



PI⁺ v2.2

**Decomposing Policy Effects On
Employment, Wages, and Prices By
Income Groups**

A table entitled "Income Distribution" is generated for the purpose of evaluating the economic impacts of policies on different compensation and income groups. This documentation discusses the industry and occupation classifications, the economic background, and the operation of this procedure.

Industrial Classification

Annual average U.S. compensation rates for 66 private non-farm sectors are obtained for 2016 from the BEA employment and compensation series. The compensation rates are ranked in ascending order and then divided into five equal groups. The range of annual average compensation rates for the five industry groups are listed below (see Exhibit 1 for a more detailed list):

	Range of Industrial Compensation Rates
Group 1 (First 20%)	\$12,119 - \$ 33,473
Group 2 (Second 20%)	\$36,723 - \$ 48,205
Group 3 (Third 20%)	\$48,338 - \$ 65,954
Group 4 (Fourth 20%)	\$66,810 - \$ 86,332
Group 5 (Fifth 20%)	\$86,565 - \$169,276

Occupational Classification

Median weekly U.S. wage rates for 95 occupations are obtained from the 2016 BLS Employment and Earnings. The wage rates are ranked in ascending order, and then divided into five groups. The range of occupational wage rates are listed below (see Exhibit 2 for a more detailed list):

	Range of Occupational Wage Rates
Group 1 (First 20%)	\$410 - \$536
Group 2 (Second 20%)	\$544 - \$701
Group 3 (Third 20%)	\$713 - \$923
Group 4 (Fourth 20%)	\$926 - \$1093
Group 5 (Fifth 20%)	\$1100 - \$1873

Personal Expenditure Classification

Average annual expenditures for consumers by quintiles or by ranges of income are obtained from the 2016 BLS Consumer Expenditure Survey. The eight income ranges are as follows:

Group	Range
1	<\$15,000
2	\$15,000-\$29,999
3	\$30,000-\$39,999
4	\$40,000-\$49,999
5	\$50,000-\$69,999
6	\$70,000-\$99,999
7	\$100,000-\$149,999
8	\$150,000+

Economic Background

The percentage changes from control forecasts for industrial compensation rates and occupational wage rates, employment, and compensation are reported on the table. Note that the simulation (alternative) forecast must be generated before running the software. For each item, the percentage change is calculated as follows:

Industrial employment:

$$\Delta E_I = \left(\frac{\sum_{j \in I} E_j^a}{\sum_{j \in I} E_j^c} \right) * 100$$

$j = 1, \dots, 66$
 $I = 1, \dots, 5$

where ΔE_I is percentage change of employment for industry group I , and E_j^a and E_j^c are employment for industry j (in group I) from a(alternative) and c(control) forecasts.

Industrial compensation:

$$\Delta WSD_I = \left(\frac{\sum_{j \in I} WSD_j^a}{\sum_{j \in I} WSD_j^c} - 1 \right) * 100$$

$j = 1, \dots, 66$
 $I = 1, \dots, 5$

where ΔWSD_I is percentage change of compensation for industry group I .

Industrial compensation rate:

$$\Delta w_I = \left[\left(\frac{\sum_{j \in I} WSD_j^a}{\sum_{j \in I} E_j^a} \right) / \left(\frac{\sum_{j \in I} WSD_j^c}{\sum_{j \in I} E_j^c} \right) - 1 \right] * 100$$

$j = 1, \dots, 66$
 $I = 1, \dots, 5$

where Δw_I is percentage change of compensation rate for industry group I .

Occupational employment:

$$\Delta OE_I = \left(\frac{\sum_{j \in I} OE_j^a}{\sum_{j \in I} OE_j^c} - 1 \right) * 100$$

$j = 1, \dots, 95$
 $I = 1, \dots, 5$

where ΔOE_I is percentage change of employment for occupation group I , OE_j^a and OE_j^c are employment for occupation j (in group I) from a(alternative) and c(control) forecasts.

Occupational wage bill:

$$\Delta OWSD_I = \left(\frac{\sum_{j \in I} OWSD_j^a}{\sum_{j \in I} OWSD_j^c} - 1 \right) * 100$$

$$j = 1, \dots, 95$$

$$I = 1, \dots, 5$$

Where ΔWSD_I is percentage change of wage bill for occupation group I . The REMI model does not predict the occupational wage bill directly, but the change in occupational wage rate (i.e. $A_{j,t+1} = ow_{j,t+1}/ow_{j,t}$, where $ow_{j,t}$ is wage rate for occupation j at year t). In order to obtain $OWSD$, we apply

$$ow_{j,T+1} = ow_{j,T}^{us} x (A_{j,T+1} + 1)$$

and

$$ow_{j,T+k+1} = ow_{j,T+k} x (A_{j,T+k+1} + 1)$$

for $k > 0$

where the subscript T denotes the last history year, and the superscript us represents the U.S. Then,

$$OWSD_j = OE_j How_j$$

Occupational wage rate:

$$\Delta ow_I = \left[\left(\frac{\sum_{j \in I} OWSD_j^a}{\sum_{j \in I} OE_j^a} \right) / \left(\frac{\sum_{j \in I} OWSD_j^c}{\sum_{j \in I} OE_j^c} \right) - 1 \right] * 100$$

$$j = 1, \dots, 95$$

$$I = 1, \dots, 5$$

where Δow_I is percentage change of wage rate for occupational group I .

In addition, the personal consumer expenditure (PCE) price deflator (PCE-price index) is reported by quintiles or by levels of income. Spending patterns by income are obtained from the 2016 BLS Consumer Expenditure Survey. For each income group, the percentage of spending on 13 major PCE items is multiplied by the corresponding coefficients in the PCE matrix to obtain five vectors, which are the weights ($wght_{j,t}$) for 66 industries. Therefore, the PCE-price index for each income group can be calculated as follows:

$$\Delta CPI_I = \sum_{j=1}^{66} SP_j \chi wghts_{j,t}$$

$$I = 1, \dots, \text{NUM}$$

Exhibit 1: Classification of Industries by 2016 U.S. Compensation Rates

Industry	Average Annual Compensation Rate	Group
1 Forestry and logging; Fishing, hunting, and trapping	\$ 18,200	1
2 Agriculture and forestry support activities	\$ 29,990	1
3 Oil and gas extraction	\$ 40,633	2
4 Mining (except oil and gas)	\$ 66,810	4
5 Support activities for mining	\$ 77,703	4
6 Utilities	\$ 132,222	5
7 Construction	\$ 48,205	2
8 Wood product manufacturing	\$ 48,338	3
9 Nonmetallic mineral product manufacturing	\$ 64,634	3
10 Primary metal manufacturing	\$ 79,751	4
11 Fabricated metal product manufacturing	\$ 63,923	3
12 Machinery manufacturing	\$ 80,889	4
13 Computer and electronic product manufacturing	\$ 130,525	5
14 Electrical equipment and appliance manufacturing	\$ 86,204	4
15 Motor vehicles manufacturing; Motor vehicle bodies and trailers, and parts manufacturing	\$ 77,128	4
16 Other transportation equipment manufacturing	\$ 108,764	5
17 Furniture and related product manufacturing	\$ 49,103	3
18 Miscellaneous manufacturing	\$ 71,753	4
19 Food manufacturing	\$ 54,809	3
20 Beverage and tobacco product manufacturing	\$ 65,110	3
21 Textile mills and Textile product mills	\$ 48,166	2
22 Apparel manufacturing; Leather and allied product manufacturing	\$ 38,294	2
23 Paper manufacturing	\$ 79,885	4
24 Printing and related support activities	\$ 51,698	3
25 Petroleum and coal products manufacturing	\$ 169,276	5
26 Pharmaceutical and Medicine Manufacturing; Other Chemical Manufacturing	\$ 115,997	5
27 Plastics and rubber products manufacturing	\$ 62,605	3
28 Wholesale Trade	\$ 73,886	4
29 Retail Trade	\$ 30,422	1
30 Air transportation	\$ 103,890	5
31 Rail transportation	\$ 124,508	5
32 Water transportation	\$ 94,887	5
33 Truck transportation	\$ 41,461	2
34 Couriers and messengers	\$ 38,438	2
35 Transit and ground passenger transportation	\$ 15,787	1
36 Pipeline transportation	\$ 146,505	5
37 Scenic and sightseeing transportation; support activities	\$ 54,201	3
38 Warehousing and storage	\$ 46,157	2
39 Publishing industries, except Internet	\$ 104,080	5

Industry	Average Annual Compensation Rate	Group
40 Motion picture and sound recording industries	\$ 65,954	3
41 Data processing, hosting, related services, and other information services	\$ 132,441	5
42 Broadcasting, except Internet	\$ 86,565	5
43 Telecommunications	\$ 89,259	5
Monetary authorities - central bank; Credit intermediation and related activities;		
44 Funds, trusts & other financial vehicles	\$ 86,332	4
45 Securities, commodity contracts, investments	\$ 60,897	3
46 Insurance carriers and related activities	\$ 79,024	4
47 Real estate	\$ 12,878	1
48 Rental and leasing services; Lessors of nonfinancial intangible assets	\$ 47,269	2
49 Professional and Technical Services	\$ 68,580	4
50 Management of Companies and Enterprises	\$ 121,528	5
51 Administrative and support services	\$ 33,473	1
52 Waste management and remediation services	\$ 61,909	3
53 Educational Services	\$ 39,242	2
54 Ambulatory health care services	\$ 59,463	3
55 Hospitals	\$ 75,431	4
56 Nursing and residential care facilities	\$ 36,866	2
57 Social assistance	\$ 23,103	1
58 Performing arts and spectator sports	\$ 21,507	1
59 Museums, historical sites, zoos, and parks	\$ 38,836	2
60 Amusement, gambling, and recreation	\$ 27,880	1
61 Accommodation	\$ 36,723	2
62 Food services and drinking places	\$ 22,690	1
63 Repair and maintenance	\$ 29,918	1
64 Personal and laundry services	\$ 12,119	1
65 Membership associations and organizations	\$ 45,798	2
66 Private households	\$ 16,558	1

Exhibit 2: Classification of Occupations by 2016 U.S. Wage Rates

Occupation	Median Weekly Wage Rate	Group
1 Top executives	\$ 1,855	5
2 Advertising, marketing, promotions, public relations, and sales managers	\$ 1,464	5
3 Operations specialties managers	\$ 1,414	5
4 Other management occupations	\$ 1,289	5
5 Business operations specialists	\$ 1,152	5
6 Financial specialists	\$ 1,211	5
7 Computer occupations	\$ 1,459	5
8 Mathematical science occupations	\$ 1,346	5
9 Architects, surveyors, and cartographers	\$ 1,339	5
10 Engineers	\$ 1,613	5
11 Drafters, engineering technicians, and mapping technicians	\$ 971	4
12 Life scientists	\$ 1,264	5
13 Physical scientists	\$ 1,418	5
14 Social scientists and related workers	\$ 1,260	5
15 Life, physical, and social science technicians	\$ 904	3
16 Counselors and Social workers	\$ 905	3
17 Miscellaneous community and social service specialists	\$ 836	3
18 Religious workers	\$ 1,039	4
19 Lawyers, judges, and related workers	\$ 1,873	5
20 Legal support workers	\$ 910	3
21 Postsecondary teachers	\$ 1,247	5
22 Preschool, primary, secondary, and special education school teachers	\$ 987	4
23 Other teachers and instructors	\$ 938	4
24 Librarians, curators, and archivists	\$ 987	4
25 Other education, training, and library occupations	\$ 601	2
26 Art and design workers	\$ 1,100	5
27 Entertainers and performers, sports and related workers	\$ 986	4
28 Media and communication workers	\$ 1,093	4
29 Media and communication equipment workers	\$ 1,020	4
30 Health diagnosing and treating practitioners	\$ 1,363	5
31 Health technologists and technicians	\$ 801	3
32 Other healthcare practitioners and technical occupations	\$ 1,083	4
33 Nursing, psychiatric, and home health aides	\$ 503	1
34 Occupational therapy and physical therapist assistants and aides	\$ 503	1
35 Other healthcare support occupations	\$ 574	2
36 Supervisors of protective service workers	\$ 1,080	4
37 Fire fighting and prevention workers	\$ 1,065	4
38 Law enforcement workers	\$ 946	4
39 Other protective service workers	\$ 609	2
40 Supervisors of food preparation and serving workers	\$ 567	2
41 Cooks and food preparation workers	\$ 438	1

Occupation	Median Weekly Wage Rate	Group
42 Food and beverage serving workers	\$ 478	1
43 Other food preparation and serving related workers	\$ 410	1
44 Supervisors of building and grounds cleaning and maintenance workers	\$ 674	2
45 Building cleaning and pest control workers	\$ 502	1
46 Grounds maintenance workers	\$ 502	1
47 Supervisors of personal care and service workers	\$ 746	3
48 Animal care and service workers	\$ 544	2
49 Entertainment attendants and related workers	\$ 481	1
50 Funeral service workers	\$ 505	1
51 Personal appearance workers	\$ 510	1
52 Baggage porters, bellhops, and concierges; Tour and travel guides	\$ 625	2
53 Other personal care and service workers	\$ 490	1
54 Supervisors of sales workers	\$ 841	3
55 Retail sales workers	\$ 536	1
56 Sales representatives, services	\$ 1,024	4
57 Sales representatives, wholesale and manufacturing	\$ 1,047	4
58 Other sales and related workers	\$ 937	4
59 Supervisors of office and administrative support workers	\$ 848	3
60 Communications equipment operators	\$ 679	2
61 Financial clerks	\$ 680	2
62 Information and record clerks	\$ 635	2
63 Material recording, scheduling, dispatching, and distributing workers	\$ 673	2
64 Secretaries and administrative assistants	\$ 713	3
65 Other office and administrative support workers	\$ 687	2
66 Supervisors of farming, fishing, and forestry workers	\$ 520	1
67 Agricultural workers	\$ 508	1
68 Fishing and hunting workers	\$ 520	1
69 Forest, conservation, and logging workers	\$ 520	1
70 Supervisors of construction and extraction workers	\$ 1,091	4
71 Construction trades workers	\$ 770	3
72 Helpers, construction trades	\$ 623	2
73 Other construction and related workers	\$ 857	3
74 Extraction workers	\$ 996	4
75 Supervisors of installation, maintenance, and repair workers	\$ 1,020	4
76 Electrical and electronic equipment mechanics, installers, and repairers	\$ 901	3
77 Vehicle and mobile equipment mechanics, installers, and repairers	\$ 816	3
78 Other installation, maintenance, and repair occupations	\$ 881	3
79 Supervisors of production workers	\$ 923	3
80 Assemblers and fabricators	\$ 600	2
81 Food processing workers	\$ 525	1
82 Metal workers and plastic workers	\$ 728	3
83 Printing workers	\$ 701	2

Occupation	Median Weekly Wage Rate	Group
84 Textile, apparel, and furnishings workers	\$ 445	1
85 Woodworkers	\$ 668	2
86 Plant and system operators	\$ 904	3
87 Other production occupations	\$ 649	2
88 Supervisors of transportation and material moving workers	\$ 807	3
89 Air transportation workers	\$ 1,324	5
90 Motor vehicle operators	\$ 751	3
91 Rail transportation workers	\$ 1,160	5
92 Water transportation workers	\$ 662	2
93 Other transportation workers	\$ 489	1
94 Material moving workers	\$ 559	2
95 Military	\$ 926	4