Volume Title: The Measurement of Labor Cost

Volume Author/Editor: Jack E. Triplett, ed.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-81256-1

Volume URL: http://www.nber.org/books/trip83-1

Publication Date: 1983

Chapter Title: Sectoral Measures of Labor Cost for the United States, 1948–1978

Chapter Author: Frank Gollop, Dale Jorgenson

Chapter URL: http://www.nber.org/chapters/c7378

Chapter pages in book: (p. 185 - 236)

5 Sectoral Measures of Labor Cost for the United States, 1948–1978

Frank M. Gollop and Dale W. Jorgenson

5.1 Introduction

The objective of this paper is to construct measures of labor cost for each industrial sector of the United States for the period 1948–78. The purpose of our measures of labor cost is to deal with the heterogeneity of labor input. Measures of labor cost based on average hourly earnings or average hourly compensation are derived by dividing payrolls by an unweighted sum of hours worked. The total of hours worked is estimated by combining, for example, the hours of hospital orderlies with the hours of brain surgeons. The resulting measures of labor cost do not adequately reflect the difference between the marginal productivity of a hospital orderly and the marginal productivity of a brain surgeon.

To solve the problem posed by the enormous heterogeneity of labor input we construct very detailed index numbers of labor cost and labor input. For this purpose we have developed a methodology based on an explicit model of production. This model is based on a production function for each sector giving output as a function of intermediate, capital, and labor inputs, and time. An important innovation in our methodology is that at the sectoral level we distinguish among components of labor input that differ in marginal productivity. Labor input is represented as a function of types of labor input broken down by characteristics of individual workers such as sex, age, education, employment status, and occupation.

A second important innovation in our methodology is that we treat the price and quantity of labor input symmetrically. In our sectoral models of

Frank M. Gollop is an associate professor of economics at Boston College, Chestnut Hill, Massachusetts. Dale W. Jorgenson is with the Department of Economics, Harvard University.

production we combine the production function and intermediate, capital, and labor inputs as functions of their components with necessary conditions for producer equilibrium. In equilibrium the share of each input in the value of output is equal to the elasticity of output with respect to that input. These conditions make it possible to identify the marginal product of each input with the ratio of the corresponding input price to the price of output. Similarly, the share of each component of labor input is equal to the elasticity of labor input with respect to that component. We can identify the marginal product of each component with the ratio of its cost to the cost of labor input as a whole.

Our methodology generates price and quantity index numbers for labor input. These index numbers are employed in constructing measures of labor cost and labor input for each industrial sector. To disaggregate labor input into components that differ in marginal productivity, we measure wage rates as well as hours worked broken down by characteristics of individual workers. We consider specific forms for the functions giving sectoral labor inputs in terms of their components. We take these functions to be translog in form, so that labor input is an exponential function of linear and quadratic terms in the logarithms of the components. Given translog labor inputs for all sectors, we can generate the corresponding translog quantity index numbers for labor input. The change in the logarithms of labor input between any two periods is a weighted average of changes in the logarithms of its components. Weights are given by the average share of each component in sectoral labor compensation for the two periods. The corresponding indexes of labor cost are defined as ratios of labor compensation to the translog quantity indexes.

To construct measures of labor cost and labor input that are consistent with the U.S. National Income and Product Accounts (Bureau of Economic Analysis 1977), we have controlled these data to industry totals based on establishment surveys. To disaggregate labor cost and labor input by industrial and demographic charcteristics of the work force, we have exploited the detail on employment, hours worked, weeks paid, and compensation available from household surveys. To achieve consistency between establishment and household survey data, we have used the household survey results to distribute industry totals based on establishment surveys.

We have disaggregated labor cost and labor input for all employed persons into cells cross-classified by the two sexes, eight age groups, five educational groups, two employment classes, ten occupational groups, and fifty-one industries listed in table 5.1. This breakdown of labor input characteristics is based on the groupings employed by the U.S. Bureau of the Census in reporting data from household surveys. The Census data provide the only source of consistent time series on the work force

Table 5.1 Characteristics of Labor Input

SEX:
Male
Female

AGE:
14–15 years
16–17 years
18–24 years
25–34 years
35–44 years
45–54 years
55–64 years
65 years and over

EDUCATION:
1–8 years grade school
1–3 years high school
4 years high school
1–3 years college
4 or more years college

EMPLOYMENT CLASS:
Wage and salary worker
Self-employed/unpaid family worker

OCCUPATION:
Professional, technical, and kindred workers
Farmers and farm managers
Managers and administrators, except farm
Clerical workers
Sales workers
Craftsmen and kindred workers
Operatives
Service workers, including private household
Farm laborers
Laborers, except farm

INDUSTRY:
Agricultural production
Agricultural services, horticultural services, forestry and fisheries
Metal mining
Coal mining
Crude petroleum and natural gas extractions
Nonmetallic mining and quarrying, except fuel
Contract construction
Food and kindred products
Tobacco manufacturers
Textile mill products
Apparel and other fabricated textile products
Paper and allied products
Printing, publishing, and allied industries
Chemicals and allied products
Petroleum and coal products
Rubber and miscellaneous plastic products
Leather and leather products
Lumber and wood products, except furniture
Furniture and fixtures
Stone, clay, and glass products
Primary metal industries
Fabricated metal industries
Machinery, except electrical
Electrical machinery, equipment, and supplies
Transportation equipment (except motor vehicles) and ordnance
Motor vehicles and motor vehicle equipment
Professional photographic equipment and watches
Miscellaneous manufacturing industries
Railroads and railway express services
Street railway, bus lines, and taxicab service
Trucking service, warehousing, and storage

Table 5.1 (continued)

Water transportation
Air transportation
Pipelines, except natural gas
Transportation services
Telephone, telegraph, and miscellaneous communication services
Radio broadcasting and television
Electric utilities
Gas utilities
Water supply, sanitary services, and other utilities
Wholesale trade
Retail trade
Finance, insurance, and real estate
Services
Private households
Nonprofit institutions
Federal public administration
Federal government enterprises
Educational services, government (state and local)
State and local public administration
State and local government enterprises

cross-classified by industrial, occupational, and demographic characteristics.

Data on labor cost and labor input for the fifty-one industry groups listed in table 5.1 also are available from establishment surveys employed in constructing the U.S. national income and product accounts. No existing household or establishment survey, including the recently expanded Current Population Survey, is designed to provide annual data on the distribution of workers among the 81,600 cells of a matrix cross-classified by the characteristics given in table 5.1. However, existing surveys do provide marginal totals cross-classified by two, three, and sometimes four characteristics of labor input. These marginal distributions, available for each year from 1948 to 1978, provide the basis for our estimates of labor cost and labor input.

Our first task is to construct annual matrices cross-classified by the industrial, occupational, and demographic characteristics listed in table 5.1 for employment, hours worked, weeks, and compensation, the four components required for measures of labor cost and labor input. We have employed all the published information on marginal totals for each component of labor cost and labor input available from the Census of Population and the Current Population Survey. A complete listing of the sources for the data on employment, hours, weeks, and labor compensation we have employed is given in the appendix to this chapter. The procedures we have adopted in constructing the matrices that underlie our index numbers for labor cost and labor input are outlined by Gollop and Jorgenson (1980).

A useful but much more costly alternative to our approach would be to compile data on hours worked and labor compensation per hour directly from the individual records underlying the Census of Population and the Current Population Survey. For example, the one in a thousand sample from the 1960 and 1970 Censuses could be used to compile data for the 81,600 entries of each matrix we require for these two years. This approach would not be feasible for data from the Current Population Survey, since the number of entries in each cell would be too small to provide the needed reliability. We have employed published data from the Census of Population rather than the one in a thousand sample in order to reduce costs. If resources were to become available that would make it possible to employ the individual records from this sample, the resulting tabulations would provide a useful check on the approach we have employed. These tabulations also could be used to benchmark our data on hours worked and labor compensation.

Data on labor cost and labor input cross-classified by characteristics such as employment class, occupation, and industry are required in studies of labor demand; data cross-classified by characteristics such as sex, age, and education are required in studies of labor supply. Our data base can be used to generate indexes of labor cost and labor input cross-classified by each of the characteristics we have employed in compiling data on hours worked and compensation per hour. The indexing methodology is described in the following section. We present indexes of labor cost and labor input for each of the fifty-one industries listed in table 5.1.

The desirability of disaggregating labor cost and labor input by industrial, occupational, and demographic characteristics of the work force has been widely recognized, for example, by Denison (1961, 1962), Griliches (1960), Jorgenson and Griliches (1967), Kendrick (1961), and others. Kendrick has developed measures of labor cost and labor input disaggregated by industry for much of the postwar period, but his measures do not incorporate a cross-classification of labor cost and labor input by age, sex, education, or other demographic characteristics of the work force. Denison has developed measures of labor cost and labor input for the U.S. economy as a whole based on data disaggregated by sex, age, education, and employment status, but not by occupation or industry.[1]

5.2 Indexes of Sectoral Labor Cost and Labor Input

We have outlined the development of data on annual hours worked and labor compensation per hour for each industrial sector. Both annual hours and compensation data are cross-classified by sex, age, education, employment class, and occupation of workers. To construct indexes of labor cost and labor input for each industrial sector, we assume that

sectoral labor input, say $\{L_i\}$, can be expressed as a translog function of its individual components, say $\{L_{\ell i}\}$. The corresponding index of sectoral labor input is a translog quantity index of individual labor inputs:

$$\ln L_i(T) - \ln L_i(T-1) = \sum_{\ell} \bar{v}^i_{L\ell} [\ln L_{\ell i}(T) - \ln L_{\ell i}(T-1)], \qquad (i = 1, 2, \ldots, n),$$

where weights are given by average shares of each component in the value of sectoral labor compensation:

$$\bar{v}^i_{L\ell} = \frac{1}{2}[v^i_{L\ell}(T) + v^i_{L\ell}(T-1)], \qquad (i = 1, 2, \ldots, n; \ \ell = 1, 2, \ldots, q),$$

and

$$v^i_{L\ell} = \frac{p^i_{L\ell} L_{\ell i}}{\sum_{\ell} p^i_{L\ell} L_{\ell i}}, \qquad (i = 1, 2, \ldots, n; \ \ell = 1, 2, \ldots, q).$$

The value shares are computed from data on hours worked $\{L_{\ell i}\}$ and compensation per hour $\{p^i_{L\ell}\}$ for each component of sectoral labor input, cross-classified by sex, age, education, employment class, and occupation of workers. Labor compensation for the sector as a whole, $\sum_{\ell} p^i_{L\ell} L_{\ell i}$, is controlled to labor compensation by industry from the U.S. national income accounts.

For each of the components of labor input into an industrial sector $\{L_{\ell i}(T)\}$ the flow of labor services is proportional to hours worked, say $\{H_{\ell i}(T)\}$:

$$L_{\ell i}(T) = Q^i_{L\ell} H_{\ell i}(T), \qquad (i = 1, 2, \ldots, n; \ \ell = 1, 2, \ldots, q),$$

where the constants of proportionality $\{Q^i_{L\ell}\}$ transform hours worked into a flow of labor services. The translog quantity indexes of sectoral labor input $\{L_i\}$ can be expressed in terms of their components $\{L_{\ell i}\}$ or in terms of the components of hours worked $\{H_{\ell i}\}$:

$$\begin{aligned} \ln L_i(T) - \ln L_i(T-1) &= \Sigma \bar{v}^i_{L\ell} [\ln L_{\ell i}(T) - \ln L_{\ell i}(T-1)] \\ &= \Sigma \bar{v}^i_{L\ell} [\ln H_{\ell i}(T) - \ln H_{\ell i}(T-1)], \\ &\qquad (i = 1, 2, \ldots, n). \end{aligned}$$

We form sectoral indexes of labor input from data on hours worked by industry, cross-classified by sex, age, education, employment class, and occupation. Changes in the logarithms of hours worked for each component are weighted by average shares in sectoral labor compensation.

We can define *sectoral hours worked*, say $\{H_i(T)\}$, as the unweighted sum of its components,

$$H_i(T) = \sum_{\ell} H_{\ell i}(T), \qquad (i = 1, 2, \ldots, n).$$

Similarly, we can define *sectoral indexes of the quality of hours worked*, say $\{Q_L^i(T)\}$, that transform sectoral measures of hours worked into the translog indexes of labor input:

$$L_i(T) = Q_L^i(T)H_i(T), \qquad (i = 1, 2, \ldots, n).$$

The sectoral indexes of the quality of hours worked can be expressed in the form:

$$\ln Q_L^i(T) - \ln Q_L^i(T-1) = \sum_\ell \bar{v}_{L\ell}^i[\ln H_{\ell i}(T) - \ln H_{\ell i}(T-1)] - [\ln H_i(T) - \ln H_i(T-1)], \quad (i = 1, 2, \ldots, n),$$

so that these indexes reflect changes in the composition of hours worked within each sector.[2] Sectoral labor quality remains unchanged if all components of hours worked within a sector are growing at the same rate. Sectoral quality rises if components with higher flows of labor input per hour worked are growing more rapidly and falls if components with lower flows per hour worked are growing more rapidly.

The product of price and quantity indexes of labor input must be equal to the value of total labor compensation for each sector. We can define the price index corresponding to the translog quantity index of labor input as the ratio of the value of total labor compensation into the sector to the translog quantity index. The resulting price index does not have the form of a translog price index, but it can be determined from data on prices and quantities of the components of labor input at any two discrete points of time. The price index of labor input becomes our index of labor cost.

We have generated price and quantity indexes of labor input for each industrial sector listed in table 5.1. There are 1600 categories of labor input for each industry and a total of fifty-one industries. Average annual rates of growth of the translog indexes of sectoral labor cost and labor input are presented for 1948–78 for seven subperiods for all fifty-one industries in tables 5.2 and 5.3. Indexes of labor cost and labor input and indexes of the quality of hours worked are presented in appendix B of this volume on an annual basis for the period 1948–78 for each industry. Annual data for employment, weekly hours per person, hourly compensation, hours worked, and labor compensation are also presented for each industry in appendix B.

To identify differences in patterns of growth in labor cost among subperiods more precisely, we present classifications of rates of growth by subperiod in table 5.4. The overall pattern of labor cost increases across subperiods coincides with variations in the rate of inflation during the postwar period. In every period more than 90 percent of the industries experienced growth rates of labor cost within a range of six percentage

Table 5.2 **Sectoral Labor Cost: Rates of Growth**

Industry	Price Index of Labor Input (average annual rates of growth)						
	1948–53	1953–57	1957–60	1960–66	1966–69	1969–73	1973–78
Agricultural production	−0.0405	0.0516	0.0503	0.0956	0.0572	0.1801	0.0675
Agricultural services	0.0439	0.0436	0.0285	−0.0125	0.0861	0.1045	0.0634
Metal mining	0.0709	0.0453	0.0276	0.0277	0.0501	0.0894	0.1126
Coal mining	0.0667	0.0425	0.0362	0.0239	0.0734	0.0808	0.0913
Crude petroleum and natural gas	0.0353	0.0346	0.0237	0.0298	0.0539	0.0649	0.0915
Nonmetallic mining and quarrying	0.0552	0.0515	0.0494	0.0277	0.0589	0.0791	0.0745
Contract construction	0.0560	0.0484	0.0397	0.0371	0.0616	0.0644	0.0613
Food and kindred products	0.0459	0.0497	0.0424	0.0321	0.0535	0.0656	0.0861
Tobacco manufacturers	0.0622	0.0603	0.0436	0.0364	0.0788	0.0685	0.1183
Textile mill products	0.0335	0.0248	0.0285	0.0368	0.0590	0.0603	0.0814
Apparel and other fabr. textile prod.	0.0314	0.0301	0.0183	0.0308	0.0703	0.0451	0.0702
Paper and allied products	0.0493	0.0453	0.0329	0.0327	0.0537	0.0713	0.0934
Printing and publishing	0.0415	0.0472	0.0110	0.0389	0.0524	0.0624	0.0651
Chemicals and allied products	0.0533	0.0486	0.0240	0.0339	0.0531	0.0698	0.0853
Petroleum and coal products	0.0546	0.0430	0.0275	0.0258	0.0528	0.0581	0.1012
Rubber and misc. plastic products	0.0469	0.0447	0.0289	0.0256	0.0525	0.0540	0.0791
Leather and leather products	0.0360	0.0376	0.0283	0.0325	0.0661	0.0434	0.0731
Lumber and wood prod., ex. furniture	0.0569	0.0548	0.0327	0.0394	0.0616	0.0653	0.0950
Furniture and fixtures	0.0464	0.0428	0.0380	0.0258	0.0627	0.0554	0.0744
Stone, clay, and glass products	0.0527	0.0488	0.0251	0.0322	0.0576	0.0690	0.0850
Primary metal industries	0.0613	0.0603	0.0372	0.0254	0.0538	0.0762	0.1019
Fabricated metal industries	0.0521	0.0428	0.0318	0.0302	0.0582	0.0637	0.0863
Machinery, ex. electrical	0.0583	0.0434	0.0360	0.0301	0.0597	0.0590	0.0845

Elec. machinery, eqpt., and supplies	0.0434	0.0398	0.0441	0.0260	0.0676	0.0562	0.0831
Trans. eqpt. + ord., ex. motor vehicles	0.0388	0.0499	0.0581	0.0346	0.0643	0.0641	0.0807
Motor vehicles and equipment	0.0716	0.0547	0.0288	0.0392	0.0645	0.0777	0.0917
Prof. photographic eqpt. and watches	0.0537	0.0480	0.0310	0.0283	0.0589	0.0569	0.0738
Misc. manufacturing industries	0.0494	0.0496	0.0213	0.0267	0.0642	0.0539	0.0683
Railroads and rail express services	0.0630	0.0472	0.0449	0.0217	0.0552	0.0989	0.0904
Street rail., bus lines, and taxicabs	0.0314	0.0337	0.0116	0.0430	0.0556	0.0463	0.0853
Trucking services and warehousing	0.0690	0.0499	0.0456	0.0306	0.0537	0.0883	0.0834
Water transportation	0.0759	0.0386	0.0351	0.0361	0.0657	0.0681	0.0808
Air transportation	0.0563	0.0404	0.0506	0.0472	0.0739	0.0924	0.0958
Pipelines, ex. natural gas	0.0398	0.0299	0.0263	0.0324	0.0302	0.0787	0.0989
Transportation services	0.0555	0.0657	0.0391	0.0207	0.0411	0.0747	0.0886
Tel. and tel. and misc. comm. services	0.0557	0.0311	0.0447	0.0369	0.0485	0.1189	0.1012
Radio broadcasting and television	0.0518	0.0518	0.0309	0.0315	0.0343	0.0502	0.0795
Electric utilities	0.0585	0.0422	0.0406	0.0409	0.0523	0.0807	0.0901
Gas utilities	0.0665	0.0550	0.0519	0.0280	0.0434	0.0771	0.0901
Water supply and sanitary services	0.0766	0.0688	0.0687	0.0508	0.0709	0.0728	0.0844
Wholesale trade	0.0339	0.0560	0.0192	0.0330	0.0646	0.0605	0.0765
Retail trade	0.0320	0.0498	0.0214	0.0499	0.0640	0.0616	0.0739
Finance, insurance, and real estate	0.0221	0.0528	−0.0064	0.0611	0.0853	0.0778	0.0549
Services	0.0421	0.0739	0.0329	0.0645	0.0779	0.0692	0.0765
Private households	0.0516	0.0460	0.0447	0.0381	0.0730	0.0560	0.0847
Nonprofit institutions	0.0478	0.0354	0.0142	0.0288	0.0451	0.0741	0.0631
Federal public administration	0.0509	0.0441	0.0554	0.0395	0.0548	0.0962	0.0696
Federal government enterprises	0.0442	0.0387	0.0442	0.0464	0.0626	0.1035	0.0890
State and local educ. services	0.0397	0.0489	0.0456	0.0507	0.0799	0.0689	0.0704
State and local public admin.	0.0366	0.0424	0.0410	0.0379	0.0752	0.0766	0.0704
State and local govt. enterprises	0.0504	0.0438	0.0507	0.0527	0.0628	0.0810	0.0667

Table 5.3 **Sectoral Labor Input: Rates of Growth**

Industry	Translog Index of Labor Input (average annual rates of growth)						
	1948–53	1953–57	1957–60	1960–66	1966–69	1969–73	1973–78
Agricultural production	−0.0320	−0.0505	−0.0251	−0.0495	−0.0242	−0.0077	−0.0176
Agricultural services	0.0178	−0.0098	−0.0350	0.0492	0.0400	0.0412	0.0433
Metal mining	0.0220	0.0035	−0.0454	−0.0070	0.0159	−0.0187	0.0091
Coal mining	−0.1040	−0.0568	−0.1224	−0.0189	−0.0117	0.0498	0.0843
Crude petroleum and natural gas	0.0491	0.0332	−0.0318	−0.0046	0.0123	−0.0030	0.1015
Nonmetallic mining and quarrying	0.0318	0.0159	−0.0136	0.0178	−0.0145	−0.0029	0.0178
Contract construction	0.0224	−0.0003	−0.0020	0.0325	0.0285	0.0235	0.0167
Food and kindred products	0.0027	−0.0081	−0.0014	0.0025	0.0048	−0.0120	0.0012
Tobacco manufacturers	0.0131	−0.0166	0.0079	−0.0083	−0.0197	0.0042	−0.0291
Textile mill products	−0.0259	−0.0392	−0.0087	0.0159	0.0076	0.0075	−0.0265
Apparel and other fabr. textile prod.	0.0069	−0.0119	0.0102	0.0228	−0.0017	0.0024	−0.0061
Paper and allied products	0.0327	0.0174	0.0231	0.0264	0.0244	−0.0052	−0.0004
Printing and publishing	0.0217	0.0137	0.0362	0.0139	0.0253	−0.0023	0.0150
Chemicals and allied products	0.0452	0.0234	0.0210	0.0270	0.0327	−0.0070	0.0231
Petroleum and coal products	0.0252	0.0045	−0.0306	−0.0161	0.0160	0.0043	0.0328
Rubber and misc. plastic products	0.0402	0.0138	0.0122	0.0566	0.0457	0.0307	0.0120
Leather and leather products	−0.0070	−0.0113	−0.0101	0.0046	−0.0278	−0.0313	−0.0261
Lumber and wood prod., ex. furniture	−0.0175	−0.0427	−0.0033	0.0120	0.0098	0.0213	−0.0008
Furniture and fixtures	0.0177	−0.0040	−0.0014	0.0370	0.0016	0.0182	−0.0017
Stone, clay, and glass products	0.0144	0.0055	0.0193	0.0176	0.0081	0.0130	0.0020
Primary metal industries	0.0216	−0.0055	−0.0309	0.0284	0.0005	−0.0047	−0.0076
Fabricated metal industries	0.0520	−0.0033	−0.0132	0.0378	0.0253	−0.0039	0.0003
Machinery, ex. electrical	0.0354	−0.0045	−0.0184	0.0548	0.0131	0.0076	0.0214

Elec. machinery, eqpt., and supplies	0.0727	0.0074	0.0396	0.0434	0.0141	0.0015	0.0076
Trans. eqpt. + ord., ex. motor vehicles	0.1923	−0.0004	−0.0545	0.0454	0.0029	−0.0684	0.0147
Motor vehicles and equipment	0.0540	−0.0420	−0.0147	0.0393	0.0044	0.0234	0.0057
Prof. photographic eqpt. and watches	0.0850	0.0165	0.0151	0.0364	0.0266	0.0080	0.0324
Misc. manufacturing industries	0.0078	−0.0212	0.0030	0.0233	−0.0010	0.0047	0.0057
Railroads and rail express services	−0.0421	−0.0408	−0.0714	−0.0174	−0.0269	−0.0273	−0.0176
Street rail., bus lines, and taxicabs	−0.0205	−0.0325	−0.0183	−0.0116	−0.0006	−0.0201	−0.0210
Trucking services and warehousing	0.0474	0.0184	0.0195	0.0339	0.0258	0.0218	0.0114
Water transportation	−0.0127	0.0070	−0.0355	0.0097	−0.0217	−0.0301	0.0105
Air transportation	0.0617	0.0851	0.0440	0.0461	0.1042	0.0042	0.0150
Pipelines, ex. natural gas	−0.0026	−0.0074	−0.0302	−0.0334	0.0102	−0.0295	0.0456
Transportation services	0.0150	−0.0149	0.0140	0.0470	0.0418	0.0239	0.0714
Tel. and tel. and misc. comm. services	0.0222	0.0288	−0.0084	0.0227	0.0440	0.0254	0.0057
Radio broadcasting and television	0.0702	0.0410	0.0306	0.0341	0.0509	0.0298	0.0394
Electric utilities	0.0207	0.0102	0.0110	0.0108	0.0253	0.0179	0.0093
Gas utilities	0.0261	0.0179	0.0196	0.0144	0.0252	0.0180	0.0094
Water supply and sanitary services	0.0169	0.0063	0.0044	0.0189	0.0244	0.0289	0.0151
Wholesale trade	0.0151	0.0128	0.0269	0.0233	0.0203	0.0215	0.0228
Retail trade	0.0118	0.0015	0.0143	0.0074	0.0130	0.0177	0.0179
Finance, insurance, and real estate	0.0421	0.0333	0.0392	0.0292	0.0390	0.0340	0.0368
Services	0.0181	0.0262	0.0335	0.0328	0.0350	0.0310	0.0347
Private households	−0.0257	0.0068	−0.0002	−0.0285	−0.0401	−0.0365	−0.0345
Nonprofit institutions	0.0470	0.0429	0.0878	0.0458	0.0527	0.0013	0.0304
Federal public administration	0.0539	−0.0060	0.0055	0.0280	0.0263	−0.0169	0.0179
Federal government enterprises	0.0282	0.0091	0.0287	0.0226	0.0268	−0.0087	−0.0038
State and local educ. services	0.0535	0.0586	0.0629	0.0535	0.0432	0.0374	0.0218
State and local public admin.	0.0434	0.0430	0.0270	0.0394	0.0334	0.0409	0.0289
State and local govt. enterprises	0.0647	0.0022	0.0647	0.0204	0.0408	0.0314	0.0386

Table 5.4 **Classification of Rates of Growth of Sectoral Labor Cost by Subperiod, 1948–78**

Average Rate of Growth of Labor Cost	1948–53	1953–57	1957–60	1960–66	1966–69	1969–73	1973–78
<0%	1	0	1	1	0	0	0
0–2%	0	0	5	0	0	0	0
2–4%	12	11	26	39	2	0	0
4–6%	28	35	18	8	25	12	1
6–8%	10	5	1	2	22	27	20
8–10%	0	0	0	1	2	8	25
>10%	0	0	0	0	0	4	5

points. The pattern varies among subperiods, depending on the rate of inflation during the period. For the subperiods 1948–53 and 1953–57, average rates of growth in labor cost for most industries ranged from 2 to 8 percent per year. For the subperiods 1957–60 and 1960–66, rates of growth in labor cost averaged 0–6 percent for most industries. The range moved up to 2–8 percent for the subperiod 1966–69, 4–10 percent for the subperiod 1969–73, and the highest of the postwar period, at 6–12 percent, for the subperiod 1973–78.

Our next objective is to identify the industrial sectors that experienced persistently rapid increases in labor cost during the postwar period. We focus on growth rates of labor cost that exceeded 4 percent in the first two subperiods (1948–53 and 1953–57), 2 percent in the following two subperiods (1957–60 and 1960–66), and 4, 6, and 8 percent in the subperiods 1966–69, 1969–73, and 1973–78 respectively. The industries with persistently rapid increases in labor cost include metal and coal mining, food, tobacco, paper, and chemicals among nondurables manufacturing; lumber and wood, stone, clay, and glass, primary and fabricated metal, and motor vehicles among durables manufacturing; railroads, trucking, air transportation, and transportation services among the transportation industries; electric utilities, gas utilities, and water supply and sanitary services among the utilities. We conclude that these industries are distributed among the major groups of the fifty-one industries included in our study.

Agricultural production stands out as the industry most subject to fluctuations in growth rates of labor cost. During the period 1948–53 the growth rate of labor cost was −4.05 percent per year. For the periods 1953–57 and 1957–60 the growth rate of labor cost was 5.16 and 5.03 percent per year. During the subperiod 1960–66 labor cost growth jumped to 9.56 percent annually; this was followed by growth at 5.72 percent per year for the subperiod 1966–69. Labor cost grew at rates of 18.01 and 6.75 percent per year during the final two subperiods, 1969–73 and 1973–78, respectively. This relatively erratic pattern reflects the important role of self-employment income in the agricultural sector and the sizable fluctuations in farm income due to variations in supply conditions.

We have presented six-percent ranges that include 90 percent of our fifty-one industrial sectors for each of seven subperiods. A useful perspective on rates of increase in labor cost is provided by identifying the industries that fall outside the six-percent ranges for each subperiod. During the period 1948–53 agricultural production experienced a decline in labor cost. During the period 1953–57 no industry had a growth rate of labor cost that fell below 2 percent or exceeded 8 percent.

The subperiod 1957–60 was characterized by a slower rate of growth of labor cost than the two preceding subperiods. Finance, insurance, and

real estate experienced a decline in labor cost during this period, while water supply and sanitary services underwent a growth of labor cost of 6.87 percent per year. During the following period, 1960–66, the growth rate of labor cost for agricultural services fell to −1.25 percent annually, while the growth rate of labor cost in agricultural production was close to 10 percent per year. The subperiod 1966–69 resulted in more rapid growth of labor cost for most industries. The growth rate of labor cost was 8.61 percent per year for agricultural services and 8.53 percent per year for finance, insurance, and real estate.

The acceleration of growth in labor cost continued during the period 1969–73. Growth rates exceeded 10 percent annually for four industries—agricultural production, agricultural services, telecommunications, and federal government enterprises. The most rapid increases in labor cost during the postwar period took place during the final subperiod, 1973–78. The growth rate of labor cost exceeded 10 percent per year for six industry groups, while growth of labor cost in finance, insurance, and real estate lagged all other industries at 5.49 percent per year.

We next consider differences in patterns of growth in labor input among subperiods, based on rates of growth of labor input by subperiod in table 5.5. The overall pattern of labor input within and across all subperiods conforms well with general impressions of economic activity in the postwar period. In every period more than half of the fifty-one industries experienced a positive average annual rate of growth in labor input. The pattern varies over time and depends on the relative strength of growth during the period. Considering the subperiods in chronological order, the number of industries with positive average annual changes in quality adjusted hours worked are 41, 29, 27, 41, 40, 32, and 38, respectively.

The immediate postwar period (1948–53), the two periods capturing the surge of economic activity relating to the Vietnam War (1960–66 and 1966–69), and the final period (1973–78) stand out. So does the 1957–60 subperiod when 24 of 51 industries experienced declines in labor input. Both agricultural sectors, all four mining industries, construction, seven of eleven durable goods industries, and four of seven transportation sectors led the downward trend. This contrasts with the 1948–53, 1960–66, and 1966–69 subperiods when construction and nearly all durable goods sectors experienced increases in labor input. In the 1960–66 subperiod, both construction and all eleven durable goods industries experienced positive average annual rates of growth.

The comparative analysis of the economic activity in the seven subperiods generates much sharper conclusions when we narrow our focus to those sectors which experienced annual rates of growth in labor input greater than 6 percent or rates of decline less than −4 percent. The

Table 5.5 **Classification of Rates of Growth of Sectoral Labor Input by Subperiod, 1948–78**

Average Rate of Growth of Labor Input	1948–53	1953–57	1957–60	1960–66	1966–69	1969–73	1973–78
$< -4\%$	2	5	4	1	1	1	0
-4 to -2%	4	3	7	2	4	6	5
-2 to 0%	4	14	13	7	6	12	8
0–2%	12	19	13	12	15	15	21
2–4%	12	5	10	20	16	14	12
4–6%	11	4	1	9	8	3	2
$>6\%$	6	1	3	0	1	0	3

period as a whole was characterized by a dramatic decline in the dispersion of growth rates of labor input. During the subperiods 1948–53, 1953–57, and 1957–60, a total of eight, six, and seven industries, respectively, experienced decline in labor input at rates exceeding 4 percent or growth in labor input at rates greater than 6 percent. By contrast only a single industry exceeded these limits in the two subperiods 1960–66 and 1969–73, only two industries exceeded the limits in the subperiod 1966–69, and three industries fell outside the limits in 1973–78. It is important to emphasize that both rapid gains and losses in sectoral labor input took place during the period ending in 1960 as the U.S. economy was reshaped to meet postwar conditions.

Considering specific sectors that underwent rapid declines in labor input, we find that labor input declined at 10.4 percent annually in coal mining and at 4.21 percent annually in railroads in the subperiod 1948–53. During the subperiod 1953–57 labor input declined at rates exceeding 4 percent in agriculture, coal mining, lumber and wood products, and railroads. During 1957–60 declines exceeded 4 percent in metal mining, coal mining, transportation equipment excluding motor vehicles, and railroads. During 1960–66 only agriculture experienced decline in labor input at a rate exceeding 4 percent, during 1966–69 only private households declined more rapidly than 4 percent, while during 1969–73 only transportation equipment excluding motor vehicles declined at this rate. Our overall conclusion is that very rapid reductions of labor input were concentrated in agriculture, coal mining, and railroads.

Turning to increases in labor input at rates of growth exceeding 6 percent annually, there were six industries undergoing rapid growth during the subperiod 1948–53—electrical machinery, transportation equipment excluding motor vehicles, professional equipment, air transportation, broadcasting, and state and local government enterprises. Labor input in air transportation grew at 8.51 percent during the subperiod 1953–57 and at 10.42 percent during the subperiod 1966–69. During the subperiod 1957–60 nonprofit institutions, state and local educational services, and state and local government enterprises all experienced annual growth rates in excess of 6 percent. Finally, during the subperiod 1973–78, growth rates of coal mining, crude petroleum and natural gas, and transportation services exceeded 6 percent. Our overall conclusion is that very rapid growth in labor input was limited to air transportation and state and local government enterprises. Transportation equipment excluding motor vehicles grew rapidly during the Korean mobilization and declined rapidly during Korean and Vietnam demobilizations. Coal mining declined rapidly through 1960 and began to grow rapidly during the subperiod 1969–73.

Our earlier observation of strong economic growth during the subperiods 1948–53 and 1960–66 is borne out by the number of industries

with rates of growth in labor input in excess of 2 percent—twenty-nine in both subperiods. By contrast labor grew at rates exceeding 2 percent in only ten industries during 1953–57. During the subperiods 1966–69, 1969–73, and 1973–78, twenty-five, seventeen, and seventeen industries, respectively, surpassed this limit. Finally, during 1957–60 fourteen industries experienced growth rates of labor input greater than 2 percent. Our overall conclusion from the data presented in tables 5.3 and 5.5 is that the postwar period was characterized by persistent growth in labor input; growth rates were high in 1948–53 and 1960–66 and low in 1953–57; finally, there was a sharp decline in dispersion of sectoral growth rates after 1960.

The growth rates of labor input for most of the fifty-one industries listed in table 5.3 exhibit no continuous postwar trend. Labor input increased over some periods and decreased over others. The exceptions, however, are notable. Labor input has persistently declined in agriculture, railroads, and local transportation sectors. The rates of growth vary over the periods but are consistently negative. The leather and private household sectors follow closely with declining labor input occurring over six of the seven subperiods. The full list includes no surprises. The principal explanations are changes in technology and tastes, the rising availability of domestic and imported substitute goods, and the reorganization of some sectors as part of government enterprises.

The list of industries with persistent positive trends is much longer. The following sectors had positive average annual growth in labor input over all seven subperiods: rubber, stone, clay, and glass, electrical machinery, professional equipment, trucking, air transportation, broadcasting, electric utilities, gas utilities, water supply and sanitary services, wholesale trade, retail trade, finance, insurance, and real estate, services, nonprofit institutions, and all three state and local government sectors. Not surprisingly all service sectors except private households are included. Noticeably absent are construction, all mining, and most manufacturing industries.

Not only has labor input in some industries persistently increased over the full 1948–78 period, but it has done so at average annual rates consistently exceeding 2 percent. This distinction is shared by the broadcasting industry, finance, insurance, and real estate, state and local educational services, and state and local public administration. Three other sectors—services, nonprofit institutions, and state and local public government enterprises—had increases in labor input in all seven subperiods and increases greater than 2 percent in six of the seven subperiods.

Second, trends in two industries have been significantly reversed. After experiencing a rather stagnant history over the 1948–60 period, labor input in agricultural services has increased at more than a 4 percent

average annual rate between 1960 and 1978. More dramatically, the long decline in labor input in the coal mining industry which reached 10 and 12 percent annual rates in the 1948–53 and 1957–60 periods, respectively, has been reversed in the 1969–73 period when labor input increased at a 4.98 percent annual rate and in the 1973–78 period when the increase was 8.43 percent.

Third, the tobacco industry appears to have the most stable level of employment from peak to peak while the transportation equipment industry appears to be the most volatile. Growth rates in the former oscillate between positive and negative values but decline at more than a 2 percent annual rate only during the period 1973–78. Indeed, the average annual rate of growth or decline is less than one percent in three periods. In the transportation equipment industry, the level of labor input exhibits severe changes. The subperiod averages in chronological order are 19.23, −.04, −5.45, 4.54, .29, −6.84, and 1.47 percent. Interestingly, the positive average annual rate in 1948–53 is more than twice the positive growth rate during that period found in any other industry. Similarly, the negative rate in the 1969–73 period is almost twice the next largest negative rate reported for private households, the next most rapidly declining sector.

5.3 Alternative Measures of Sectoral Labor Compensation

Measures of sectoral labor compensation are important in many areas of economic research. Among these are the measurement and analysis of productivity growth. To provide additional perspective on our approach to measuring labor compensation, we find it useful to compare our methodology and data sources with alternative approaches found in the literature on productivity. We evaluate the alternative approaches against the requirements of economic theory. Wherever possible, we test the assumptions implicit in the alternative models. Our comparison begins with the measurement of hours. Since it is common practice to measure the wage rate as the ratio of the wage bill to some measure of hours, the treatment of hours affects the measurement of labor compensation. To measure payments to labor from the point of view of the producer, as required in productivity research and all studies of labor demand, the appropriate measure is labor compensation per hour worked.

Bureau of Labor Statistics data on hours paid are frequently employed in productivity studies.[3] It is important to recognize that measures of labor compensation based on hours paid data may be biased in two nontrivial ways. First, the time trend in hours paid data will be different from that of hours worked. Since time paid but not worked has increased significantly since 1948, the BLS hours paid estimates have a higher rate

of growth than estimates of hours worked. The growth rates for the resulting measures of hourly wages are biased downward relative to the growth rates of the cost of an hour worked from the point of view of the employer. Second, the estimates of hourly wages in all nonmanufacturing sectors will be biased, since the BLS assigns the same number of hours to supervisory as to nonsupervisory workers.

The description in the *BLS Handbook of Methods* (1971) makes clear that separate hours series are developed for production and nonproduction workers only in the manufacturing sectors. According to the *Handbook*, manufacturing production worker hours are taken directly from the data in the BLS Area Wage Surveys and the study of employer expenditures published by the Bureau of Labor Statistics (1963). For the nonmanufacturing industries the hours paid series collected in the Consumer Expenditure Survey (CES) program relate to nonsupervisory workers only. The Bureau of Labor Statistics assumes that these hours apply to all wage and salary workers.[4]

The different demographic mix of the supervisory and nonsupervisory occupations and different average hours worked recorded for the demographic classes make suspect the assumption that supervisory workers in each nonmanufacturing industry are paid for the same average number of hours per week as are nonsupervisory workers. For example, according to the Census of Population, the 1970 female to male ratio was .87 in nonsupervisory occupations in the nonmanufacturing sector and only .22 in supervisory occupations.[5] Furthermore, female nonsupervisory workers in 1970 worked, on average, 34.5 hours while their male counterparts worked 41.5 hours.[6] Given that women in 1970 worked fewer weekly hours than men and were proportionately underrepresented in supervisory occupations, it is highly unlikely that supervisory laborers in the postwar period were paid for the same number of weekly hours as were nonsupervisory laborers, an assumption implicit in the BLS hours paid totals. A similar analysis could be based on age or education compositions. The conclusion would be the same.

The evidence suggests that estimates of hourly wages constructed from total wage bill and BLS hours paid data are biased for all nonmanufacturing sectors. More important, shifts in the demographic composition of the supervisory and nonsupervisory occupational groups over time will bias any estimates of the time trend in hourly labor costs. The direction of the bias is uncertain. It depends both on the difference in the composition of each industry's supervisory and nonsupervisory labor force and on the differential rates at which those compositions change.

Differences in the measurement of annual hours aside, measures of hourly labor compensation depend on the measurement of the annual wage bill. In the productivity literature it is common to employ earnings data for this purpose. Denison, for example, uses Bureau of the Census

data on earnings to construct weights for use in aggregating distinct categories of hours both in his original *Sources of Economic Growth* (1962) and in his more recent works on productivity (1974, 1979). He discusses the assumptions underlying his use of earnings in the following excerpts from his 1979 book:

> Calculating such an index (of total hours) requires two types of information: distributions of hours worked by age and sex, and appropriate weights. Hourly earnings are used as weights. Their use rests on the assumption that average earnings in the ten age-sex groups distinguished are proportional to the marginal products of labor, per hour worked, of these groups. If this assumption is correct, it is necessary and legitimate to consider an average hour worked by a demographic group whose average hourly earnings are twice as high as those of another group to represent twice as much labor input. . . .
>
> My assumption that average earnings are proportional to marginal products of labor implies that an average hour's work by males 35 to 64 years of age, for example, was 2.3 times as valuable in the 1970's as an average hour's work by females 20 to 24 years of age (100 ÷ 44). The assumption is valid insofar as earnings differentials among age-sex groups reflect differences in the value of the work that is actually performed.[7]

The principal problem with using Census earnings data to measure marginal productivity is that reported earnings exclude all supplements to wages and salaries and include the return to capital invested by self-employed workers. As Denison correctly points out, earnings can be used only if the average earnings for workers cross-classified by education or by age and sex are proportional to the corresponding marginal products. However, given the way supplements, particularly social security and unemployment insurance, are charged to employers, reported earnings do not proportionately reflect employers' labor outlay. If supplements are neglected, only those ratios of hourly labor earnings among groups of laborers with annual incomes below the lowest base for supplements will be unbiased estimates of relative wages as viewed by employers.

Using Denison's example, if the average 35–64-year-old male has an annual labor income above either the social security or unemployment insurance tax bases, while the average 20–24-year-old female's labor earnings are below either base, then the male to female ratio of average hourly earnings is biased upward relative to the relative wages of males and females from the point of view of the employer. Supplements add to the employers' outlay for both males and females but, in this example, supplements add proportionately more to the employers' outlay for females than for males. Based on 1969 earnings reported in the decennial Census, employed 35–64-year-old males had mean annual earnings ($10,008) well above either the social security ($7800) or unemployment

insurance ($3000) tax bases in 1969. Females 18–24 years of age, however, had mean labor income of $2960.[8] Ratios of male (35–64 years old) to female (18–24 years old) hourly wage costs excluding supplements are upward biased estimates of relative labor costs experienced by employers.

The inclusion of the return to noncorporate capital in measured earnings leads to an additional bias in the same direction. The assumption of proportionality between earnings and labor outlay among different sex-age groups is valid only if the ratio of noncorporate property income to total earnings is constant across these groups. However, if the representative 35–64-year-old male has a larger fraction of his earnings being generated from capital invested in noncorporate enterprises than does the representative 20–24-year-old female, then earnings based estimates for the relative valuation of an hour's work by males to an hour's work by females is upward biased. Unfortunately, we cannot test this hypothesis directly. Data measuring the noncorporate property income of workers classified by demographic characteristics are not available. However, the reasonableness of this assumption can be evaluated by comparing the distribution of employment in wage and salary versus self-employed activities across sex and age groups.

We again refer to data published in the 1970 Census. We construct ratios of self-employed persons to total employment for sixteen age groups for both males and females. The ratios, reported in table 5.6, vary

Table 5.6 **Ratios of Self-Employed Persons to Total Employment by Age and Sex, 1970**[a]

Age	Males	Females
14–15	.044	.026
16–17	.016	.009
18–19	.014	.005
20–24	.029	.011
25–29	.052	.024
30–34	.078	.033
35–39	.101	.038
40–44	.114	.041
45–49	.124	.045
50–54	.137	.053
55–59	.154	.060
60–62	.166	.062
63–64	.183	.073
65–69	.243	.093
70–74	.300	.118
75 and over	.336	.133

Source: Bureau of the Census (1973*b*), table 47.

[a]Total employed excludes unpaid family workers.

significantly across sex-age groups. For both males and females, the ratios generally increase with age; for any given age group, the ratio for males is more than twice the ratio for females. Continuing with our example, the ratios for older males are considerably higher than the similar ratios for young females. The relevant ratio for 35–64-year-old males is .130; the corresponding ratio for 20–24-year-old females is .011. Compared to young females, older males apparently allocate a greater proportion of their labor effort to self-employed activities.

From this we infer that earnings for a representative male include a higher percentage of returns to noncorporate capital than do the earnings for a representative female, even after controlling for age. In short, relative earnings are inadequate measures of relative marginal products. The wage and salary income of wage and salary workers adjusted for supplements is a more appropriate starting point for a measure of labor compensation.

The issues discussed in this section do not exhaust the problems that arise in measuring labor compensation in productivity studies. However, they are sufficient to illustrate two principles for measuring sectoral wages that follow directly from economic theory. First, any study of labor demand requires measures of wages and labor input from the producers' point of view. Second, measures of wages and labor input require data on labor compensation and hours worked for all categories of labor that are characterized by differences in marginal productivity.

5.4 Conclusion

In this paper we have developed measures of labor cost and labor input for each of fifty-one industrial sectors. Components of labor input that differ in marginal productivity are treated separately in measuring labor cost and labor input for each sector. In particular, we have constructed data on hours worked and labor compensation for 1600 types of labor input for each sector in each year from 1948 to 1978.

We have measured labor compensation from the producers' point of view, including wages and salaries, payroll taxes, and supplements paid by producers. We have employed data on labor compensation based on establishment surveys from the U.S. National Income and Product Accounts to provide control totals for labor compensation in each sector. Finally, we have allocated labor compensation among components of labor input on the basis of household surveys from the Census of Population and the Current Population Survey.

Similarly, we have controlled hours worked for each industrial sector to total employment and hours worked from establishment surveys. Hours worked have been distributed among components of labor input on the basis of household surveys. For both labor compensation and

hours worked we have allocated data from establishment based surveys by using data from household surveys cross-classified by characteristics of individual workers.

On the basis of data from establishment and household surveys we have allocated labor compensation and hours worked among the two sexes, eight age groups, five education groups, two employment classes, and ten occupational groups for each industrial sector in each year from 1948 to 1978. Measurement of labor input from multiple job holders, self-employed individuals, and unpaid family workers has necessitated the use of supplementary survey data on hours worked and labor compensation for these workers.

Our data on labor input and hourly compensation have been compiled to facilitate the incorporation of new data from establishment and household surveys as they become available. Our classification of hours worked and labor compensation is consistent with the most recent reports from the Current Population Survey. We have reconciled the classifications of data on labor input from earlier surveys with the classification used in current reports. Our control totals for hours worked and labor compensation are consistent with data from the current version of the U.S. National Income and Product Accounts.

We have employed our data on hours worked and labor compensation to construct price and quantity indexes of labor input for each of the fifty-one industrial sectors included in our study. Our data also can be employed to construct indexes of hourly wages or labor input for either aggregates over these sectors or components within industrial sectors. For example, it would be possible to construct hourly wage and labor input indexes for each of the ten occupational groups within an industrial sector. These indexes, for example, could be employed in studies of the impact of changes in relative wages on the composition of demand for labor input by occupational groups.

Appendix
Data Sources for Labor Input

Introduction

This appendix lists the sources of the detailed labor data used to construct the sectoral measures of labor input described in the text. The following sections present tables identifying the particular sources of the employment, hours worked, weeks paid, and compensation data, respectively. The tables within each section are ordered similarly. Tables describing the data sources relevant to each benchmark year are presented

first; a summary table for all intermediate years follows. Additional tables identifying the sources of various supporting data conclude each section. The formats introduced in the next section are adopted throughout the appendix.

Employment

Tables 5.A.1 through 5.A.6 list the sources of the data used to generate the employment matrices. All data for each of the benchmark years are taken from the decennial censuses conducted by the Bureau of the Census, U.S. Department of Commerce. Identifying publication codes for the population subject reports and detailed table titles and numbers are presented for the 1950, 1960, and 1970 data in tables 5.A.1 through 5.A.3, respectively.

The data sources for the nonbenchmark or intermediate years are arranged in table 5.A.4 so that the subscripted variables at the head of each column indicate the extent of cross-classification available in those data sources listed directly below. Each variable derives its name from the first letter of the labor dimension it represents: industry (I), sex (S), employment class (C), age (A), education (E), or occupation (O). Each subscript indicates the maximum number of discrete divisions available in the data tables. Absence of a subscript suggests that the tables' divisions for that variable match exactly with the characteristic groups listed in table 5.1. Blank lines within any column imply that the particular data series are not available for the corresponding years.[9]

The three-part entry for each data source listed in table 5.A.4 should be interpreted as follows. The first entry indicates the parent publication series, the second identifies the relevant volume within the series, and the third specifies the number of the appropriate table. For convenience, publication titles have been abbreviated as follows:

SLFR: *Special Labor Force Reports*, Bureau of Labor Statistics, U.S. Department of Labor

E/E: *Employment and Earnings*, Division of Manpower and Employment Statistics, Bureau of Labor Statistics, U.S. Department of Labor

P–20: *Series P–20 Current Population Reports—Population Characteristics*, Bureau of the Census, U.S. Department of Commerce

P–50: *Series P–50, Current Population Reports—Labor Force*, Bureau of the Census, U.S. Department of Commerce

P–60: *Series P–60, Current Population Reports—Consumer Income*, Bureau of the Census, U.S. Department of Commerce

The employment model requires two additional sets of employment data. The data tables necessary to build the second 1960 labor matrix based on the employed U.S. population exclusive of those persons working in either Alaska or Hawaii are listed separately under their state titles

Table 5.A.1 **U.S. Census Employment Data: 1950**

Population Subject Report	Table	
	Number	Title
P–E No. 1B	4	Age of the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1B	5	Age of wage and salary workers in the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1B	6	Age of employed persons, by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1C	2	Detailed occupation of employed persons, by detailed industry and sex, for the U.S.: 1950.
P–E No. 1D	3	Age of employed persons, by detailed industry and sex, for the U.S.: 1950.
P–E No. 1D	4	Age of employed wage and salary workers, by detailed industry and sex, for the U.S.: 1950.
P–E No. 1D	6	Major occupation group of employed persons, by detailed industry and sex, for the U.S.: 1950.
P–E No. 1D	7	Major occupation group of employed wage and salary workers, by detailed industry and sex, for the U.S.: 1950.
P–E No. 5B	11	Major occupation group: persons 14 years old and over, by years of school completed, age, color, and sex, for the U.S., by regions: 1950.

Table 5.A.2 **U.S. Census Employment Data: 1960**

Population Subject Report	Table	
	Number	Title
PC(2)–5B	8	Major occupation group—persons 14 years old and over in the experienced civilian labor force, by years of school completed, age, color, and sex, for the U.S., by type of residence, and by regions: 1960.
PC(2)–7A	4	Age of the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1960.
PC(2)–7A	5	Age of wage and salary workers in the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1960.
PC(2)–7A	6	Age of employed persons, by detailed occupation and sex, for the U.S.: 1960.
PC(2)–7A	36	Industry group of employed persons, by occupation, color, and sex, for the U.S.: 1960.
PC(2)–7C	1	Major occupation group of employed persons, by major industry group, age, and sex, for the U.S.: 1960.
PC(2)–7C	2	Detailed occupation of employed persons, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	4	Age of employed persons, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	5	Age of employed wage and salary workers, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	21	Years of school completed by the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	28	Class of workers and color of the experienced civilian labor force, by agriculture and nonagricultural industries, years of school completed, and sex, for the U.S.: 1960.

Table 5.A.3 U.S. Census Employment Data: 1970

Population Subject Report	Table	
	Number	Title
PC(2)–5B	11	Major occupation group of employed persons 14 years old and over, by years of school completed, age, race, and sex: 1970.
PC(2)–7B	3	Years of school completed by the experienced civilian labor force by detailed industry and sex: 1970.
PC(2)–7B	34	Age of employed persons by detailed industry and sex: 1970.
PC(2)–7B	37	Class of worker of employed persons by detailed industry and sex: 1970.
PC(2)–7B	47	Age of employed persons by class of worker, agriculture and nonagricultural industries, race, Spanish origin, and sex: 1970.
PC(2)–7C	1	Industry group of employed persons by occupation, age, and sex: 1970.
PC(2)–7C	5	Industry group of employed wage and salary workers by occupation, race, and sex: 1970.
PC(2)–7C	6	Industry group of self-employed workers by occupation, race, and sex: 1970.
PC(2)–7C	8	Detailed occupation of employed persons by detailed industry and sex: 1970.

Table 5.A.4 Employment Data for Nonbenchmark Years

Year	SCI_2	SC_1I_{37}	SCI_2A	SI_{17}	$SI_{18}A_5$
1948	P–50,#13,T–9,10				
1949	P–50,#19,T–9				
1950	P–50,#31,T–9				
1951	P–50,#40,T–9				
1952	P–50,#45,T–9				
1953	P–50,#59,T–C9			P–50,#50,T–5	
1954	P–50,#59,T–A9				
1955	P–50,#67,T–12				
1956	P–50,#72,T–12				
1957	P–50,#85,T–12				
1958	P–50,#89,T–13				
1959	SLFR,#23,T–C4	SLFT,#11,T–B			SLFR,#4,T–C10
1960	SLFR,#23,T–C4	SLFR,#19,T–A2			
1961	SLFR,#23,T–C4	SLFR,#25,T–A2			SLFR,#23,T–C10
1962	SLFR,#69,T–C4	SLFR,#38,T–A2			SLFR,#31,T–C10
1963	SLFR,#69,T–C4	SLFR,#48,T–A2			SLFR,#43,T–C10
1964	SLFR,#69,T–C4	SLFR,#62,T–A2			SLFR,#52,T–C10
1965	SLFR,#69,T–C4	SLFR,#76,T–A2			SLFR,#69,T–C10
1966	E/E,Jan.'67,T–14	SLFR,#91,T–A2			
1967		SLFR,#107,T–A2	E/E,Jan.'68,T–A16		
1968		SLFR,#115,T–A2	E/E,Jan.'69,T–A18		
1969		SLFR,#127,T–A2	E/E,Jan.'70,T–A18		
1970		SLFR,#141,T–A2	E/E,Jan.'71,T–A18		
1971			E/E,Jan.'72,T–A18		
1972		SLFR,#162,T–A2	SLFR,#152,T–A19		
1973			SLFR,#163,T–A21		
1974			SLFR,#178,T–A20		
1975			SLFR,#185,T–20		
1976			SLFR,#199,T–21		
1977			SLFR,#212,T–24		
1978			SLFR,#218,T–24		

Table 5.A.4 (continued)

Year	SI_7A	SI_6A_6	SI_2A	$S_1I_{13}A$	$SI_{42}E$
1948			P–50,#13,T–5,6	P–50,#75,T–4	
1949			P–50,#19,T–5,6		
1950	P–50,#31,T–E		P–50,#31,T–5,6	P–50,#75,T–4	
1951	P–50,#40,T–E		P–50,#40,T–5,6		
1952	P–50,#45,T–E		P–50,#45,T–5,6	P–50,#75,T–4	
1953			P–50,#59,T–C5,6		
1954	P–50,#67,T–F		P–50,#59,T–A5,6	P–50,#75,T–4	
1955	P–50,#67,T–F		P–50,#67,T–8,9		
1956	P–50,#72,T–G		P–50,#72,T–8,9	P–50,#75,T–4	
1957			P–50,#85,T–9,10		
1958		P–50,#89,T–18	P–50,#89,T–9,10		
1959			SLFR,#31,T–C2,3		
1960			SLFR,#31,T–C2,3		
1961			SLFR,#31,T–C2,3		
1962			SLFR,#31,T–C2,3		
1963			SLFR,#69,T–C2,3		
1964			SLFR,#69,T–C2,3		
1965			SLFR,#69,T–C2,3		
1966			E/E,Jan.'67,T–A13		
1967					
1968					SLFR,#103,T–N
1969					SLFR,#125,T–N
1970					SLFR,#125,T–N
1971					SLFR,#140,T–N
1972					SLFR,#148,T–N
1973					
1974					
1975					
1976					
1977					
1978					

Table 5.A.4 (continued)

Year	$I_{12}O$	SAE	SA_5E	SAO	SA_6O
1948					
1949					
1950					
1951					
1952			P–50,#49,T–2		
1953					
1954					
1955					
1956					
1957			P–50,#78,T–2		
1958					P–50,#89,T–16
1959	SLFR,#4,T–C9	SLFR,#1,T–D		SLFR,#4,T–C8	
1960	SLFR,#14,T–C9			SLFR,#14,T–C8	
1961	SLFR,#23,T–C9			SLFR,#23,T–C8	
1962	SLFR,#31,T–C9	SLFR,#30,T–D		SLFR,#31,T–C8	
1963	SLFR,#43,T–C9			SLFR,#43,T–C8	
1964	SLFR,#52,T–C9	SLFR,#53,T–D		SLFR,#52,T–C8	
1965	SLFR,#69,T–C9	SLFR,#65,T–D		SLFR,#69,T–C8	
1966		SLFR,#83,T–D			
1967		SLFR,#92,T–D			
1968		SLFR,#103,T–D			
1969		SLFR,#125,T–D			
1970		SLFR,#125,T–D			
1971		SLFR,#140,T–D			
1972		SLFR,#148,T–D			
1973		SLFR,#161,T–D			
1974		SLFR,#175,T–D			
1975		SLFR,#186,T–D			
1976		SLFR,#193,T–D			
1977		SLFR,#209,T–E,T–L			
1978		SLFR,#225,T–E,SLFR,#218,T–3			

Table 5.A.4 (continued)

Year	SA_5O	SA_2O	S_1A_6O	SEO	SO
1948				P–50,#14,T–5	P–50,#13,T–15
1949					P–50,#19,T–14
1950		P–50,#32,T–4			P–50,#31,T–14
1951		P–50,#41,T–4			P–50,#40,T–14
1952				P–50,#49,T–4	P–50,#45,T–14
1953		P–50,#51,T–4			P–50,#67,T–25
1954		P–50,#58,T–3			P–50,#59,T–A10
1955		P–50,#64,T–3			P–50,#67,T–13
1956		P–50,#71,T–3			P–50,#72,T–13
1957	P–20,#80,T–4	P–50,#83,T–3		P–50,#78,T–7	P–50,#85,T–13
1958		P–50,#90,T–3			P–50,#89,T–14
1959		SLFR,#6,T–G	P–20,#104,T–8	SLFR,#1,T–1	
1960		SLFR,#16,T–G			
1961		SLFR,#22,T–G			
1962		SLFR,#34,T–G		SLFR,#30,T–I	
1963		SLFR,#42,T–G			
1964		SLFR,#55,T–G		SLFR,#53,T–I	
1965		SLFR,#68,T–F		SLFR,#65,T–I	
1966		SLFR,#87,T–F		SLFR,#83,T–I	
1967		SLFR,#98,T–G	P–20,#171,T–10	SLFR,#92,T–I	
1968		SLFR,#111,T–E	P–20,#188,T–9	SLFR,#103,T–I	
1969		SLFR,#124,T–E	P–20,#193,T–9	SLFR,#125,T–I	
1970		SLFR,#135,T–E	P–20,#210,T–9	SLFR,#125,T–I	
1971		SLFR,#147,T–E	P–20,#235,T–9	SLFR,#140,T–I	
1972		SLFR,#158,T–E		SLFR,#148,T–I	
1973		SLFR,#163,T–E		SLFR,#161,T–I	
1974		SLFR,#178,A–18		SLFR,#175,T–I	
1975		SLFR,#185,A–18		SLFR,#186,T–I	
1976		SLFR,#199,A–18		SLFR,#193,T–I	
1977		SLFR,#211,T–21,T–38		SLFR,#209,T–J	
1978		SLFR,#218,T–21,T–38		SLFR,#225,T–J	

Table 5.A.5 **U.S. Census Employment Data for Alaska and Hawaii: 1960**

Characteristics of the Population	Table	
	Number	Title
Vol. 1, part 3, Alaska	122	Occupation of the experienced civilian labor force by color, of the employed by race and class of worker, and of persons not in labor force with work experience by sex, for the state: 1960.
Vol. 1, part 3, Alaska	123	Age of employed persons, by occupation, color, and sex, for the state: 1960.
Vol. 1, part 3, Alaska	125	Industry group of the employed by occupation and sex, for the state: 1960.
Vol. 1, part 3, Alaska	126	Detailed industry of the experienced civilian labor force and of the employed by sex, for the state: 1960.
Vol. 1, part 3, Alaska	128	Age of employed persons by industry and sex, for the state: 1960.
Vol. 1, part 3, Hawaii	122	Occupation of the experienced civilian labor force by color, of the employed by race and class of worker, and of persons not in labor force with work experience by sex, for the state and for standard metropolitan statistical areas of 250,000 or more: 1960.
Vol. 1, part 13, Hawaii	123	Age of employed persons by occupation, color, and sex, for the state and for standard metropolitan statistical areas of 250,000 or more: 1960.
Vol. 1, part 13, Hawaii	125	Industry group of the employed by occupation and sex, for the state and for standard metropolitan statistical areas of 250,000 or more: 1960.
Vol. 1, part 13, Hawaii	127	Detailed industry for the employed by sex, for the state and for standard metropolitan statistical areas of 100,000 or more: 1960.
Vol. 1, part 13, Hawaii	128	Age of employed persons by industry and sex, for the state and for standard metropolitan statistical areas of 250,000 or more: 1960.

Table 5.A.6 **Monthly Labor Survey Employment Data: 1966**

Table 8	Employed persons by age and sex, Monthly Labor Survey—Current Population Survey comparisons, annual average 1966.
Table 11	Employed persons by class of worker and occupation group, Monthly Labor Survey—Current Population Survey comparisons, annual average 1966.

Source: Stein (1967).

in table 5.A.5. Table 5.A.6 identifies the published sources of the data compiled by the Monthly Labor Survey's 1966 study of employed persons under the then newly conceived Census definitions.

Hours Worked

The sources of the data on hours worked are listed in tables 5.A.7 through 5.A.12. Sources of the data for each decennial census year are presented in tables 5.A.7 through 5.A.9. For an explanation of the format underlying the presentation of the data sources for each intermediate year in table 5.A.10 consult the explanation before the source tables in the preceding section.

Using formats similar to that used in table 5.A.10, tables 5.A.11 and 5.A.12 list the data sources relating to the hours and employment series, respectively, for multiple job holders. The letter enclosed in parentheses and appended to the variable list at the head of each column indicates whether the recorded sources report data referring to the multiple job holders' demographic and occupational characteristics in their primary (P) or secondary (S) industry of employment.

Weeks

We require data on weeks paid per person to convert data measuring average compensation per person to estimates of average compensation per job. The necessary data sources are listed in tables 5.A.13 through 5.A.16. The weeks paid data used to construct the benchmark year series for this research are taken from the 1950, 1960, and 1970 decennial

Table 5.A.7 U.S. Census Hours Worked Data: 1950

Population Subject Report	Table	
	Number	Title
P–E No. 1A	13	Hours worked during census week: employed persons by age, color, and sex, for the U.S., urban and rural: 1950.
P–E No. 1B	14	Hours worked during the census week by employed persons, by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1B	15	Hours worked during the census week by employed wage and salary workers, by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1D	10	Hours worked during the census week by employed persons, by detailed industry and sex, for the U.S.: 1950.
P–D No. 1D	11	Hours worked during the census week by employed wage and salary workers, by detailed industry and sex, for the U.S.: 1950.

Table 5.A.8 U.S. Census Hours Worked Data: 1960

Population Subject Report	Table	
	Number	Title
PC(2)–6A	12	Hours worked by employed persons, by marital status, presence of own children, age, color, and sex, for the U.S., urban and rural: 1960.
PC(2)–7A	13	Hours worked by employed persons, by detailed occupation and sex, for the U.S.: 1960.
PC(2)–7F	9	Hours worked by employed persons, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	10	Hours worked by employed wage and salary workers, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	23	Hours worked and color of employed persons, by class of worker, agriculture and nonagricultural industries, and sex, for the U.S.: 1960.

censuses. Since the "weeks paid" responses of those interviewed are based on their work experience during the previous year, the benchmark years for the weeks data are those immediately preceding the decennial census years. The specific data sources are listed in tables 5.A.13 through 5.A.15.

For an explanation of the abbreviations and format used in table 5.A.16 to present the sources for the weeks data of the intermediate years, consult the discussion immediately preceding the source tables in the second section of this appendix.

Compensation

Tables 5.A.17 through 5.A.21 identify data sources for labor compensation. All the compensation tables for the benchmark years 1949, 1959, and 1969 are presented in tables 5.A.17 through 5.A.19 are derived from the 1950, 1960, and 1970 decennial censuses, respectively. The one-year lag is explained by the fact that the census respondent declares his annual compensation for the previous year. The payroll tax tables, 5.A.20 and 5.A.21, are taken directly from Pechman (1977, pp. 264–65).

Table 5.A.9 **U.S. Census Hours Worked Data: 1970**

Population Subject Report	Table	
	Number	Title
PC(2)–6A	17	Hours worked of employed persons, by marital status, presence of own children, age, race, and sex, for the U.S., urban and rural: 1970.
PC(2)–7A	45	Employed persons by hours worked, detailed occupation, and sex: 1970.
PC(2)–7B	39	Employed persons by hours worked, detailed industry, and sex: 1970.
PC(2)–7B	48	Hours worked of employed persons by class of worker, agriculture and nonagricultural industries, race, Spanish origin, and sex: 1970.

Table 5.A.10 Hours Worked Data for Nonbenchmark Years

Year	SA	SA_6	SA_5	SO_8	C
1948					
1949					
1950					
1951					
1952					
1953					
1954					
1955					
1956	P–50,#72,T–18				
1957	P–50,#85,T–18				
1958	P–50,#89,T–24				
1959		SLFR,#4,T–D7			
1960		SLFR,#14,T–D7			
1961		SLFR,#23,T–D7			
1962		SLFR,#31,T–D7			
1963		SLFR,#43,T–D7			
1964		SLFR,#52,T–D7			
1965		SLFR,#69,T–D7			
1966		E/E,Jan.'67,T–22			
1967			E/E,Jan.'68,T–A21	E/E,Jan.'68,T–A22	E/E,Jan.'68,T–A20
1968			E/E,Jan.'69,T–A23	E/E,Jan.'69,T–A24	E/E,Jan.'69,T–A22
1969			SLFR,#116,T–A24	SLFR,#116,T–A25	SLFR,#116,T–A23
1970			SLFR,#129,T–A24	SLFR,#129,T–A25	SLFR,#129,T–A23
1971			SLFR,#142,T–A24	SLFR,#142,T–A25	SLFR,#142,T–A23
1972			SLFR,#152,T–A24	SLFR,#163,T–A27	SLFR,#152,T–A23
1973			SLFR,#163,T–A26	SLFR,#163,T–A27	SLFR,#163,T–A25
1974	SLFR,#178,T–1		SLFR,#178,T–A25,T–20	SLFR,#178,T–A26	SLFR,#178,T–A24
1975	SLFR,#185,T–1		SLFR,#185,T–A25,T–20	SLFR,#185,T–26	SLFR,#185,T–24
1976	SLFR,#199,T–1,T–33		SLFR,#199,T–31,T–21	SLFR,#199,T–32	SLFR,#199,T–30
1977	SLFR,#212,T–3,T–37		SLFR,#212,T–35,T–24	SLFR,#212,T–36,T–22	SLFR,#212,T–34
1978	SLFR,#218,T–3,T–37		SLFR,#218,T–35,T–24	SLFR,#218,T–36,T–21	SLFR,#218,T–34

Table 5.A.10 (continued)

Year	CI_2	C_1I_9	C_1I_8	C_1I_6	C_1I_5
1948					P–50,#61,T–8
1949					P–50,#61,T–8
1950					
1951			P–50,#40,T–G		
1952			P–50,#45,T–H		
1953					P–50,#61,T–8
1954					P–50,#61,T–8
1955					P–50,#67,T–17
1956					P–50,#67,T–17
1957					P–50,#85,T–21
1958	P–50,#89,T–22			P–50,#89,T–26	
1959	SLFR,#4,T–D2			SLFR,#4,T–D3	
1960	SLFR,#23,T–D2			SLFR,#14,T–D3	
1961	SLFR,#23,T–D2			SLFR,#23,T–D3	
1962	SLFR,#31,T–D2			SLFR,#31,T–D3	
1963	SLFR,#43,T–D2			SLFR,#43,T–D3	
1964	SLFR,#52,T–D2			SLFR,#52,T–D3	
1965	SLFR,#69,T–D2			SLFR,#69,T–D3	
1966	E/E,Jan.'67,T–22			E/E,Jan.'67,T–19	
1967		E/E,Jan.'68,T–A20			
1968		E/E,Jan.'69,T–A22			
1969		SLFR,#116,T–A23			
1970		SLFR,#129,T–A23			
1971		SLFR,#152,T–A23			
1972		SLFR,#152,T–A23			
1973		SLFR,#163,T–A25			
1974		SLFR,#178,T–A24			
1975		SLFR,#185,T–A24			
1976		SLFR,#199,T–30,T–24			
1977		SLFR,#212,T–31,T–27			
1978		SLFR,#218,T–34,T–27			

Table 5.A.10 (continued)

Year	I_2	O	O_8
1948			
1949			
1950			
1951			
1952		P–50,#45,T–H	
1953			
1954			
1955	P–50,#67,T–16		
1956	P–50,#72,T–17		
1957	P–50,#85,T–17		
1958		P–50,#89,T–27	
1959		SLFR,#4,T–D6	
1960		SLFR,#14,T–D6	
1961		SLFR,#23,T–D6	
1962		SLFR,#31,T–D6	
1963		SLFR,#43,T–D6	
1964		SLFR,#52,T–D6	
1965		SLFR,#69,T–D6	
1966			E/E,Jan.'67,T–20
1967	E/E,Jan.'68,T–A18		
1968	E/E,Jan.'69,T–A20		
1969	SLFR,#116,T–A21		
1970	SLFR,#129,T–A21		
1971	SLFR,#142,T–A21		
1972	SLFR,#152,T–A21		
1973	SLFR,#163,T–A21		
1974	SLFR,#178,T–A22		
1975	SLFR,#185,T–A22		
1976	SLFR,#199,T–30		
1977	SLFR,#212,T–32		
1978	SLFR,#218,T–32		

Table 5.A.11 Hours Worked Data for Multiple Job Holders

Year	CI_2(P)	CI_2(S)	C_1I_{12}(P)	C_1I_{12}(S)	C_1I_{11}(P)	C_1I_{11}(S)
1948						
1949						
1950						
1951						
1952						
1953						
1954						
1955						
1956						
1957						
1958						
1959						
1960	SLFR,#18,T–G	SLFR,#18,T–H			SLFR,#18,T–G	SLFR,#18,T–H
1961						
1962	SLFR,#29,T–F	SLFR,#29,T–G			SLFR,#29,T–F	SLFR,#29,T–G
1963	SLFR,#39,T–F	SLFR,#39,T–G			SLFR,#39,T–F	SLFR,#39,T–G
1964	SLFR,#51,T–F	SLFR,#51,T–G			SLFR,#51,T–F	SLFR,#51,T–G
1965	SLFR,#63,T–G	SLFR,#63,T–H			SLFR,#63,T–G	SLFR,#63,T–H
1966	SLFR,#90,T–G	SLFR,#90,T–H			SLFR,#90,T–G	SLFR,#90,T–H
1967						
1968						
1969	SLFR,#123,T–H	SLFR,#123,T–I	SLFR,#123,T–H	SLFR,#123,T–I		
1970	SLFR,#139,T–H	SLFR,#139,T–I	SLFR,#139,T–H	SLFR,#139,T–I		
1971	SLFR,#139,T–H	SLFR,#139,T–I	SLFR,#139,T–H	SLFR,#139,T–I		
1972	SLFR,#166,T–H	SLFR,#166,T–I	SLFR,#166,T–H	SLFR,#166,T–I		
1973	SLFR,#166,T–H	SLFR,#166,T–I	SLFR,#166,T–H	SLFR,#166,T–I		
1974	SLFR,#177,T–H	SLFR,#177,T–I	SLFR,#177,T–H	SLFR,#177,T–I		
1975	SLFR,#182,T–H	SLFR,#182,T–I	SLFR,#182,T–H	SLFR,#182,T–I		
1976	SLFR,#194,T–B8	SLFR,#194,T–B9	SLFR,#194,T–B4	SLFR,#194,T–B9		
1977	SLFR,#194,T–B8	SLFR,#211,T–H	SLFR,#194,T–B4	SLFR,#211,T–H,T–L		
1978	SLFR,#194,T–B8	SLFR,#221,T–H	SLFR,#194,T–B4	SLFR,#221,T–C,T–H		

Table 5.A.12 **Employment Data for Multiple Job Holders**

Year	CI_2(P)	CI_2(S)	C_1I_{16}(P)	C_1I_{16}(S)	C_1I_{12}(P)
1948					
1949					
1950	P–50,#30,T–2	P–50,#30,T–2			
1951					
1952					
1953					
1954					
1955					
1956	P–50,#74,T–2	P–50,#74,T–2			
1957	P–50,#80,T–6	P–50,#80,T–6	P–50,#80,T–6	P–50,#80,T–6	
1958	P–50,#88,T–6	P–50,#88,T–6	P–50,#88,T–6	P–50,#88,T–6	
1959	SLFR,#9,T–2	SLFR,#9,T–B			
1960	SLFR,#18,T–3	SLFR,#18,T–3			
1961					
1962	SLFR,#29,T–2	SLFR,#29,T–2			
1963	SLFR,#39,T–2	SLFR,#39,T–2			
1964	SLFR,#51,T–4	SLFR,#51,T–4			
1965	SLFR,#63,T–3	SLFR,#63,T–3			
1966	SLFR,#90,T–3	SLFR,#90,T–3			
1967					
1968					
1969	SLFR,#123,T–B	SLFR,#123,T–B			SLFR,#123,T–B
1970	SLFR,#139,T–B	SLFR,#139,T–B			SLFR,#139,T–B
1971	SLFR,#139,T–B	SLFR,#139,T–B			SLFR,#139,T–B
1972	SLFR,#166,T–B	SLFR,#166,T–B			SLFR,#166,T–B
1973	SLFR,#166,T–B	SLFR,#166,T–B			SLFR,#166,T–B
1974	SLFR,#177,T–C	SLFR,#177,T–C			SLFR,#177,T–C
1975	SLFR,#182,T–C	SLFR,#182,T–C			SLFR,#182,T–C
1976	SLFR,#194,T–B3	SLFR,#194,T–B3			SLFR,#194,T–B3
1977	SLFR,#221,T–C	SLFR,#221,T–C			SLFR,#211,T–C
1978	SLFR,#221,T–C	SLFR,#221,T–C			SLFR,#221,T–C

Table 5.A.12 (continued)

Year	C_1I_{12}(S)	C_1I_{11}(P)	C_1I_{11}(S)	C_1I_9(P)	C_1I_9(S)
1948					
1949					
1950					
1951					
1952					
1953					
1954					
1955					
1956					
1957					
1958					
1959				SLFR,#9,T-2	SLFR,#8,T-B
1960		SLFR,#18,T-3	SLFR,#18,T-3		
1961					
1962		SLFR,#39,T-2	SLFR,#29,T-2		
1963		SLFR,#39,T-2	SLFR,#39,T-2		
1964		SLFR,#51,T-4	SLFR,#51,T-4		
1965		SLFR,#63,T-3	SLFR,#63,T-3		
1966		SLFR,#90,T-3	SLFR,#90,T-3		
1967					
1968					
1969	SLFR,#123,T-B				
1970	SLFR,#139,T-B				
1971	SLFR,#139,T-B				
1972	SLFR,#166,T-B				
1973	SLFR,#166,T-B				
1974	SLFR,#177,T-C				
1975	SLFR,#182,T-C				
1976	SLFR,#194,T-B3				
1977	SLFR,#221,T-C				
1978	SLFR,#221,T-C				

Table 5.A.13 U.S. Census Weeks Paid Data: 1949

Population Subject Report	Table	
	Number	Title
P–E No. 1A	14	Weeks worked in 1949 by labor force status: persons by age, color, and sex, for the U.S., urban and rural: 1950.
P–E No. 1B	16	Weeks worked in 1949 by the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1B	17	Weeks worked in 1949 by wage and salary workers in the experienced civilian labor force by detailed occupation and sex, for the U.S.: 1950.
P–E No. 1D	12	Weeks worked in 1949 by the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1950.
P–E No. 1D	13	Weeks worked in 1949 by wage and salary workers in the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1950.
P–E No. 1D	21	Weeks worked in 1949 by the experienced civilian labor force, by class of worker and sex, for the U.S.: 1950.

Table 5.A.14 U.S. Census Weeks Paid Data: 1959

Population Subject Report	Table	
	Number	Title
PC(2)–6A	15	Employment status, by weeks worked in 1959, age, color, and sex, for the U.S., urban and rural: 1960.
PC(2)–7A	14	Weeks worked in 1959 by the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1960.
PC(2)–7A	17	Weeks worked in 1959 by wage and salary workers in the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1960.
PC(2)–7F	11	Weeks worked in 1959 by the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1960.
PC(2)–7F	13	Weeks worked in 1959 by wage and salary workers in the experienced civilian labor force, by industry, wage or salary income in 1959, and sex, for the U.S.: 1960.
PC(2)–7F	24	Weeks worked in 1959 and color of the experienced labor force, by class of worker, agriculture and nonagricultural industries, and sex, for the U.S.: 1960.

Table 5.A.15 **U.S. Census Weeks Paid Data: 1969**

Population Subject Report	Table	
	Number	Title
PC(2)–6A	22	Employment status by weeks worked in 1969, age, race, Spanish origin, and sex: 1970.
PC(2)–7A	11	Weeks worked in 1969 by the experienced civilian labor force by detailed occupation and sex: 1970.
PC(2)–7A	14	Weeks worked in 1969 by wage and salary workers 16 years old and over in the experienced civilian labor force by the selected occupations and sex: 1970.
PC(2)–7B	6	Weeks worked in 1969 by the experienced civilian labor force, by detailed industry and sex: 1970.
PC(2)–7B	9	Weeks worked in 1969 by wage and salary workers in the experienced civilian labor force by industry and sex: 1970.

Table 5.A.16 Weeks Paid Data for Nonbenchmark Years

Year	SC_1I_{36}	SC_1I_9	SC_1I_8	SA	SO
1948					
1949					
1950			P–50,#35,T–4	P–50,#35,T–1	P–50,#35,T–3
1951			P–50,#43,T–4	P–50,#43,T–1	P–50,#43,T–3
1952			P–50,#48,T–4	P–50,#48,T–1	P–50,#48,T–3
1953		P–50,#54,T–3		P–50,#54,T–1	
1954		P–50,#59,T–B2		P–50,#59,T–1	
1955		P–50,#68,T–2		P–50,#68,T–1	P–50,#68,T–3
1956		P–50,#77,T–2		P–50,#77,T–1	P–50,#77,T–3
1957		P–50,#86,T–B		P–50,#86,T–1	P–50,#86,T–3
1958	P–50,#91,T–2,1			P–50,#91,T–1	P–50,#91,T–3
1959	SLFR,#11,T–B,A			SLFR,#11,T–A	SLFR,#11,T–C
1960	SLFR,#19,T–A2,A1			SLFR,#19,T–A1	SLFR,#19,T–A4,A1
1961	SLFR,#25,T–A2,A3			SLFR,#25,T–A1	SLFR,#25,T–A4,A1
1962	SLFR,#38,T–A2,A3			SLFR,#38,T–A1	SLFR,#38,T–A4,A1
1963	SLFR,#48,T–A2,A3			SLFR,#48,T–A1	SLFR,#58,T–A4,A1
1964	SLFR,#62,T–A2,A3			SLFR,#62,T–A1	SLFR,#62,T–A5,A1
1965	SLFR,#76,T–A2,A3			SLFR,#76,T–A1	SLFR,#76,T–A5,A1
1966	SLFR,#91,T–A2,A3			SLFR,#91,T–A1	SLFR,#91,T–A5,A1
1967	SLFR,#107,T–A2,A3			SLFR,#107,T–A1	SLFR,#107,T–A5
1968	SLFR,#115,T–A2,A3			SLFR,#115,T–A1	SLFR,#115,T–A5
1969	SLFR,#127,T–A2,A3			SLFR,#127,T–A1	SLFR,#127,T–A5
1970	SLFR,#141,T–A2,A3			SLFR,#141,T–A1	SLFR,#141,T–A5
1971	SLFR,#162,T–A2,A3			SLFR,#162,T–A1	SLFR,#162,T–A5
1972	SLFR,#162,T–A2,A3			SLFR,#162,T–A1	SLFR,#162,T–A5
1973	SLFR,#171,T–A2,A3			SLFR,#171,T–A1	SLFR,#171,T–A5
1974	SLFR,#181,T–A2,A3			SLFR,#181,T–A1	SLFR,#181,T–A5
1975	SLFR,#192,T–B2,B3			SLFR,#192,T–B1	SLFR,#192,T–B6
1976	SLFR,#201,T–B2,B3			SLFR,#201,T–B1	SLFR,#201,T–B6
1977	SLFR,#224,T–B2,B3			SLFR,#224,T–A1	SLFR,#224,T–A5
1978	SLFR,#236,T–B2,B3			SLFR,#236,T–A1	SLFR,#236,T–A5

Table 5.A.17 **U.S. Census Labor Compensation Data: 1949**

Population Subject Report	Table Number	Table Title
P-E No. 1B	19	Income in 1949 of the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1950.
P-E No. 1B	22	Wage and salary income in 1949 of wage and salary workers in the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1950.
P-E No. 1D	15	Income in 1949 of the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1950.
P-E No. 1D	17	Wage and salary income in 1949 of wage and salary workers in the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1950.
P-E No. 5B	12	Income in 1949, persons 14 years old and over, by years of school completed, age, color, and sex, for the U.S., by regions: 1950.

Table 5.A.18 **U.S. Census Labor Compensation Data: 1959**

Population Subject Report	Table Number	Table Title
PC(2)-5B	6	Total income—males 14 years old and over with income in 1959, by years of school completed, age, and color, for the U.S., by type of residence, and by regions: 1960.
PC(2)-5B	7	Total income—females 14 years old and over with income in 1959, by years of school completed, age, and color, for the U.S., by type of residence, and by regions: 1960.
PC(2)-5B	9	Occupation and earnings—persons 18 to 64 years old in the experienced civilian labor force with earnings in 1959, by years of school completed, age, and sex, for the U.S.: 1960.
PC(2)-7A	25	Income in 1959 of the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1960.
PC(2)-7A	27	Wage and salary income in 1959 of wage and salary workers in the experienced civilian labor force, by detailed occupation and sex, for the U.S.: 1960.
PC(2)-7F	15	Income in 1959 of the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1960.
PC(2)-7F	17	Wage or salary income in 1959 of wage and salary workers in the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1960.
PC(2)-7F	18	Earnings in 1959 of the experienced civilian labor force, by detailed industry and sex, for the U.S.: 1960.

Table 5.A.19 **U.S. Census Labor Compensation Data: 1969**

Population Subject Report	Table Number	Table Title
PC(2)–5B	7	Total income of males 14 years old and over with income in 1969, by years of school completed, age, and race: 1970.
PC(2)–5B	8	Total income of females 14 years old and over with income in 1969, by years of school completed, age, and race: 1970.
PC(2)–7A	24	Wage and salary earnings in 1969 of wage and salary workers, 16 years old and over, in the experienced civilian labor force, by detailed occupation and sex: 1970.
PC(2)–7B	12	Earnings in 1969 of the experienced civilian labor force by detailed industry and sex: 1970.
PC(2)–7B	16	Earnings in 1969 of the experienced civilian labor force by years of school completed, industry, and sex: 1970.
PC(2)–7B	20	Wage and salary earnings in 1969 of wage and salary workers in the experienced civilian labor force by industry and sex: 1970.
PC(2)–8B	1	Earnings and occupation of total and white males 25 to 64 years old in the experienced civilian labor force with earnings in 1969, by work experience in 1969, years of school completed, and age: 1970.
PC(2)–8B	5	Earnings and occupation of males 18 to 24 years old in the experienced civilian labor force with earnings in 1969, by work experience in 1969, years of school completed, race, and Spanish origin: 1970.
PC(2)–8B	6	Earnings and occupation of males 65 years old and over in the experienced civilian labor force with earnings in 1969, by work experience in 1969, years of school completed, race, and Spanish origin: 1970.
PC(2)–8B	7	Earnings and occupation of total and white females 25 to 64 years old in the experienced labor force with earnings in 1969, by work experience in 1969, years of school completed, and age: 1970.
PC(2)–8B	11	Earnings and occupation of females 18 to 24 years old in the experienced civilian labor force with earnings in 1969, by work experience in 1969, years of school completed, race, and Spanish origin: 1970.

Table 5.A.20 History of Social Security Tax Rates

Year	Maximum Taxable Wages[a] (dollars)	Tax Rate (percentages)		
		Employer	Employee	Self-Employed
	Old-Age, Survivors, Disability, and Health Insurance			
1937–49	3,000	1.0	1.0	[b]
1950	3,000	1.5	1.5	[b]
1951–53	3,600	1.5	1.5	2.25
1954	3,600	2.0	2.0	3.0
1955–56	4,200	2.0	2.0	3.0
1957–58	4,200	2.25	2.25	3.375
1959	4,800	2.5	2.5	3.75
1960–61	4,800	3.0	3.0	4.5
1962	4,800	3.125	3.125	4.7
1963–65	4,800	3.625	3.625	5.4
1966	6,600	4.2	4.2	6.15
1967	6,600	4.4	4.4	6.4
1968	7,800	4.4	4.4	6.4
1969–70	7,800	4.8	4.8	6.9
1971	7,800	5.2	5.2	7.5
1972	9,000	5.2	5.2	7.5
1973	10,800	5.85	5.85	8.0
1974	13,200	5.85	5.85	7.9
1975	14,100	5.85	5.85	7.9
1976	15,300	5.85	5.85	7.9
1977	16,500	5.85	5.85	7.9
1978	17,700	6.05	6.05	8.1

Source: Social Security Administration (1980), p. 35.

[a]Maximum taxable wages is in dollars per year for OASDHI.

[b]Not covered by the program until January 1, 1951.

Table 5.A.21 History of Unemployment Insurance Tax Rates

Year	Covered Wages[a] (dollars)	Statutory Range of Rates[b] (percentages)	Actual Rate Paid[c] (percentages)
	Federal Unemployment Insurance[d]		
1936	All wages	—	1.0
1937	All wages	—	2.0
1938	All wages	—	3.0
1939–60	3,000	—	3.0
1961	3,000	—	3.1
1962	3,000	—	3.5
1963	3,000	—	3.35
1964–69	3,000	—	3.1
1970–71	3,000	—	3.2
1972	4,200	—	3.2
1973	4,200	—	3.28
1974–76	4,200	—	3.2
1977	4,200	—	3.4
1978	6,000	—	3.4

Source: Pechman (1977), p. 312.

[a]Covered wages are in dollars per year for federal unemployment insurance.

[b]For federal unemployment insurance, employers are taxed by the states on the basis of an experience rating determined by past unemployment records. All employers are permitted to take the maximum credit allowed against the federal unemployment tax, even though they may, in fact, pay a lower rate because of a good experience rating. In 1969, the effective tax rate on covered wages ranged from 0.4 percent in Texas and Illinois to 2.9 percent in Alaska (U.S. Congress 1969, p. 183).

[c]For federal unemployment insurance, credit up to 90 percent of the tax is allowed for contributions paid into a state unemployment fund. Beginning in 1961, credits up to 90 percent are computed as if the tax rate were 3 percent.

[d]Applicable to employers of eight persons or more between 1936 and 1956, to employers of four persons or more from 1956 through 1971, and to employers of one person or more in 1972 and later years.

Notes

1. Kendrick purposely avoids disaggregating the employed population by demographic or occupational characteristics. Any difference in the productivity of an hour worked by laborers of differing personal characteristics should, in Kendrick's view, be captured not in a measure of factor input, but in an index of productivity change. By contrast, Denison posits that disaggregation by personal characteristics is essential in measuring labor input. In his view, however, any shifting composition by industrial and occupational characteristics does not reflect changes in the level of labor input, but should be included in the measure of productivity change.

2. Detailed discussions of quality indexes and applications to disaggregated labor data can be found in doctoral dissertations by Barger (1971) and Chinloy (1974). Chinloy (1980, 1981) presents an application to U.S. aggregate data.

3. Kendrick (1961, 1973), relies occasionally on Bureau of Labor Statistics (1973) data on hours paid. See Kendrick (1973), p. 156. In the more recent study, Kendrick and Grossman (1980) rely on BLS hours paid data for all laborers except proprietors and unpaid family workers. See Kendrick and Grossman (1980), p. 25.

Denison (1967, 1974, 1979) begins from the BLS hours paid series when constructing his hours estimates for wage and salary workers. He converts the average hours paid per job to average hours worked per job, using "unpublished BLS ratios of 'hours at work' to 'hours paid for.'" These ratios, extrapolated from data collected for a single year, 1966, were developed by BLS for the 1952–74 period. Based on the trends in the 1952–74 series, Denison (1979) further extrapolates his hours worked series back to 1947 and forward to 1976. See Denison (1979), p. 155.

4. Bureau of Labor Statistics (1971), pp. 214–15.

5. Bureau of the Census (1972), table 5. The Census occupational category for "managers" best identifies the group of nonsupervisory workers underlying BLS estimates. The occupations of nonsupervisory workers are defined in the technical note to Bureau of Labor Statistics [1976], p. 774.

6. Bureau of the Census (1973*c*), table 45. Also see note 5.

7. Denison (1979), pp. 32–33.

8. Bureau of Census (1973*a*), tables 1 and 11.

9. The reader should note that while entries appear in table 5.A.4 for the three benchmark years, these sources are listed only for completeness sake. The data reported in tables 5.A.1 through 5.A.3 are used to generate the 1950, 1960, and 1970 employment matrices.

References

Bacharach, Michael. 1965. Estimating non-negative matrices from marginal data. *International Economic Review* 6, no. 3: 294–310.

Barger, William J. 1971. *The measurement of labor input: U.S. manufacturing industries, 1948–1966*. Ph.D. diss., Harvard University.

Bureau of the Census. 1972. *Census of population: 1970, occupation by industry*. Final Report PC(2)-7C. Washington, D.C.: U.S. Department of Commerce.

———. 1973*a*. *Census of population: 1970, earnings by occupation and education*. Final Report PC(2)-8B. Washington, D.C.: U.S. Department of Commerce.

———. 1973*b*. *Census of population: 1970, industrial characteristics*. Final Report PC(2)-7B. Washington, D.C.: U.S. Department of Commerce.

———. 1973*c*. *Census of population: 1970, occupational characteristics*. Final Report PC(2)-7A. Washington, D.C.: U.S. Department of Commerce.

Bureau of Economic Analysis. 1977. *The national income and product accounts of the United States, 1929–1974: Statistical tables*, Washington, D.C.: Government Printing Office.

Bureau of Labor Statistics. 1963. *Manufacturing industries 1962: Employer expenditures for selected supplementary compensation practices for production and related workers*. Bulletin 1428. Washington, D.C.: U.S. Department of Labor.

———. 1971. *BLS Handbook of methods for surveys and studies*. Bulletin 1711. Washington, D.C.: U.S. Department of Labor.

———. 1973. Historical productivity measures. Working paper (March). Productivity and Technology Division. Washington, D.C.: U.S. Department of Labor.

———. 1976. *Employment and earnings, United States, 1909–75*. Bulletin 1312–10. Washington, D.C.: U.S. Department of Labor.

Chinloy, Peter T. 1974. *Issues in the measurement of labor input*. Ph.D. diss., Harvard University.

———. 1980. Sources of quality change in labor input. *American Economic Review* 70, no. 1: 108–19.

———. 1981. *Labor productivity*. Cambridge, Mass.: Abt Books.

Deming, W. E., and F. F. Stephan. 1940. On least squares adjustment of a sampled frequency table when the expected marginal totals are known. *Annals of Mathematical Statistics* 11: 427–44.

Denison, Edward F. 1961. Measurement of labor input: Some questions of definition and the adequacy of data. In *Output, input, and productivity measurement*. Conference on Research in Income and Wealth, 347–72. Princeton, N.J.: Princeton University Press.

———. 1962. *Sources of economic growth in the United States and the alternatives before us*. New York: The Committee for Economic Development.

———. 1967. *Why growth rates differ*. Washington, D.C.: The Brookings Institution.

———. 1974. *Accounting for United States economic growth: 1929 to 1969*. Washington, D.C.: The Brookings Institution.

———. 1979. *Accounting for slower economic growth: The United States in the 1970's*. Washington, D.C.: The Brookings Institution.

Gollop, Frank M., and Dale W. Jorgenson. 1980. U.S. productivity growth by industry, 1947–73. In *New developments in productivity measurement and analysis*, ed. J. W. Kendrick and B. Vaccara. Confer-

ence on Research in Income and Wealth: Studies in Income and Wealth, vol. 41, 17–136. Chicago: University of Chicago Press for the National Bureau of Economic Research.

Griliches, Zvi. 1960. Measuring inputs in agriculture: A critical survey. *Journal of Farm Economics* 42, no. 4: 1411–27.

Jorgenson, Dale W., and Zvi Griliches. 1967. The explanation of productivity change. *Review of Economic Studies* 34, no. 99: 249–83.

Kendrick, John W. 1961. *Productivity trends in the United States*. Princeton, N.J.: Princeton University Press.

———. 1973. *Postwar productivity trends in the United States, 1948–1969*. New York: National Bureau of Economic Research.

Kendrick, John W., and Elliot S. Grossman. 1980. *Productivity in the United States: Trends and cycles*. Baltimore and London: the Johns Hopkins University Press.

Pechman, Joseph A. 1977. *Federal tax policy*. Rev. ed. Washington, D.C.: The Brookings Institution (1st ed., 1966).

Social Security Administration. 1980. *Social security bulletin, annual statistical supplement, 1977–79*. Washington, D.C.: Government Printing Office.

Stein, Robert L. 1967. New definitions for employment and unemployment. *Employment and Earnings and Monthly Report on the Labor Force* 13, no. 8: 3–27.

Stone, R., and J. A. C. Brown. 1962. *A computable model of economic growth (a programme for growth 1)*. London: Chapman & Hall.

U.S. Congress. House. Committee on Ways and Means. 1969. *Hearings on unemployment compensation*. 91st Cong. 1st sess. October 1–7.

This Page Intentionally Left Blank