967	40.147	63.498	65.097	66.715	69.047	71.283	73.050
39		32.655	24.633	18.225	16.980	18.865	51.260	60.319	72.230	86.951	102.945	120.083
40		9.061	11.625	10.913	9.852	8.964	13.563	14.193	13.375	12.684	12.224	11.871
41		40.612	65.418	62.197	53.271	45.753	66.112	76.102	72.359	67.478	63.832	61.516
42		5.949	5.876	5.775	5.781	5.864	8.737	8.950	9.096	9.204	9.284	9.351
43		46.761	53.695	61.344	68.509	75.094	106.826	116.592	126.056	135.240	144.125	152.433
44		330.424	365.731	362.365	367.198	370.364	584.156	607.227	615.213	630.293	645.121	658.748
45		61.062	67.824	71.468	73.214	74.490	100.254	103.271	105.416	107.496	109.915	112.506
46		6.312	9.618	9.069	7.865	6.752	9.449	10.475	9.366	9.428	9.072	8.841
47		57.560	61.540	30.501	27.483	33.975	73.654	75.967	61.044	60.515	63.385	64.431
48		53.056	53.683	58.552	66.728	75.059	113.370	123.581	134.798	146.321	157.476	168.083
49		16.483	14.198	13.418	15.721	17.800	29.275	29.186	29.880	31.912	33.864	35.363
50		36.291	42.921	43.044	43.760	44.249	68.898	72.422	74.466	77.400	80.326	83.023
51		29.759	31.867	19.504	15.404	15.673	31.890	33.826	28.545	26.880	26.731	27.182
52		2837.079	3201.105	3138.491	3161.355	3231.314	4726.658	4933.889	4966.606	5111.927	5311.018	5511.289

Durable Goods Output Impacts

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
58	XMDR											
1		75.564	96.713	103.708	108.460	112.084	159.211	172.291	179.489	186.917	194.090	200.743
2		.481	.729	.626	.532	.333	.813	.857	.833	.967	1.057	1.140
3		45.728	64.816	68.490	66.404	57.936	83.525	88.401	90.481	96.670	100.987	104.894
4		24.231	30.414	28.445	26.170	21.904	41.468	43.534	44.345	49.238	53.652	57.596
5		245.110	320.850	346.429	329.284	329.445	317.508	306.415	265.144	293.059	307.030	319.537
6		31.641	38.357	36.808	35.124	31.695	51.224	53.320	53.261	55.964	57.989	59.899
7		27.415	38.695	32.890	28.003	17.107	46.049	48.776	48.856	56.690	62.437	67.692
8		2.031	3.224	2.799	2.389	1.508	3.777	4.127	4.156	4.810	5.281	5.703
9		.049	.048	.048	.048	.047	.088	.088	.087	.087	.086	.086
10		39.416	64.679	63.672	61.959	51.984	79.092	82.760	79.755	87.102	94.289	101.576
11		156.069	212.120	226.391	235.443	243.343	348.421	383.248	399.939	417.545	435.303	451.906
12		.989	1.249	1.297	1.344	1.352	2.031	2.194	2.284	2.411	2.519	2.618
13		22.843	26.747	27.344	27.742	27.436	41.107	43.558	45.155	47.834	50.287	52.685
14		111.637	176.764	164.028	150.518	116.512	222.161	241.844	243.945	277.296	302.965	326.763
15		82.158	143.195	136.957	140.702	141.909	164.834	181.948	182.776	216.917	242.490	266.086
16		41.665	53.446	51.794	50.200	45.033	74.363	78.918	80.087	86.008	90.981	[illegible]
17		26.864	33.388	30.204	28.420	24.657	42.867	44.529	43.863	[illegible]	[illegible]	[illegible]
18		32.917	51.823	46.164	39.777	27.761	59.209	64.391	63.367	[illegible]	[illegible]	[illegible]
19		28.037	34.713	35.384	36.533	37.070	59.466	65.989	71.059	[illegible]	[illegible]	[illegible]
20		5.176	7.394	6.851	6.272	4.785	9.454	10.163	10.299	[illegible]	[illegible]	[illegible]
21		26.241	34.499	33.045	31.463	28.070	49.503	53.953	55.629	[illegible]	[illegible]	[illegible]
22		61.024	79.735	77.477	73.947	65.718	111.843	119.277	121.643	[illegible]	[illegible]	[illegible]
23		141.811	165.733	210.814	192.036	197.026	238.957	251.265	247.720	307.434	354.156	399.198
24		45.422	60.420	57.176	54.445	46.997	80.136	84.702	84.945	91.823	97.052	101.877
25		23.621	34.054	31.316	28.256	20.878	39.820	41.837	40.998	45.395	48.386	51.182
26		79.497	105.313	103.662	103.278	96.534	155.588	168.103	173.250	187.784	199.938	210.980
27		6.295	7.581	7.161	6.742	5.896	9.677	9.947	9.816	10.369	10.774	11.155
28		10.672	13.652	13.508	13.108	11.681	19.439	20.589	20.893	22.536	23.800	24.973
29		7.193	8.878	7.505	6.363	5.836	9.505	10.078	9.496	9.295	9.305	9.421
30		6.827	9.999	8.882	7.929	5.591	12.187	13.084	13.254	15.281	16.797	18.184
31		45.486	60.806	59.118	48.352	35.502	85.152	83.471	95.431	102.370	115.591	122.348
32		15.597	19.255	19.403	18.560	17.488	24.280	25.416	25.584	26.050	26.376	26.722
33		423.213	547.945	563.241	564.437	560.143	852.254	925.266	959.750	1001.213	1043.124	1081.479
34		53.529	76.353	74.779	73.315	66.686	114.158	126.174	132.053	145.888	157.959	169.422
35		2.890	3.334	3.342	3.373	3.402	5.044	5.334	5.453	5.643	5.851	6.065
36		138.054	217.643	201.901	185.288	147.423	276.877	301.428	303.011	342.438	373.354	402.065
37		31.439	38.868	36.869	36.082	33.429	64.976	57.770	67.985	61.243	63.876	66.350
38		36.824	48.016	42.662	39.659	28.943	63.039	66.627	68.354	77.937	85.571	92.424
39		101.875	139.903	125.944	113.968	88.097	187.469	201.908	207.446	233.941	256.418	278.177
40		9.285	12.780	11.791	10.766	8.601	16.470	17.586	17.713	19.317	20.492	21.550
41		36.210	51.063	52.434	52.079	50.574	76.649	85.041	88.554	93.065	97.277	101.504
42		2.565	3.070	3.124	3.158	3.164	4.672	4.944	5.060	5.245	5.426	5.601
43		43.453	60.876	58.050	54.914	44.836	82.483	90.073	92.440	104.587	114.333	123.515
44		129.370	182.372	167.059	156.347	126.974	238.927	256.679	256.622	283.678	303.725	321.961
45		30.339	35.168	36.642	37.901	37.403	54.737	57.722	59.950	64.358	68.281	72.128
46		5.009	6.918	6.573	6.029	5.067	8.511	9.129	9.122	9.609	9.962	10.292
47		40.709	52.456	45.646	42.760	39.529	73.447	79.563	80.204	86.871	93.429	99.426
48		37.754	51.111	45.732	41.183	31.669	62.142	64.969	64.012	71.631	77.467	82.983
49		8.784	11.735	9.088	7.180	3.145	12.716	12.700	12.115	14.916	16.948	18.892
50		47.790	65.307	62.625	56.655	45.957	90.221	91.204	97.186	107.849	117.945	127.235
51		2.568	2.940	2.710	2.632	2.669	4.140	4.385	4.348	4.389	4.467	4.559
52		2648.367	3607.042	3589.613	3446.536	3158.828	4921.689	5257.781	5328.919	5829.064	6243.101	6624.857

Nondurable Goods Output Impacts

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
59	XMND											
1		128.922	144.548	148.368	152.473	155.634	229.113	236.900	240.785	244.674	249.115	253.339
2		5.991	6.648	6.786	6.918	7.180	11.857	12.277	12.514	12.742	12.966	13.193
3		59.147	65.869	69.370	70.180	69.567	100.024	102.905	104.900	106.448	107.679	109.817
4		95.485	102.008	99.816	99.780	99.612	158.906	162.426	163.276	165.477	167.924	170.318
5		606.416	650.061	648.281	646.846	646.517	999.711	1017.134	1017.040	1023.961	1031.988	1039.987
6		150.290	150.385	149.299	148.712	148.754	225.207	227.195	227.851	228.464	229.102	229.729
7		64.726	70.723	69.599	68.070	67.528	111.852	114.615	115.345	116.364	117.553	118.595
8		61.548	70.616	71.458	71.842	71.349	114.128	120.018	123.132	125.750	128.275	130.476
9		5.833	5.877	5.733	5.708	5.721	10.736	10.799	10.808	10.860	10.925	10.980
10		126.143	143.699	144.382	147.084	147.869	215.356	220.197	219.264	220.733	224.361	228.279
11		206.947	233.960	236.281	240.197	243.538	382.248	397.935	405.420	414.635	423.939	432.651
12		7.828	8.167	7.866	7.867	7.903	13.171	13.333	13.386	13.469	13.560	13.640
13		42.341	43.620	44.000	44.611	45.321	68.536	70.330	71.862	73.526	75.226	76.689
14		239.438	273.952	279.214	283.784	284.626	448.869	469.138	479.427	490.814	501.780	512.068
15		93.382	107.967	109.267	108.704	108.935	168.024	172.492	173.102	176.746	180.331	183.817
16		60.176	62.304	62.952	63.370	63.558	98.741	100.005	100.696	101.413	102.159	102.910
17		61.614	64.603	64.209	64.238	63.923	96.712	97.974	98.057	98.643	99.202	99.719
18		134.421	149.919	149.296	150.105	150.872	237.959	246.690	250.428	255.039	260.063	264.901
19		142.617	152.031	152.484	154.388	156.231	257.753	266.331	272.553	280.360	288.844	297.484
20		34.459	36.198	37.133	37.577	38.371	59.357	61.236	62.709	64.126	65.499	66.744
21		61.129	63.494	59.889	59.250	59.026	100.351	101.814	101.927	102.710	103.718	104.666
22		109.763	113.957	107.584	105.897	105.249	173.469	174.832	174.728	175.131	176.075	176.861
23		121.011	138.574	139.329	139.924	141.263	220.335	229.579	233.312	239.496	245.874	252.057
24		132.236	147.026	148.061	149.257	150.092	226.944	234.940	238.413	242.257	246.377	250.314
25		56.964	60.905	60.427	60.071	59.387	91.713	93.387	93.559	94.127	94.870	95.661
26		152.453	163.877	165.686	167.796	169.665	260.101	268.537	273.574	279.905	286.066	291.849
27		15.264	14.997	14.737	14.427	14.124	21.319	21.049	20.750	20.480	20.237	20.013
28		35.379	36.528	37.015	37.301	37.393	58.206	59.050	59.536	60.040	60.458	60.842
29		13.603	14.366	13.699	13.042	12.803	19.792	20.080	19.754	19.525	19.451	19.441
30		28.999	32.587	33.551	34.045	34.370	51.494	53.807	55.147	56.634	58.109	59.518
31		222.432	255.571	255.240	256.344	255.547	414.915	433.727	441.906	450.830	459.510	467.148
32		27.084	27.655	27.518	27.293	27.251	39.239	39.587	39.583	39.599	39.630	39.670
33		407.140	459.244	464.698	459.387	456.398	741.251	772.865	791.393	805.323	820.699	833.641
34		266.741	304.359	297.723	302.493	308.159	493.131	519.881	534.699	554.193	574.658	594.439
35		5.258	5.645	5.446	5.405	5.366	8.375	8.560	8.576	8.671	8.782	8.895
36		236.047	269.023	266.199	267.306	269.764	426.707	439.843	441.681	450.426	459.420	467.997
37		72.348	76.830	76.608	77.061	77.387	122.797	125.194	126.341	127.407	128.671	129.775
38		61.802	66.150	66.702	67.262	67.651	107.490	110.756	112.704	115.185	117.650	119.968
39		245.647	281.987	285.204	283.334	279.042	459.791	482.743	494.933	509.403	523.956	538.221
40		18.956	19.502	18.406	18.178	18.087	30.027	30.214	30.099	30.171	30.302	30.416
41		126.652	149.251	150.693	156.872	164.097	253.561	272.857	286.538	300.617	314.821	328.528
42		5.404	5.733	5.619	5.598	5.589	8.549	8.698	8.717	8.757	8.814	8.869
43		185.822	205.138	206.806	208.869	210.491	326.501	338.012	343.295	350.600	358.089	365.297
44		452.040	485.271	488.293	496.246	502.492	813.853	838.619	853.270	869.751	885.644	900.331
45		46.776	47.411	48.048	48.825	49.257	72.510	73.678	74.737	75.811	76.878	77.924
46		7.117	7.357	7.101	7.000	6.954	11.061	11.168	11.170	11.186	11.230	11.263
47		138.599	150.622	147.944	147.780	147.450	240.743	247.061	249.033	252.786	256.814	260.579
48		76.621	80.242	81.769	83.365	84.914	134.822	139.396	142.968	146.986	150.873	154.562
49		33.890	34.555	34.686	34.854	35.009	57.578	58.090	58.423	58.833	59.271	59.736
50		108.738	120.881	118.547	119.399	120.109	189.853	196.101	198.968	203.279	207.631	211.646
51		11.914	12.450	12.115	12.065	12.141	19.131	19.457	19.465	19.570	19.709	19.642
52		5811.551	6393.583	6399.109	6437.801	6469.427	10203.870	10543.513	10701.956	10904.013	11114.772	11314.494

Transportation, Communication, & Utilities Output Impacts

60	XTCU	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		32.739	42.713	48.558	52.922	56.697	75.875	83.392	88.883	93.264	97.035	100.359
2		3.364	3.675	3.642	3.534	3.664	6.084	6.352	6.292	6.247	6.250	6.255
3		43.555	57.285	64.112	66.632	66.714	86.853	92.521	96.156	99.081	101.529	103.678
4		19.761	23.871	25.821	27.202	28.720	40.923	44.797	47.944	51.059	54.273	57.445
5		139.262	187.745	205.414	208.690	209.509	274.811	288.150	289.496	290.268	291.154	292.193
6		86.954	92.303	90.640	88.135	86.146	125.571	127.925	127.331	126.616	125.871	125.371
7		8.188	11.695	14.185	15.761	16.680	22.975	25.593	27.712	29.564	31.231	32.743
8		3.017	4.870	6.389	7.578	8.498	11.107	12.744	14.151	15.338	16.355	17.234
9		3.475	3.373	2.334	.949	-.502	.783	-.274	-1.808	-3.594	-5.517	-7.574
10		90.493	137.313	151.335	162.212	165.370	193.656	199.701	193.161	190.287	194.511	200.869
11		62.760	91.103	103.466	111.349	118.960	163.102	183.325	195.816	205.785	214.899	223.083
12		4.872	6.936	8.605	9.894	10.938	14.511	16.312	17.845	19.101	20.150	21.035
13		21.021	23.368	24.394	25.273	26.038	37.172	39.139	40.572	42.310	43.839	45.279
14		36.977	72.708	94.141	105.072	108.684	143.722	167.865	184.756	199.340	212.383	224.335
15		13.044	25.287	28.515	29.244	29.251	38.305	40.459	40.020	41.553	43.584	45.844
16		24.819	27.664	27.365	27.053	26.203	40.297	41.573	41.918	43.027	44.111	45.263
17		33.467	37.256	36.737	36.408	35.394	52.972	54.335	54.349	55.438	56.364	57.227
18		21.099	28.093	29.549	29.491	29.075	42.230	46.119	47.741	49.392	51.126	52.820
19		55.234	69.894	75.618	80.435	84.972	124.476	139.333	151.932	164.901	179.001	193.430
20		5.606	7.894	9.021	9.610	10.022	13.355	14.951	15.934	16.641	17.177	17.567
21		30.812	36.119	36.729	36.838	36.694	56.975	61.342	63.797	66.029	67.949	69.620
22		21.940	30.300	35.441	38.029	39.812	52.830	58.302	62.155	64.977	67.264	69.135
23		19.243	33.100	42.511	46.460	50.466	68.025	77.674	83.952	91.501	99.340	107.152
24		33.064	37.947	37.753	37.370	36.259	54.632	55.318	56.502	57.518	58.426	59.281
25		16.547	19.639	19.486	18.798	17.356	26.195	26.803	26.426	26.592	26.703	26.845
26		36.222	50.594	58.507	64.169	68.926	93.874	106.438	116.085	124.902	133.098	140.335
27		18.592	18.620	17.464	16.611	15.844	23.571	23.136	22.422	22.110	21.830	21.603
28		6.355	8.051	9.441	10.468	11.238	15.282	16.747	17.975	19.025	19.954	20.787
29		19.610	23.319	21.806	20.404	20.063	28.835	30.373	29.948	29.597	29.604	29.752
30		4.566	5.675	6.197	6.590	6.901	9.518	10.373	11.032	11.710	12.363	12.986
31		31.505	46.370	51.159	51.958	50.418	74.581	83.699	88.997	92.058	94.313	95.429
32		27.787	31.442	32.152	32.009	32.084	43.087	44.887	45.580	45.999	46.358	46.716
33		126.463	172.145	189.403	190.316	189.876	269.770	297.693	314.372	325.160	335.231	343.756
34		45.013	60.876	69.820	78.991	88.269	129.321	150.963	170.539	190.844	210.918	230.505
35		5.284	5.372	5.111	4.996	4.937	7.599	7.672	7.628	7.676	7.759	7.861
36		44.785	69.106	73.454	74.937	74.834	107.575	117.917	120.327	125.775	131.363	136.849
37		37.448	35.076	38.990	41.149	42.419	58.019	62.798	65.703	67.725	69.281	70.542
38		26.471	33.388	36.466	38.086	38.884	53.138	58.797	61.368	63.628	72.523	76.989
39		39.263	55.739	60.611	61.034	59.204	86.990	97.843	103.836	109.036	113.837	118.548
40		4.884	5.074	4.145	3.375	2.653	5.157	4.949	4.429	4.156	3.935	3.756
41		16.697	25.781	29.094	30.296	31.176	42.123	48.403	52.117	54.837	57.339	59.832
42		5.018	4.936	4.527	4.281	4.126	6.501	6.409	6.224	6.132	6.078	6.048
43		22.427	35.498	44.774	51.390	56.681	75.293	87.385	97.690	107.066	115.761	123.936
44		146.286	178.352	187.123	194.181	198.195	297.667	321.161	335.154	350.101	363.233	374.686
45		21.062	27.775	33.589	38.528	42.824	55.342	61.590	67.312	72.572	77.463	92.062
46		1.988	2.223	2.081	1.890	1.723	2.598	2.653	2.563	2.472	2.389	2.307
47		26.727	33.638	32.649	32.596	33.996	51.232	56.980	59.110	61.666	64.845	67.992
48		27.805	38.788	44.612	48.843	52.388	72.925	82.748	90.264	97.560	104.717	111.671
49		12.874	15.400	16.243	16.835	17.335	25.889	28.044	29.682	31.658	33.885	36.217
50		18.473	26.271	28.587	30.119	31.286	43.921	48.893	52.341	55.594	58.755	61.709
51		6.804	8.934	10.493	11.674	12.692	17.082	19.001	20.643	22.063	23.336	24.506
52		1602.120	2130.594	2329.254	2429.068	2489.910	3466.319	3784.298	3969.858	4148.357	4325.088	4492.888

Wholesale and Retail Trade Output Impacts

61	XWRT	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		38.217	48.840	53.479	56.970	60.231	82.563	90.732	96.297	101.526	106.609	111.278
2		1.507	1.729	1.588	1.346	1.081	1.817	1.680	1.461	1.210	.955	.709
3		65.120	87.867	96.026	98.924	99.244	129.632	140.182	145.763	150.967	155.716	160.030
4		20.655	23.520	24.729	26.114	27.683	39.777	43.325	46.152	49.479	52.863	56.158
5		319.021	376.552	383.756	383.488	386.421	542.843	576.007	588.965	606.796	625.606	643.852
6		66.275	70.473	70.820	70.443	70.448	99.773	103.118	104.226	105.257	106.306	107.371
7		33.959	36.780	36.160	34.165	33.253	52.164	53.802	55.220	55.967	57.195	58.150
8		5.204	7.449	8.059	8.218	8.350	11.797	13.282	14.096	14.780	15.485	16.139
9		4.847	5.046	4.394	4.270	4.403	7.712	8.266	8.427	8.798	9.284	9.739
10		95.765	137.327	152.179	159.876	165.542	219.428	242.764	254.458	266.051	279.563	293.073
11		70.170	100.789	113.078	120.872	127.886	174.631	196.057	209.505	221.769	233.936	245.320
12		12.122	16.001	17.155	17.681	18.214	25.312	27.806	29.146	30.419	31.723	32.956
13		18.780	22.867	25.217	27.052	28.916	39.444	43.334	46.434	49.552	52.642	55.618
14		82.706	131.928	146.973	156.125	162.467	221.413	252.312	270.140	288.778	307.438	325.052
15		27.878	43.051	46.090	48.293	50.055	66.730	74.336	77.231	82.033	87.289	92.546
16		32.110	40.722	41.727	43.232	44.798	68.781	77.251	82.943	90.356	99.379	109.726
17		17.682	20.417	19.625	20.184	20.616	28.974	30.533	30.967	32.019	33.071	34.012
18		28.722	39.581	42.381	43.389	44.079	62.061	68.652	72.053	75.566	79.290	82.904
19		47.255	56.631	60.109	64.976	69.937	102.964	115.087	126.266	138.675	152.093	165.701
20		11.064	12.959	13.054	13.282	13.770	19.788	21.384	22.180	23.024	23.820	24.504
21		46.471	54.538	51.249	50.899	51.358	80.713	88.206	91.261	95.514	100.006	104.217
22		65.668	74.650	76.835	74.821	74.324	111.471	117.350	122.095	125.237	129.023	132.165
23		56.236	85.266	96.099	100.289	105.667	144.323	164.860	175.911	188.854	202.404	215.845
24		24.463	29.606	29.373	30.119	30.664	43.112	45.875	47.044	48.639	50.273	51.812
25		21.284	29.468	31.531	31.917	31.722	43.244	47.344	49.037	50.660	52.480	54.324
26		52.367	73.911	80.747	84.648	88.082	120.496	135.086	143.577	151.993	160.575	168.723
27		14.689	16.008	15.324	15.000	14.940	21.007	21.552	21.480	21.568	21.754	21.961
28		9.950	16.008	19.873	22.631	24.683	31.735	36.002	39.330	42.254	44.959	47.491
29		20.619	22.579	21.705	20.822	20.097	28.262	28.878	28.414	28.355	28.459	28.629
30		8.612	10.332	10.745	11.087	11.601	16.311	17.677	18.549	19.472	20.396	21.234
31		82.697	97.767	99.519	95.321	92.229	142.157	151.497	158.270	162.396	167.363	171.389
32		39.231	43.925	45.165	44.342	44.095	59.082	61.577	62.492	62.975	63.457	63.972
33		153.274	222.654	220.655	217.197	215.023	311.833	351.915	365.382	378.330	392.231	404.619
34		54.607	74.354	82.600	89.061	95.618	135.457	154.595	169.401	184.342	199.664	214.639
35		5.267	6.868	7.017	7.304	7.731	11.442	13.015	13.878	14.942	16.293	17.851
36		52.054	73.891	76.056	77.755	79.693	111.698	123.276	127.234	133.363	140.063	146.668
37		27.983	38.539	40.100	40.454	40.873	49.493	47.491	48.496	49.810	51.128	52.317
38		25.516	32.131	33.240	33.832	34.054	49.803	53.367	56.564	60.142	63.922	67.650
39		82.076	104.852	108.701	108.029	108.881	162.634	177.616	186.948	195.274	204.056	212.167
40		6.872	7.909	7.574	7.280	7.237	10.991	11.660	11.818	12.099	12.426	12.706
41		34.210	48.987	53.236	55.001	56.871	79.114	89.233	94.863	99.894	105.182	110.437
42		2.168	2.291	2.319	2.337	2.348	3.267	3.282	3.286	3.285	3.279	3.270
43		54.528	72.460	81.456	87.142	92.372	128.518	144.097	155.917	167.169	178.386	189.123
44		213.741	262.261	264.103	275.421	286.372	414.297	451.147	473.816	495.775	521.141	544.909
45		32.970	36.171	38.275	39.889	41.521	56.545	59.856	62.488	65.109	67.684	70.179
46		4.018	5.137	5.207	5.063	4.949	7.018	7.595	7.773	7.903	8.059	8.199
47		54.802	67.337	72.891	79.623	87.916	131.283	150.359	166.988	184.048	201.424	218.278
48		52.400	69.874	76.156	81.106	85.951	120.466	135.469	146.193	157.287	168.543	179.478
49		9.969	10.663	10.078	10.132	10.371	16.715	17.824	18.806	20.456	22.514	24.762
50		39.680	59.639	65.105	67.815	69.838	95.918	107.995	114.791	121.606	128.602	135.295
51		9.054	10.735	10.928	11.014	11.226	16.101	17.200	17.666	18.167	18.717	19.266
52		2356.478	3033.638	3180.464	3266.850	3356.300	4747.306	5212.804	5478.396	5759.940	6054.721	6338.405

Finance, Insurance, & Real Estate Output Impacts

62	XFIR	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		23.972	35.096	42.347	48.098	54.269	69.801	78.672	85.229	90.504	94.595	97.799
2		1.248	1.625	1.891	2.009	2.046	2.954	3.241	3.389	3.437	3.432	3.400
3		41.310	73.560	85.662	88.057	83.951	102.563	115.264	123.331	129.103	132.022	135.096
4		12.048	14.428	12.105	13.064	14.674	22.701	25.589	26.425	29.006	31.557	34.018
5		276.023	392.256	181.220	147.760	129.137	253.644	228.572	130.436	109.141	92.748	76.581
6		93.323	102.748	104.554	103.940	104.228	146.662	154.128	157.002	158.573	160.018	161.615
7		7.563	10.089	12.624	14.984	17.133	24.328	27.978	31.679	35.457	39.301	43.180
8		5.293	6.859	5.249	5.036	5.181	8.291	9.619	9.338	9.446	9.621	9.811
9		7.377	3.813	-1.153	-3.493	-4.516	.447	-.922	-3.747	-5.644	-7.047	-8.533
10		124.551	215.807	211.704	227.236	237.659	261.971	263.011	244.193	233.941	238.899	244.527
11		69.427	115.138	122.515	136.790	153.221	206.839	241.772	255.856	272.096	287.648	299.895
12		7.257	11.470	11.783	12.726	13.719	18.176	20.971	21.946	22.959	23.880	24.685
13		5.692	7.853	10.275	12.825	15.491	20.875	24.698	28.748	32.980	37.360	41.859
14		26.997	42.738	49.771	52.949	53.134	77.676	89.545	96.621	103.836	110.715	117.272
15		.475	1.470	.476	-1.039	-2.496	-1.447	-4.128	-7.578	-9.824	-11.326	-12.337
16		10.282	13.081	14.012	14.502	14.617	20.964	22.909	24.140	25.463	26.763	28.015
17		27.887	32.671	17.656	15.045	14.441	28.858	30.241	22.427	22.878	23.494	23.973
18		14.628	24.172	14.316	4.173	.947	12.457	17.101	11.556	8.304	8.470	8.861
19		23.390	29.275	27.608	30.657	34.188	52.647	61.134	66.889	74.933	83.704	92.704
20		3.750	4.776	5.056	5.239	5.398	7.491	8.265	8.610	8.875	9.042	9.131
21		31.956	40.876	43.005	43.943	44.822	66.089	74.165	79.008	83.085	86.860	90.246
22		16.742	17.272	16.751	15.924	15.562	24.181	25.162	25.379	25.543	25.680	25.733
23		8.440	22.067	29.495	33.470	39.027	54.981	68.520	78.495	88.757	100.049	111.745
24		5.391	2.787	1.404	.526	-.299	1.375	-.655	-1.996	-3.001	-3.922	-4.739
25		4.041	5.758	7.099	7.898	8.132	10.292	10.762	10.908	10.816	10.585	10.270
26		25.582	28.352	24.510	28.615	32.850	48.393	52.563	52.321	55.569	59.790	62.940
27		8.991	14.148	14.437	14.494	14.424	17.838	19.623	19.710	19.814	19.930	20.075
28		5.389	4.107	3.527	3.465	3.546	6.369	6.104	6.223	6.654	7.106	7.575
29		12.423	16.130	11.492	8.365	8.352	13.662	14.938	12.869	11.388	10.957	10.711
30		4.119	6.198	4.558	3.936	3.572	5.607	6.560	5.961	5.851	6.013	6.273
31		10.111	18.574	26.666	33.922	39.935	53.242	63.613	73.637	82.921	91.429	99.048
32		20.503	35.744	36.717	33.921	30.956	36.387	40.768	41.623	41.925	42.053	42.377
33		95.907	110.812	117.139	119.038	114.146	177.963	212.604	236.782	255.461	267.375	275.335
34		21.005	36.164	48.399	60.188	72.394	100.383	125.032	149.210	173.689	198.107	222.079
35		1.548	1.109	.707	.494	.407	1.031	.861	.724	.693	.705	.741
36		12.038	17.049	16.877	15.827	15.440	27.454	28.666	27.065	27.161	28.363	29.895
37		33.266	37.381	24.448	25.026	25.199	43.227	45.609	39.081	39.879	40.503	41.156
38		15.517	17.916	13.135	13.248	14.028	24.577	27.439	26.989	29.023	32.617	35.032
39		23.242	13.563	5.700	-.915	-7.066	2.868	-2.648	-7.275	-10.804	-14.119	-17.385
40		5.778	6.599	6.356	6.122	6.008	9.290	9.874	10.079	10.387	10.732	11.073
41		9.454	13.078	13.934	14.084	14.332	20.365	23.263	24.879	26.135	27.366	28.709
42		2.318	2.334	2.006	1.766	1.637	2.675	2.733	2.662	2.682	2.750	2.846
43		20.717	39.695	52.353	63.072	72.773	94.718	113.648	129.259	144.877	160.171	175.032
44		151.230	167.875	117.575	121.475	130.683	221.798	246.336	226.929	238.444	249.910	258.975
45		12.602	18.658	24.167	29.045	33.421	42.727	48.899	54.679	60.087	65.177	70.000
46		1.723	2.686	3.185	3.352	3.383	4.327	4.814	5.121	5.304	5.440	5.540
47		34.484	25.281	-14.969	-25.210	-13.372	9.764	10.208	-4.620	-5.961	.100	3.344
48		31.440	42.850	38.440	42.878	45.291	67.637	76.615	77.270	84.559	91.361	97.980
49		2.087	2.465	2.479	2.448	2.471	4.125	4.802	5.523	6.513	7.842	9.494
50		26.386	36.565	20.673	19.134	19.656	37.867	42.440	36.049	38.215	40.714	42.921
51		2.767	3.308	3.156	2.809	2.637	3.880	4.123	4.076	3.920	3.781	3.694
52		1439.696	1876.327	1644.787	1673.357	1742.774	2572.956	2824.996	2784.784	2915.847	3071.221	3212.267

Services Output Impacts

63	XSER	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		22.473	33.983	41.469	46.798	51.177	66.051	74.446	80.688	85.478	89.365	92.612
2		3.755	3.549	2.981	2.178	1.639	4.140	3.986	3.496	2.984	2.637	2.350
3		49.380	78.815	95.249	100.329	99.170	119.878	130.031	137.358	142.438	146.317	149.573
4		9.510	12.690	14.402	15.704	17.120	24.208	27.412	30.117	32.855	35.608	38.293
5		133.958	160.175	160.234	151.916	145.158	208.445	206.678	195.560	185.739	177.605	170.220
6		79.999	87.837	85.500	81.638	79.266	113.533	117.015	116.018	113.995	112.125	110.725
7		13.597	18.417	18.186	17.189	16.186	25.654	28.184	28.791	29.629	30.622	31.586
8		4.759	7.398	8.506	8.917	9.111	12.296	13.845	14.743	15.310	15.793	16.229
9		5.218	4.066	-.043	-4.080	-7.168	-4.991	-6.224	-9.009	-12.093	-15.016	-17.885
10		94.820	166.595	196.951	210.798	213.600	243.006	254.807	251.309	247.691	251.851	259.724
11		53.453	79.657	89.766	95.650	101.608	139.531	156.910	167.006	174.817	182.129	188.759
12		5.304	6.862	7.554	7.995	8.439	11.914	13.141	13.918	14.455	14.865	15.185
13		10.308	13.802	16.763	19.196	21.329	28.289	31.638	34.774	37.729	40.552	43.269
14		19.055	34.631	45.003	50.011	50.428	73.062	85.131	94.286	102.965	110.834	117.831
15		4.212	11.798	13.030	12.646	12.212	15.889	16.766	15.396	15.295	15.846	16.672
16		11.883	13.432	12.934	12.513	12.152	18.298	19.123	19.232	19.569	20.117	20.793
17		9.642	13.535	15.816	17.104	17.726	22.934	24.886	26.103	27.005	27.726	28.331
18		15.297	21.370	21.815	20.473	18.817	28.440	30.950	31.235	31.505	32.010	32.552
19		25.806	35.618	40.892	45.456	50.289	73.926	87.886	101.446	115.622	131.034	147.280
20		6.751	9.984	11.734	12.671	13.295	17.518	19.729	21.167	22.170	22.892	23.406
21		24.705	32.800	35.985	36.736	36.946	53.147	59.949	64.561	67.650	70.018	71.917
22		26.557	35.962	40.217	41.188	41.685	56.825	62.013	64.888	66.600	67.917	68.914
23		9.635	12.985	15.191	15.067	16.268	28.331	31.721	33.795	38.148	43.954	50.223
24		12.015	15.286	17.321	18.348	18.642	25.357	26.604	27.249	27.595	27.799	27.914
25		8.206	12.242	13.837	14.095	13.634	17.843	19.202	19.631	19.737	19.795	19.872
26		20.594	29.098	36.041	42.037	47.712	64.543	74.654	84.033	92.749	100.871	108.286
27		8.448	9.413	9.546	9.338	9.068	12.525	12.641	12.491	12.262	12.032	11.825
28		6.156	8.313	8.848	9.012	9.178	13.073	14.336	14.859	15.318	15.796	16.240
29		29.112	39.893	35.342	28.410	25.340	36.598	40.356	38.184	34.903	32.816	31.614
30		4.610	5.690	6.175	6.331	6.846	9.599	10.428	11.082	11.757	12.430	13.083
31		10.782	8.494	5.815	2.685	-.971	7.036	6.322	5.384	3.708	1.451	-1.471
32		29.612	26.170	26.516	25.112	23.883	30.698	31.779	31.515	30.693	29.735	28.861
33		47.844	74.046	93.638	103.919	107.998	142.779	162.455	180.271	193.684	203.512	210.421
34		27.503	44.378	55.860	65.904	75.980	106.342	128.874	149.541	169.840	189.880	209.446
35		2.184	2.137	1.878	1.745	1.706	2.741	2.767	2.695	2.684	2.717	2.777
36		17.667	36.987	44.337	46.106	46.918	64.647	72.588	74.797	76.917	79.835	83.068
37		20.690	23.708	24.881	25.529	25.935	37.819	39.727	40.750	41.507	42.121	42.596
38		10.090	25.225	27.470	28.646	29.848	42.967	49.277	53.472	57.655	61.628	65.027
39		45.888	60.320	60.713	58.373	55.515	87.174	98.015	102.587	107.022	111.633	116.453
40		3.666	5.233	6.148	6.637	6.874	9.309	10.269	10.965	11.521	12.002	12.442
41		15.712	25.796	30.061	31.537	32.406	43.048	49.649	53.725	56.505	58.955	61.371
42		1.979	1.227	.440	-.069	-.369	.264	-.197	-.646	-.967	-1.217	-1.413
43		32.157	45.821	53.834	59.431	64.552	89.647	102.434	112.752	122.447	131.629	140.269
44		145.300	192.288	205.652	215.481	223.069	325.694	360.785	381.101	400.184	417.773	433.357
45		25.689	29.387	31.728	33.501	35.221	47.642	50.879	53.519	55.947	58.273	60.518
46		1.702	1.358	.877	.423	.033	.594	.255	-.122	-.466	-.800	-1.127
47		25.585	24.183	17.947	14.965	15.794	32.634	35.117	34.900	35.746	37.843	40.093
48		30.913	46.489	55.183	61.425	66.845	93.183	107.471	118.770	129.533	140.184	150.550
49		5.329	6.002	6.116	6.316	6.555	10.540	11.421	12.228	13.356	14.724	16.209
50		19.912	29.938	32.464	33.912	35.110	49.358	55.348	59.266	62.892	66.545	69.983
51		4.713	5.383	7.247	7.682	7.996	10.861	11.937	12.654	13.153	13.561	13.925
52		1253.134	1731.465	1906.048	1975.123	2017.769	2794.812	3075.416	3234.532	3375.438	3520.224	3660.747

Mining Employment Impacts

3	EMIN	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		.157	.258	.323	.365	.391	.475	.529	.562	.583	.596	.603
2		.000	-.029	-.023	-.017	-.012	-.007	-.018	-.012	-.006	-.002	.003
3		.289	.530	.731	.899	1.041	1.278	1.475	1.639	1.776	1.891	1.988
4		.111	.110	.113	.117	.120	.173	.175	.178	.181	.184	.186
5		.042	.079	.112	.142	.169	.212	.251	.286	.317	.344	.368
6		.212	.407	.586	.750	.900	1.123	1.328	1.516	1.689	1.846	1.991
7		.042	.072	.095	.112	.124	.156	.180	.197	.210	.218	.224
8		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
9		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
10		.055	.090	.111	.125	.134	.163	.181	.192	.199	.203	.206
11		.052	.076	.087	.092	.095	.125	.139	.145	.148	.150	.150
12		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
13		.140	.219	.265	.291	.304	.370	.408	.430	.444	.452	.457
14		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
15		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
16		.034	.048	.054	.057	.056	.073	.079	.081	.082	.083	.083
17		.015	-.014	-.026	-.025	-.017	-.001	-.005	-.001	.010	.022	.036
18		.170	.262	.311	.338	.352	.446	.497	.525	.540	.548	.553
19		.143	.144	.145	.146	.147	.238	.241	.243	.246	.249	.252
20		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
21		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
22		.105	.103	.103	.102	.102	.152	.151	.151	.151	.151	.151
23		.188	.369	.545	.714	.876	1.130	1.375	1.611	1.838	2.057	2.268
24		.050	.076	.090	.098	.102	.124	.136	.143	.146	.147	.148
25		.042	.042	.041	.041	.041	.057	.057	.057	.056	.056	.056
26		.105	.091	.094	.098	.102	.149	.145	.150	.155	.159	.163
27		.213	.214	.215	.217	.218	.296	.293	.293	.295	.296	.297
28		.034	.027	.028	.030	.031	.047	.045	.046	.047	.048	.048
29		.086	.127	.145	.152	.153	.188	.203	.208	.210	.209	.207
30		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
31		.053	.056	.060	.065	.069	.108	.115	.121	.125	.129	.133
32		.124	.048	.062	.078	.092	.144	.116	.131	.145	.157	.168
33		.057	.081	.096	.105	.111	.157	.178	.192	.200	.206	.210
34		.122	.198	.249	.284	.309	.396	.452	.492	.521	.542	.558
35		.014	.014	.014	.015	.016	.022	.022	.023	.024	.024	.025
36		.128	.212	.298	.387	.477	.636	.774	.912	1.048	1.183	1.315
37		.115	-.097	-.058	-.014	.029	.113	.037	.077	.117	.181	.181
38		.083	.148	.190	.224	.250	.311	.357	.392	.418	.438	.454
39		.227	.237	.268	.318	.375	.575	.655	.734	.811	.884	.952
40		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
41		.023	.035	.041	.044	.046	.059	.065	.069	.071	.072	.072
42		.005	.003	.003	.004	.004	.007	.005	.006	.006	.007	.007
43		.206	.310	.380	.428	.462	.583	.649	.696	.731	.757	.779
44		.465	.908	1.332	1.737	2.123	2.754	3.357	3.931	4.479	5.001	5.499
45		.073	.125	.161	.186	.203	.243	.271	.291	.305	.315	.323
46		.008	.008	.008	.008	.008	.011	.011	.011	.011	.011	.011
47		.120	.236	.350	.459	.565	.732	.893	1.049	1.201	1.348	1.490
48		.072	.125	.164	.194	.217	.271	.312	.345	.371	.392	.409
49		.099	-.165	-.222	-.181	-.106	.027	-.024	.015	.093	.179	.263
50		.055	.091	.095	.069	.074	.104	.110	.114	.119	.122	.125
51		.036	.048	.062	.079	.098	.135	.160	.187	.214	.242	.270
52		4.371	5.887	7.666	9.330	10.847	14.355	16.580	18.427	20.322	22.068	23.681

NOTE: Employment impacts by industry are in thousands of man-years

Construction Employment Impacts

4 ECC	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	2.625	3.488	3.771	4.053	4.300	5.822	6.497	6.901	7.268	7.581	7.664
2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
3	6.775	10.469	12.235	11.368	9.641	11.290	12.046	12.696	12.789	12.670	12.537
4	1.246	1.582	1.584	1.661	1.809	2.666	3.117	3.440	3.828	4.265	4.744
5	12.471	10.952	8.874	7.978	7.704	14.318	13.329	12.221	12.062	12.203	12.516
6	10.652	13.153	13.157	12.760	12.628	17.251	18.538	18.801	18.833	18.924	19.097
7	.781	1.557	2.111	2.466	2.677	3.340	3.913	4.331	4.639	4.878	5.073
8	.816	1.031	1.040	1.035	1.042	1.551	1.684	1.709	1.723	1.757	1.800
9	.244	.040	-.187	-.108	.002	.387	.331	.190	.196	.223	.240
10	14.815	24.464	28.045	30.777	31.048	30.373	27.037	21.000	17.775	17.754	18.929
11	7.768	9.755	10.187	10.603	11.074	16.302	17.679	18.344	19.016	19.704	20.320
12	.481	.693	.802	.901	.977	1.332	1.471	1.572	1.644	1.695	1.731
13	.775	1.536	2.244	2.909	3.530	4.465	5.356	6.201	7.006	7.778	8.523
14	.834	.727	.583	.887	1.249	2.427	3.036	3.576	4.307	5.033	5.746
15	.444	.769	1.233	1.593	1.932	2.563	2.803	3.070	3.331	3.612	3.889
16	.988	.931	1.013	1.166	1.287	1.864	1.958	2.073	2.178	2.263	2.338
17	1.466	1.188	1.211	1.348	1.463	2.162	2.141	2.221	2.314	2.393	2.466
18	1.683	3.431	3.492	2.952	2.406	3.304	3.992	3.888	3.658	3.531	3.467
19	3.241	3.763	3.827	4.406	5.311	8.577	10.726	12.827	15.236	17.859	20.653
20	.499	.762	.899	1.011	1.096	1.434	1.631	1.750	1.850	1.934	2.007
21	2.494	2.956	2.997	3.181	3.362	5.065	5.754	6.121	6.394	6.571	6.709
22	1.880	3.148	4.031	4.670	5.183	6.556	7.566	8.329	8.930	9.421	9.825
23	.882	1.990	1.978	1.920	1.993	3.136	3.839	4.168	4.580	5.090	5.599
24	.899	1.468	1.674	1.934	2.192	2.868	3.332	3.619	3.901	4.153	4.365
25	1.265	2.091	2.169	2.101	1.994	2.558	2.834	2.774	2.685	2.615	2.561
26	1.241	1.121	.943	1.096	1.400	2.231	2.392	2.532	2.717	2.893	3.013
27	1.074	1.078	1.071	1.041	1.008	1.412	1.389	1.367	1.343	1.325	1.311
28	.392	.551	.641	.723	.783	1.034	1.157	1.234	1.293	1.332	1.358
29	2.759	3.453	1.987	1.099	1.013	2.414	2.796	2.238	1.908	1.871	1.942
30	.480	.866	1.109	1.262	1.362	1.684	1.917	2.087	2.228	2.354	2.471
31	1.267	2.036	1.685	1.262	.965	1.952	2.629	2.724	2.785	2.845	2.885
32	3.183	3.173	2.531	2.028	1.820	2.958	3.031	2.932	2.852	2.824	2.851
33	2.426	4.304	5.683	6.789	7.526	9.928	11.913	13.490	14.689	15.586	16.281
34	5.284	7.498	8.102	8.735	9.262	13.324	15.263	16.395	17.568	18.698	19.781
35	.264	.235	.183	.188	.190	.314	.303	.281	.282	.282	.285
36	1.264	2.299	1.997	2.659	4.746	4.157	3.843	3.400	3.481	3.846	4.025
37	1.835	2.635	2.990	3.143	3.204	4.208	4.630	4.806	4.878	4.911	4.930
38	1.923	2.137	2.125	2.214	2.293	3.509	3.731	3.831	3.983	4.121	4.235
39	1.258	1.350	1.038	.976	1.046	2.319	3.032	3.650	4.533	5.568	6.761
40	.355	.462	.518	.541	.537	.731	.795	.817	.818	.811	.805
41	2.975	5.115	4.839	4.044	3.405	4.853	5.797	5.535	5.125	4.833	4.665
42	.279	.258	.233	.229	.231	.365	.369	.368	.371	.373	.376
43	2.955	5.194	6.995	8.510	9.822	12.639	14.919	16.867	18.599	20.185	21.649
44	9.411	16.560	20.574	24.133	27.195	36.087	42.779	47.511	51.640	55.234	58.345
45	2.782	4.043	4.639	4.924	5.082	6.320	6.882	7.174	7.369	7.546	7.725
46	.316	.566	.581	.543	.502	.648	.752	.757	.742	.728	.716
47	4.433	5.686	3.535	3.009	3.446	6.556	7.358	6.344	6.154	6.356	6.457
48	1.393	2.048	2.433	2.874	3.329	4.587	5.491	6.258	7.026	7.772	8.486
49	1.006	.871	.818	.956	1.081	1.778	1.772	1.812	1.935	2.053	2.144
50	1.632	1.768	1.994	2.215	2.415	3.344	3.934	4.297	4.688	5.073	5.447
51	1.158	1.366	.962	.741	.717	1.350	1.527	1.381	1.296	1.279	1.300
52	128.770	178.629	189.179	199.454	210.184	282.254	311.012	321.911	336.445	354.569	373.242

Durable Goods Employment Impacts

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
5	EMDR											
1		3.036	8.009	11.191	13.562	15.337	19.133	22.426	25.020	27.150	28.962	30.537
2		.006	.020	.020	.018	.013	.023	.027	.027	.031	.034	.037
3		2.041	5.021	6.595	7.160	6.869	8.330	9.315	9.890	10.540	11.103	11.601
4		1.396	1.875	1.773	1.634	1.372	2.539	2.706	2.764	3.067	3.343	3.590
5		7.531	17.545	21.222	20.841	20.628	19.453	18.891	16.629	17.338	18.053	18.722
6		.856	2.125	2.909	3.240	3.241	3.970	4.482	4.790	5.049	5.252	5.424
7		.853	1.640	1.497	1.288	.823	1.920	2.164	2.201	2.529	2.797	3.038
8		-.022	.056	.100	.121	.116	.160	.199	.227	.261	.294	.326
9		.002	.004	.006	.007	.009	.012	.014	.017	.019	.022	.024
10		.814	4.260	5.630	6.078	5.649	7.024	7.896	8.074	8.592	9.242	9.952
11		6.461	12.111	15.023	16.565	17.528	22.565	26.205	28.402	30.048	31.495	32.814
12		.038	.060	.076	.088	.094	.125	.143	.156	.168	.178	.186
13		.698	.975	1.040	1.063	1.057	1.495	1.647	1.723	1.822	1.917	2.009
14		1.274	8.759	11.036	11.241	9.721	13.845	15.544	17.683	19.671	21.632	23.492
15		.239	6.839	8.887	9.773	10.142	10.992	12.323	12.843	14.638	16.425	18.116
16		1.367	2.200	2.257	2.184	1.968	3.011	3.344	3.432	3.661	3.878	4.095
17		1.150	2.662	3.097	3.160	2.940	4.003	4.587	4.791	5.096	5.401	5.698
18		.782	2.393	2.568	2.334	1.753	2.897	3.410	3.497	3.851	4.180	4.492
19		1.091	2.356	2.867	3.089	3.199	4.309	5.255	5.875	6.464	7.074	7.702
20		.105	.234	.290	.316	.285	.432	.497	.536	.602	.656	.704
21		.551	2.359	3.099	3.262	3.127	4.019	4.985	5.501	5.912	6.292	6.630
22		1.353	2.745	3.096	3.095	2.853	4.107	4.725	4.980	5.291	5.565	5.807
23		.553	3.274	5.405	5.803	5.173	6.905	7.682	8.069	9.463	10.802	12.090
24		1.596	3.732	4.278	4.310	3.926	5.504	6.313	6.597	7.053	7.483	7.881
25		.692	1.939	2.145	2.042	1.634	2.465	2.825	2.883	3.126	3.348	3.553
26		.732	2.481	3.627	4.380	4.753	6.085	7.237	8.105	8.955	9.751	10.489
27		.126	.268	.317	.326	.306	.402	.452	.471	.494	.515	.535
28		.490	1.166	1.417	1.489	1.419	1.925	2.217	2.358	2.530	2.686	2.829
29		.238	.486	.589	.592	.562	.684	.783	.822	.835	.840	.848
30		.254	.548	.576	.556	.432	.766	.876	.921	1.051	1.163	1.264
31		.714	2.483	3.063	2.861	2.315	3.902	4.436	5.089	5.568	6.232	6.712
32		1.051	1.819	2.118	2.163	2.099	2.573	2.839	2.951	3.026	3.077	3.122
33		13.202	23.035	26.631	27.776	27.982	37.983	43.745	46.726	49.062	51.232	53.229
34		1.631	3.532	3.915	3.938	3.669	5.527	6.494	6.966	7.647	8.304	8.930
35		.084	.122	.133	.137	.139	.189	.211	.221	.229	.237	.246
36		1.662	9.096	11.828	11.381	9.967	14.274	16.964	18.338	19.962	21.852	23.646
37		.808	1.737	1.981	2.040	1.968	2.709	3.098	3.244	3.416	3.575	3.723
38		.636	1.441	1.627	1.612	1.389	2.229	2.566	2.739	3.070	3.379	3.666
39		.219	1.429	2.278	2.643	2.618	3.430	4.149	4.788	5.453	6.093	6.707
40		.315	.467	.437	.400	.321	.599	.649	.656	.715	.759	.799
41		1.267	2.441	2.862	2.974	2.947	3.968	4.639	4.987	5.274	5.530	5.779
42		.165	.237	.255	.260	.262	.363	.400	.416	.431	.446	.460
43		1.871	3.522	3.824	3.848	3.466	5.545	6.316	6.752	7.596	8.276	8.882
44		4.455	11.320	12.426	12.141	10.437	15.971	18.668	19.432	21.148	22.744	24.202
45		1.132	1.723	2.069	2.310	2.404	3.151	3.517	3.768	4.060	4.329	4.590
46		.241	.421	.429	.400	.342	.522	.586	.595	.624	.648	.669
47		.649	1.546	1.776	1.803	1.737	2.508	3.006	3.240	3.500	3.772	4.035
48		.135	2.036	3.103	3.631	3.614	4.715	5.593	6.141	6.791	7.444	8.087
49		-.056	.299	.507	.645	.588	.981	1.188	1.333	1.577	1.829	2.084
50		.022	1.792	1.969	1.952	1.531	2.029	2.844	3.079	3.394	3.694	3.966
51		.075	.086	.079	.077	.078	.121	.128	.127	.128	.131	.133
52		68.359	168.677	205.320	214.509	207.853	272.977	312.205	330.570	357.976	383.966	408.153

Nondurable Goods Employment Impacts

6	EMVD	1980	1981	1982	1983	1984	1995	1986	1987	1988	1989	1990
1		7.106	9.595	10.371	10.768	11.036	15.205	16.532	17.042	17.365	17.682	17.965
2		.355	.414	.430	.440	.454	.738	.781	.798	.813	.827	.840
3		2.040	2.939	3.399	3.580	3.577	4.603	4.997	5.195	5.312	5.385	5.443
4		1.951	4.040	5.940	7.706	9.345	12.155	14.852	17.380	19.777	22.059	24.233
5		14.622	18.714	19.505	19.518	19.463	28.076	30.101	30.436	30.599	30.786	30.988
6		3.631	4.744	5.052	5.129	5.153	7.019	7.627	7.825	7.898	7.935	7.961
7		1.124	1.824	2.260	2.544	2.724	3.662	4.207	4.584	4.863	5.090	5.296
8		.884	1.363	1.533	1.589	1.601	2.239	2.553	2.701	2.788	2.854	2.909
9		.142	.118	.140	.180	.218	.368	.413	.465	.513	.553	.585
10		2.730	4.882	6.200	7.033	7.540	9.371	10.569	11.260	11.695	12.031	12.318
11		9.307	14.706	17.031	18.152	18.763	25.467	28.949	30.716	31.855	32.749	33.519
12		.351	.234	.267	.308	.331	.577	.535	.570	.599	.619	.633
13		1.004	1.534	1.809	1.958	2.048	2.646	2.978	3.176	3.311	3.418	3.509
14		4.808	13.035	17.427	19.547	20.581	24.828	30.322	33.350	35.125	36.373	37.367
15		.665	1.163	1.464	1.649	1.720	2.241	2.491	2.608	2.688	2.751	2.810
16		.397	.647	.796	.880	.928	1.199	1.343	1.445	1.504	1.543	1.571
17		1.683	2.672	3.162	3.409	3.525	4.504	5.037	5.309	5.461	5.554	5.615
18		1.055	2.016	2.707	3.210	3.579	4.566	5.358	5.961	6.433	6.814	7.129
19		3.667	4.834	5.167	5.290	5.368	8.042	8.915	9.329	9.649	9.974	10.307
20		3.098	3.960	4.332	4.471	4.573	6.500	7.060	7.340	7.536	7.700	7.840
21		2.423	4.105	5.014	5.554	5.883	7.760	9.006	9.790	10.311	10.677	10.945
22		4.626	6.011	6.082	6.025	5.983	8.878	9.656	9.842	9.902	9.957	10.004
23		3.640	6.924	8.991	10.283	11.124	14.273	16.563	18.104	19.258	20.183	20.964
24		.879	1.551	1.960	2.212	2.367	2.991	3.424	3.706	3.901	4.045	4.159
25		2.660	3.723	4.026	4.099	4.090	5.628	6.180	6.357	6.436	6.495	6.551
26		5.826	8.426	9.402	9.819	10.037	13.645	15.227	15.975	16.474	16.887	17.256
27		.245	.241	.237	.232	.227	.343	.339	.334	.330	.326	.322
28		.281	.454	.556	.615	.650	.837	.950	1.018	1.060	1.087	1.106
29		.533	.776	.855	.864	.860	1.136	1.256	1.296	1.305	1.307	1.308
30		1.320	2.034	2.638	3.119	3.473	4.531	5.151	5.674	6.118	6.490	6.808
31		7.278	13.418	17.219	19.599	21.036	27.448	32.095	35.252	37.503	39.191	40.497
32		.687	2.053	2.540	2.695	2.738	3.055	3.670	3.891	3.967	3.994	4.006
33		10.447	14.843	16.116	16.282	16.241	23.755	26.538	27.726	28.383	28.955	29.443
34		9.188	18.698	26.044	32.054	37.040	47.871	57.529	65.765	73.026	79.556	85.482
35		.064	.113	.142	.160	.172	.217	.249	.270	.284	.295	.303
36		6.350	10.370	12.019	12.742	13.107	17.808	20.094	21.086	21.737	22.264	22.734
37		2.504	4.106	5.028	5.564	5.860	7.652	8.715	9.361	9.761	10.024	10.209
38		.660	1.129	1.413	1.567	1.694	2.200	2.538	2.760	2.918	3.039	3.136
39		11.354	19.715	23.987	25.975	26.726	36.068	41.879	45.333	47.734	49.634	51.277
40		1.113	1.075	1.161	1.298	1.400	2.172	2.256	2.388	2.509	2.602	2.672
41		7.174	11.643	13.620	14.798	15.699	21.256	24.695	26.922	28.651	30.180	31.596
42		.141	.184	.192	.193	.194	.272	.294	.300	.303	.306	.308
43		4.956	8.161	9.837	10.712	11.192	14.651	16.701	17.966	18.643	19.236	19.731
44		11.737	15.156	16.057	16.458	16.689	24.932	27.203	28.073	28.674	29.200	29.677
45		2.092	2.573	2.716	2.771	2.810	3.861	4.132	4.237	4.306	4.365	4.428
46		.399	.414	.441	.470	.489	.733	.759	.791	.816	.835	.849
47		2.530	4.211	5.054	5.495	5.721	7.613	8.741	9.375	9.780	10.070	10.295
48		2.092	3.070	3.514	3.739	3.879	5.326	6.042	6.435	6.706	6.927	7.121
49		.115	.117	.118	.119	.119	.196	.198	.199	.200	.202	.203
50		3.195	5.723	7.214	8.143	8.724	11.249	12.980	14.126	14.950	15.581	16.083
51		.273	.382	.413	.423	.428	.590	.655	.678	.688	.695	.701
52		167.401	264.852	313.613	341.454	359.179	482.936	551.343	592.417	622.415	647.305	669.019

Transportation, Communication, & Utilities Employment Impacts

7	ETCU	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		.733	1.142	1.384	1.538	1.659	2.120	2.400	2.595	2.738	2.855	2.956
2		.070	.079	.072	.067	.068	.119	.128	.125	.123	.122	.122
3		.972	1.539	1.940	2.170	2.280	2.797	3.086	3.306	3.478	3.618	3.734
4		.353	.542	.607	.662	.714	.962	1.114	1.213	1.315	1.415	1.515
5		3.915	6.701	8.009	8.917	9.555	12.003	13.327	13.899	14.343	14.668	14.905
6		2.665	3.497	3.687	3.647	3.564	4.761	5.109	5.184	5.177	5.147	5.122
7		.144	.252	.312	.359	.390	.517	.605	.667	.727	.783	.837
8		.033	.062	.080	.094	.103	.131	.153	.169	.183	.195	.206
9		.068	.098	.098	.092	.081	.119	.133	.125	.107	.075	.026
10		3.270	5.239	5.965	6.381	6.503	7.529	7.817	7.599	7.463	7.614	7.860
11		2.425	3.673	4.207	4.529	4.838	6.575	7.445	7.967	8.372	8.743	9.077
12		.127	.237	.328	.399	.455	.573	.669	.748	.813	.866	.911
13		.441	.790	.850	.944	1.008	1.282	1.452	1.571	1.666	1.748	1.821
14		.719	2.153	3.323	4.451	5.525	7.473	9.593	11.568	13.468	15.215	16.740
15		.185	.888	1.299	1.455	1.495	1.771	1.945	1.991	2.051	2.135	2.238
16		.471	.875	1.108	1.232	1.281	1.608	1.828	1.964	2.064	2.144	2.215
17		1.037	1.647	1.913	2.015	2.018	2.603	2.885	3.025	3.126	3.206	3.277
18		.489	.794	.853	.876	.881	1.213	1.395	1.470	1.544	1.619	1.692
19		2.193	3.527	4.596	5.897	7.419	10.652	13.635	16.878	20.506	24.378	28.285
20		.238	.406	.507	.556	.582	.730	.835	.906	.952	.986	1.010
21		.898	1.449	1.715	2.011	2.276	3.140	3.713	4.081	4.401	4.648	4.829
22		.561	1.019	1.312	1.572	1.791	2.299	2.684	2.957	3.177	3.337	3.443
23		.417	.636	1.289	1.925	2.524	3.453	4.085	4.808	5.572	6.329	7.051
24		1.215	1.713	1.827	1.834	1.789	2.480	2.686	2.737	2.783	2.825	2.866
25		.415	.592	.597	.590	.556	.787	.848	.843	.854	.863	.871
26		1.137	1.909	2.385	2.677	2.885	3.728	4.317	4.762	5.130	5.455	5.744
27		.335	.499	.542	.594	.638	.829	.933	.982	1.028	1.065	1.093
28		.154	.266	.351	.440	.525	.689	.824	.936	1.041	1.133	1.213
29		.432	.658	.690	.683	.682	.882	.982	1.003	1.009	1.015	1.023
30		.030	.066	.103	.134	.157	.191	.220	.245	.266	.283	.298
31		.444	.907	1.270	1.457	1.534	1.973	2.307	2.572	2.740	2.857	2.931
32		.771	1.012	1.074	1.131	1.175	1.522	1.659	1.721	1.773	1.809	1.838
33		4.139	5.843	6.506	6.548	6.538	9.183	10.198	10.814	11.167	11.514	11.808
34		.991	1.679	2.028	2.380	2.727	3.803	4.647	5.359	6.091	6.921	7.540
35		.114	.156	.160	.174	.187	.260	.296	.316	.339	.362	.383
36		.911	1.784	2.640	3.349	3.954	5.364	6.316	7.199	8.094	8.974	9.802
37		.201	.380	.504	.613	.663	.800	.906	.987	1.039	1.074	1.096
38		.660	1.162	1.478	1.852	2.262	3.125	3.908	4.626	5.373	6.102	6.779
39		1.296	2.527	3.196	3.435	3.453	4.460	5.249	5.777	6.163	6.490	6.793
40		.113	.151	.126	.112	.097	.160	.175	.165	.162	.160	.158
41		.377	.775	1.066	1.244	1.361	1.678	1.985	2.236	2.432	2.594	2.740
42		.050	.076	.084	.089	.094	.123	.140	.147	.153	.159	.163
43		.516	.987	1.299	1.548	1.752	2.268	2.715	3.090	3.440	3.771	4.086
44		2.987	4.725	5.301	5.857	6.271	8.676	10.047	10.824	11.577	12.233	12.797
45		.314	.551	.799	1.034	1.249	1.570	1.840	2.099	2.341	2.565	2.772
46		.038	.065	.080	.084	.083	.099	.109	.113	.114	.112	.109
47		.916	1.422	1.531	1.543	1.584	2.193	2.553	2.720	2.842	2.979	3.123
48		.650	1.022	1.466	1.869	2.228	2.967	3.527	4.085	4.612	5.109	5.573
49		.275	.479	.614	.800	1.033	1.517	2.024	2.500	3.004	4.111	4.974
50		.435	.662	1.009	1.220	1.287	1.636	1.903	2.095	2.245	2.380	2.505
51		.151	.283	.391	.475	.541	.675	.791	.892	.978	1.053	1.120
52		42.513	69.708	84.679	95.559	104.313	138.070	160.141	176.758	192.454	207.713	222.073

Wholesale and Retail Trade Employment Impacts

8	EWRT	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1		1.211	2.299	2.962	3.517	4.003	5.084	6.004	6.711	7.343	7.925	8.456
2		.056	.078	.076	.069	.058	.084	.086	.078	.067	.055	.043
3		2.421	4.932	6.701	7.829	8.484	10.051	11.397	12.393	13.170	13.805	14.340
4		.720	1.226	1.484	1.649	1.781	2.290	2.660	2.930	3.174	3.410	3.639
5		8.390	15.821	19.718	22.538	24.758	30.974	35.844	39.072	41.859	44.361	46.605
6		2.610	3.790	4.294	4.437	4.460	5.630	6.173	6.423	6.539	6.607	6.663
7		.510	.932	1.219	1.363	1.434	1.791	2.048	2.252	2.398	2.518	2.620
8		.209	.437	.596	.701	.770	.968	1.145	1.285	1.398	1.497	1.584
9		.242	.265	.134	.073	.045	.187	.198	.130	.095	.074	.054
10		5.121	10.430	13.434	15.696	17.414	21.595	25.075	27.311	29.188	31.002	32.742
11		2.721	4.737	5.652	6.074	6.377	8.288	9.553	10.311	10.902	11.480	12.037
12		.399	.801	1.046	1.188	1.278	1.579	1.834	2.011	2.147	2.263	2.368
13		.999	1.627	1.961	2.255	2.517	3.233	3.758	4.148	4.519	4.873	5.208
14		1.630	4.415	6.297	7.529	8.345	10.268	12.199	13.595	14.976	16.149	17.239
15		.557	1.941	2.640	3.144	3.474	4.184	4.891	5.372	5.797	6.210	6.618
16		1.089	1.871	2.251	2.366	2.477	3.369	4.080	4.431	4.842	5.308	5.843
17		.414	.802	1.032	1.194	1.309	1.596	1.827	1.987	2.117	2.228	2.324
18		.663	1.522	2.102	2.464	2.691	3.313	3.886	4.314	4.660	4.965	5.244
19		1.768	3.120	3.860	4.577	5.256	7.000	8.452	9.579	10.927	12.212	13.517
20		.259	.498	.655	.760	.840	1.042	1.216	1.347	1.453	1.541	1.615
21		.783	1.626	2.188	2.560	2.791	3.471	4.093	4.578	4.974	5.307	5.592
22		1.471	2.783	3.607	4.026	4.252	5.292	6.089	6.573	7.086	7.423	7.698
23		1.329	3.750	5.437	6.479	7.221	8.887	10.605	11.913	13.062	14.153	15.212
24		1.004	2.046	2.738	3.236	3.594	4.396	5.076	5.586	6.000	6.352	6.659
25		.765	1.454	1.760	1.921	2.004	2.503	2.878	3.086	3.249	3.400	3.542
26		1.682	3.842	5.383	6.436	7.186	8.820	10.396	11.652	12.709	13.660	14.532
27		.347	.476	.418	.378	.355	.484	.527	.504	.492	.488	.490
28		.231	.552	.837	1.070	1.255	1.540	1.819	2.064	2.278	2.471	2.646
29		.991	1.586	1.806	1.851	1.854	2.272	2.490	2.565	2.599	2.621	2.642
30		.468	.801	.957	1.038	1.100	1.398	1.603	1.736	1.842	1.938	2.026
31		2.072	3.526	4.192	4.347	4.363	5.771	6.622	7.165	7.484	7.755	7.972
32		1.716	2.743	3.214	3.583	3.876	4.789	5.409	5.776	6.057	6.275	6.448
33		2.986	5.829	6.238	6.240	6.269	8.355	10.011	10.657	11.153	11.671	12.156
34		1.898	3.106	3.688	4.113	4.459	5.992	7.020	7.811	8.581	9.335	10.063
35		.166	.294	.383	.455	.519	.679	.820	.939	1.051	1.166	1.290
36		1.520	4.112	5.838	6.981	7.773	9.547	11.229	12.448	13.460	14.374	15.225
37		.472	.969	1.378	1.729	2.023	2.540	3.018	3.431	3.802	4.136	4.436
38		1.080	2.000	2.450	2.727	2.920	3.687	4.268	4.689	5.066	5.435	5.792
39		1.119	2.743	4.037	5.003	5.725	7.173	8.591	9.920	10.888	11.847	12.711
40		.356	.543	.562	.574	.591	.812	.928	.967	1.011	1.054	1.092
41		1.427	2.901	3.708	4.211	4.584	5.793	6.864	7.605	8.214	8.774	9.301
42		.072	.105	.120	.127	.130	.161	.175	.181	.183	.184	.184
43		2.075	3.759	4.672	5.196	5.582	7.196	8.425	9.309	10.066	10.781	11.464
44		5.906	11.450	14.472	16.424	17.805	22.450	26.218	28.943	31.014	32.965	34.752
45		1.280	2.110	2.586	3.045	3.464	4.382	5.095	5.644	6.151	6.616	7.044
46		.053	.112	.151	.174	.186	.225	.259	.284	.302	.315	.326
47		1.962	3.422	4.189	4.724	5.239	7.095	8.597	9.804	10.920	12.016	13.087
48		1.901	3.830	5.019	5.791	6.361	8.020	9.492	10.644	11.653	12.604	13.515
49		.269	.467	.534	.599	.661	.900	1.075	1.204	1.345	1.501	1.670
50		.909	2.193	3.097	3.866	4.027	4.921	5.793	6.464	7.016	7.509	7.963
51		.208	.430	.610	.753	.871	1.081	1.276	1.441	1.582	1.707	1.818
52		70.469	137.005	174.333	198.875	216.815	273.154	319.002	351.361	378.863	404.315	428.105

Finance, Insurance, & Real Estate Employment Impacts

9 EFIR	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	.369	.658	.851	1.016	1.159	1.451	1.684	1.858	2.001	2.115	2.206
2	.021	.027	.031	.033	.034	.049	.054	.056	.057	.057	.056
3	1.053	1.906	2.230	2.296	2.242	2.666	3.000	3.211	3.360	3.460	3.543
4	.163	.239	.223	.233	.257	.374	.442	.468	.510	.555	.600
5	2.247	3.954	3.699	3.432	3.257	4.308	4.648	3.908	3.377	2.978	2.581
6	1.735	2.279	2.432	2.459	2.472	3.273	3.576	3.696	3.753	3.792	3.831
7	.105	.171	.241	.277	.327	.451	.533	.615	.685	.763	.839
8	.109	.150	.115	.110	.113	.178	.209	.202	.205	.208	.212
9	.235	.126	-.033	-.109	-.142	.013	-.028	-.116	-.177	-.221	-.267
10	2.170	4.607	5.119	5.339	5.835	6.312	6.447	6.124	5.847	5.881	5.999
11	1.317	2.300	2.460	2.744	3.072	4.114	4.845	5.150	5.454	5.765	6.011
12	.136	.214	.220	.238	.256	.339	.391	.409	.428	.445	.460
13	.025	.043	.052	.062	.074	.098	.120	.141	.165	.191	.220
14	.232	.397	.462	.490	.492	.711	.827	.892	.956	1.019	1.079
15	-.010	.025	.011	-.016	-.041	-.031	-.070	-.129	-.170	-.196	-.213
16	.046	.044	.002	-.024	-.043	-.029	-.037	-.058	-.070	-.077	-.082
17	.187	.355	.355	.354	.367	.481	.569	.572	.586	.607	.626
18	.116	.302	.312	.216	.132	.194	.276	.264	.227	.208	.201
19	.439	.573	.534	.596	.670	1.020	1.196	1.308	1.469	1.644	1.822
20	.070	.093	.101	.103	.106	.146	.161	.168	.173	.176	.178
21	.591	.771	.818	.835	.852	1.248	1.404	1.499	1.575	1.647	1.711
22	.195	.353	.460	.526	.570	.706	.817	.900	.961	1.007	1.041
23	.067	.315	.532	.685	.830	1.100	1.406	1.680	1.943	2.214	2.494
24	.047	.026	.013	.005	-.002	.013	-.004	-.016	-.025	-.033	-.040
25	.082	.119	.147	.163	.168	.212	.222	.225	.223	.218	.212
26	.326	.651	.859	1.082	1.318	1.718	2.098	2.399	2.685	2.973	3.247
27	.060	.106	.103	.092	.084	.102	.116	.114	.112	.112	.114
28	.019	.026	.023	.024	.026	.039	.045	.048	.053	.059	.065
29	.300	.398	.286	.208	.206	.335	.368	.318	.281	.270	.264
30	.067	.130	.120	.109	.104	.137	.166	.164	.163	.167	.173
31	.163	.388	.622	.841	1.034	1.340	1.645	1.942	2.223	2.483	2.720
32	.328	.641	.709	.679	.636	.722	.817	.851	.867	.876	.887
33	1.057	2.052	2.640	2.964	3.064	3.895	4.850	5.659	6.321	6.822	7.200
34	.473	.845	1.135	1.410	1.696	2.342	2.927	3.494	4.066	4.638	5.200
35	.013	.010	.006	.004	.004	.009	.008	.006	.006	.006	.007
36	.137	.268	.337	.391	.407	.562	.653	.639	.638	.679	.696
37	.184	.234	.095	.037	.022	.107	.129	.064	.042	.045	.050
38	.122	.144	.106	.106	.112	.196	.220	.216	.238	.261	.280
39	.369	.254	.112	-.008	-.117	.041	-.038	-.119	-.183	-.242	-.299
40	.105	.123	.119	.115	.113	.173	.185	.189	.194	.201	.207
41	.110	.220	.291	.332	.357	.443	.526	.592	.643	.686	.726
42	.030	.032	.027	.024	.022	.036	.037	.036	.036	.037	.038
43	.217	.520	.760	.977	1.177	1.507	1.856	2.171	2.481	2.787	3.087
44	.987	2.083	2.362	2.588	2.817	3.634	4.410	4.825	5.207	5.564	5.897
45	.128	.216	.263	.309	.345	.433	.505	.565	.629	.694	.763
46	.017	.027	.032	.034	.034	.043	.049	.052	.054	.055	.056
47	.455	.475	-.055	-.347	-.277	.049	.150	-.020	-.088	-.028	.032
48	.381	.414	.373	.413	.439	.653	.740	.747	.817	.882	.947
49	.020	.030	.031	.031	.032	.049	.061	.071	.084	.102	.124
50	.553	.805	.459	.423	.434	.822	.931	.790	.835	.890	.938
51	.050	.061	.058	.050	.047	.069	.074	.073	.070	.067	.065
52	18.338	31.199	33.259	35.152	37.193	48.853	56.212	58.895	61.989	65.511	68.792

Services Employment Impacts

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
10	ESER											
1		.838	1.154	.834	.419	-.017	.023	-.124	-.463	-.755	-.982	-1.123
2		.166	.172	.140	.103	.077	.189	.191	.166	.141	.125	.112
3		1.734	3.910	5.748	7.127	8.348	9.563	10.884	12.069	13.087	13.954	14.700
4		.134	.316	.506	.695	.886	1.165	1.466	1.776	2.095	2.423	2.757
5		6.511	11.319	13.273	13.628	13.405	16.625	17.956	17.393	17.333	16.662	15.987
6		3.981	5.145	5.097	4.920	4.785	6.499	7.021	7.029	6.947	6.853	6.777
7		.125	.280	.362	.395	.402	.509	.601	.659	.700	.733	.762
8		.395	.657	.852	.990	1.092	1.426	1.653	1.840	1.993	2.116	2.224
9		.097	.116	.038	-.061	-.144	-.131	-.141	-.206	-.289	-.377	-.469
10		4.611	11.543	16.050	19.055	20.940	23.723	26.094	27.145	27.624	28.288	29.151
11		2.304	3.857	3.962	3.879	3.860	5.388	6.347	6.654	6.926	7.242	7.598
12		.336	.520	.607	.652	.687	.914	1.041	1.114	1.159	1.191	1.214
13		.422	.796	1.210	1.661	2.134	2.818	3.472	4.142	4.824	5.512	6.197
14		.386	1.804	3.165	4.158	4.680	5.875	7.101	8.194	9.157	10.006	10.754
15		-.103	.739	1.084	1.223	1.286	1.518	1.725	1.717	1.726	1.778	1.857
16		.343	.722	1.012	1.232	1.398	1.729	2.029	2.275	2.485	2.671	2.844
17		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
18		1.265	1.867	2.010	1.959	1.845	2.697	3.008	3.119	3.204	3.302	3.401
19		1.557	2.718	3.639	4.443	5.213	7.086	8.846	10.641	12.510	14.494	16.587
20		.220	.472	.678	.829	.938	1.143	1.342	1.506	1.635	1.735	1.810
21		1.922	2.788	3.648	3.089	3.097	4.379	5.034	5.410	5.660	5.857	6.016
22		1.165	1.708	1.776	1.740	1.697	2.341	2.618	2.687	2.737	2.786	2.836
23		.111	.674	1.013	1.156	1.274	1.842	2.304	2.599	2.930	3.343	3.823
24		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
25		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
26		1.156	2.102	2.799	3.452	4.071	5.326	6.443	7.450	8.426	9.358	10.235
27		.180	.281	.304	.319	.331	.421	.478	.502	.521	.538	.552
28		.181	.405	.583	.718	.820	1.018	1.206	1.359	1.484	1.590	1.680
29		.733	1.342	1.399	1.269	1.199	1.512	1.789	1.845	1.815	1.790	1.785
30		.133	.295	.431	.543	.637	.798	.949	1.083	1.204	1.317	1.423
31		.500	.620	.488	.318	.082	.406	.499	.455	.367	.224	.027
32		1.880	3.070	3.531	3.627	3.586	4.214	4.541	4.628	4.596	4.502	4.388
33		1.392	3.096	4.598	5.697	6.392	7.810	9.213	10.503	11.593	12.468	13.138
34		1.603	3.460	4.685	5.955	7.290	9.964	12.780	15.507	18.359	21.306	24.307
35		.330	.297	.260	.241	.235	.377	.381	.371	.368	.373	.381
36		.493	2.152	3.087	3.662	4.102	5.322	6.449	7.138	7.718	8.256	8.666
37		.637	1.003	1.181	1.269	1.314	1.706	1.923	2.038	2.105	2.150	2.182
38		.791	1.609	2.083	2.353	2.533	3.246	3.897	4.395	4.824	5.218	5.584
39		1.805	3.680	5.132	5.718	5.861	7.302	8.560	9.340	9.819	10.129	10.350
40		.170	.322	.413	.479	.524	.669	.782	.863	.934	.997	1.056
41		.348	.387	.452	.598	.841	1.369	1.869	2.512	3.319	4.297	5.453
42		.312	.200	.073	-.008	-.056	.044	-.027	-.099	-.150	-.189	-.220
43		1.507	3.002	3.983	4.647	5.166	6.649	7.929	8.953	9.849	10.670	11.435
44		5.766	10.141	11.452	12.504	13.401	18.268	21.753	23.779	25.640	27.365	28.935
45		.727	1.260	1.590	1.887	2.157	2.719	3.183	3.557	3.902	4.225	4.527
46		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
47		.346	.599	.689	.709	.733	.987	1.210	1.366	1.489	1.606	1.722
48		1.936	3.941	5.234	6.240	7.079	9.259	11.165	12.595	14.105	15.450	16.737
49		.191	.202	.193	.209	.254	.458	.585	.723	.895	1.103	1.342
50		.863	2.373	3.592	4.787	5.697	7.174	8.685	10.073	11.344	12.528	13.635
51		.514	.705	.802	.850	.884	1.197	1.319	1.398	1.453	1.498	1.538
52		52.985	99.960	125.239	141.334	152.735	195.479	228.030	250.397	269.806	288.514	306.874

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