



PI⁺ v1.2

**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 2008 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%)	\$ 7,800 - \$25,836
Group 2 (Second 20%)	\$28,941 - \$41,497
Group 3 (Third 20%)	\$42,143 - \$56,521
Group 4 (Fourth 20%)	\$57,318 - \$74,334
Group 5 (Fifth 20%)	\$76,145 - \$153,049

Occupational Classification

Median weekly U.S. wage rates for 94 occupations are obtained from the 2008 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%)	\$341 - \$454
Group 2 (Second 20%)	\$471 - \$599
Group 3 (Third 20%)	\$625 - \$766
Group 4 (Fourth 20%)	\$767 - \$933
Group 5 (Fifth 20%)	\$960 - \$1,604

Personal Expenditure Classification

Average annual expenditures for consumers by quintiles or by ranges of income are obtained from the 2008 BLS Consumer Expenditure Survey. The eight income ranges are as follows:

Group	Range
1	<\$5,000
2	\$5,000-\$9,999
3	\$10,000-\$14,999
4	\$15,000-\$19,999
5	\$20,000-\$29,999
6	\$30,000-\$39,999
7	\$40,000-\$49,999
8	\$50,000+

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:

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

$j = 1, \dots, 94$
 $I = 1, \dots, 5$

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:

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

$$\begin{aligned} j &= 1, \dots, 94 \\ I &= 1, \dots, 5 \end{aligned}$$

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

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

and

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

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:

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

$$\begin{aligned} j &= 1, \dots, 94 \\ I &= 1, \dots, 5 \end{aligned}$$

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 2007 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 2008 U.S. Compensation Rates

	Industry	Average Annual Compensation Rate	Group
1	Forestry et al.	\$ 16,504	1
2	Agriculture	\$ 20,448	1
3	Oil, gas extraction	\$ 54,929	3
4	Mining (except oil, gas)	\$ 60,883	4
5	Support activities for mining	\$ 72,353	4
6	Utilities	\$ 109,204	5
7	Construction	\$ 39,280	2
8	Wood product mfg	\$ 42,169	2
9	Nonmetallic mineral prod mfg	\$ 58,200	3
10	Primary metal mfg	\$ 73,555	4
11	Fabricated metal prod mfg	\$ 57,232	3
12	Machinery mfg	\$ 68,368	4
13	Computer, electronic prod mfg	\$ 102,189	5
14	Electrical equip, appliance mfg	\$ 70,257	4
15	Motor vehicle mfg	\$ 74,766	5
16	Transp equip mfg. exc. motor veh	\$ 89,414	5
17	Furniture, related prod mfg	\$ 43,577	3
18	Miscellaneous mfg	\$ 58,883	4
19	Food mfg	\$ 46,359	3
20	Beverage, tobacco prod mfg	\$ 73,784	4
21	Textile mills	\$ 46,010	3
22	Textile prod mills	\$ 40,346	2
23	Apparel mfg	\$ 35,977	2
24	Leather, allied prod mfg	\$ 43,038	2
25	Paper mfg	\$ 70,792	4
26	Printing, rel supp act	\$ 49,487	3
27	Petroleum, coal prod mfg	\$ 140,676	5
28	Chemical mfg	\$ 100,239	5
29	Plastics, rubber prod mfg	\$ 53,773	3
30	Wholesale trade	\$ 66,586	4
31	Retail trade	\$ 26,714	1
32	Air transportation	\$ 74,441	4
33	Rail transportation	\$ 96,497	5
34	Water transportation	\$ 77,427	5
35	Truck transp; Couriers, msngrs	\$ 35,208	2
36	Transit, ground pass transp	\$ 21,807	1
37	Pipeline transportation	\$ 113,031	5
38	Scenic, sightseeing transp; supp	\$ 48,722	3
39	Warehousing, storage	\$ 43,544	2
40	Publishing, exc Internet	\$ 76,039	5
41	Motion picture, sound rec	\$ 58,761	3

	Industry	Average Annual Compensation Rate	Group
42	Internet serv, data proc, other	\$ 77,663	5
43	Broadcasting, exc Int; Telecomm	\$ 75,357	5
44	Monetary authorities, et al.	\$ 63,291	4
45	Sec, comm contracts, inv	\$ 75,812	5
46	Ins carriers, rel act	\$ 66,067	4
47	Real estate	\$ 10,642	1
48	Rental, leasing services	\$ 36,477	2
49	Prof, tech services	\$ 55,767	3
50	Mgmnt of companies, enterprises	\$ 110,682	5
51	Administrative, support services	\$ 27,279	1
52	Waste mgmnt, remed services	\$ 54,079	3
53	Educational services	\$ 33,421	2
54	Ambulatory health care services	\$ 51,613	3
55	Hospitals	\$ 61,135	4
56	Nursing, residential care facilities	\$ 31,447	2
57	Social assistance	\$ 18,961	1
58	Performing arts, spectator sports	\$ 19,273	1
59	Museums et al.	\$ 34,141	2
60	Amusement, gambling, recreation	\$ 22,298	1
61	Accommodation	\$ 32,291	2
62	Food services, drinking places	\$ 18,266	1
63	Repair, maintenance	\$ 23,821	1
64	Personal, laundry services	\$ 19,271	1
65	Membership assoc, organ	\$ 36,116	2
66	Private households	\$ 7,935	1

Exhibit 2: Classification of Occupations by 2008 U.S. Wage Rates

	Occupation	Median Weekly Wage Rate	Group
1	Top executives	\$ 1,587	5
2	Advertising, marketing, promotions,	\$ 1,321	5
3	Operations specialties managers	\$ 1,205	5
4	Other management occupations	\$ 1,110	5
5	Business operations specialists	\$ 982	4
6	Financial specialists	\$ 1,013	5
7	Computer specialists	\$ 1,254	5
8	Mathematical science occupations	\$ 1,259	5
9	Architects, surveyors, and cartogra	\$ 1,128	5
10	Engineers	\$ 1,409	5
11	Drafters, engineering, and mapping	\$ 884	4
12	Life scientists	\$ 1,004	5
13	Physical scientists	\$ 1,251	5
14	Social scientists and related occup	\$ 1,136	5
15	Life, physical, and social science	\$ 794	4
16	Counselors, social workers	\$ 785	3
17	Misc community and social service s	\$ 736	3
18	Religious workers	\$ 853	4
19	Lawyers, judges, and related worker	\$ 1,717	5
20	Legal support workers	\$ 773	3
21	Postsecondary teachers	\$ 1,149	5
22	Primary, secondary, and special edu	\$ 875	4
23	Other teachers and instructors	\$ 858	4
24	Librarians, curators, and archivist	\$ 878	4
25	Other education, training, and libr	\$ 487	2
26	Art and design occupations	\$ 832	4
27	Entertainers and performers, sports	\$ 879	4
28	Media and communication occupations	\$ 969	4
29	Media and communication equipment o	\$ 837	4
30	Health diagnosing and treating prac	\$ 1,187	5
31	Health technologists and technician	\$ 733	3
32	Other healthcare practitioners and	\$ 671	3
33	Nursing, psychiatric, and home heal	\$ 429	1
34	Occupational and physical therapist	\$ 465	1
35	Other healthcare support occupation	\$ 511	2
36	First-line supervisors/managers, pr	\$ 1,071	5
37	Fire fighting and prevention worker	\$ 970	4
38	Law enforcement workers	\$ 848	4
39	Other protective service workers	\$ 533	2
40	Supervisors, food preparation and s	\$ 517	2
41	Cooks and food preparation workers	\$ 382	1

Occupation	Median Weekly Wage Rate	Group
42 Food and beverage serving workers	\$ 402	1
43 Other food preparation and serving	\$ 376	1
44 Supervisors, building and grounds c	\$ 642	2
45 Building cleaning and pest control	\$ 435	1
46 Grounds maintenance workers	\$ 420	1
47 Supervisors, personal care and serv	\$ 705	3
48 Animal care and service workers	\$ 475	1
49 Entertainment attendants and relate	\$ 543	2
50 Funeral service workers	\$ 475	1
51 Personal appearance workers	\$ 486	1
52 Transportation, tourism, and lodgin	\$ 669	3
53 Other personal care and service wor	\$ 430	1
54 Supervisors, sales workers	\$ 721	3
55 Retail sales workers	\$ 461	1
56 Sales representatives, services	\$ 901	4
57 Sales representatives, wholesale an	\$ 986	5
58 Other sales and related workers	\$ 722	3
59 Supervisors, office and administrat	\$ 731	3
60 Communications equipment operators	\$ 601	2
61 Financial clerks	\$ 584	2
62 Information and record clerks	\$ 559	2
63 Material recording, scheduling, dis	\$ 625	2
64 Secretaries and administrative assi	\$ 616	2
65 Other office and administrative sup	\$ 601	2
66 Supervisors, farming, fishing, and	\$ 420	1
67 Agricultural workers	\$ 401	1
68 Fishing and hunting workers	\$ 420	1
69 Forest, conservation, and logging w	\$ 420	1
70 Supervisors, construction and extra	\$ 947	4
71 Construction trades and related wor	\$ 663	3
72 Helpers, construction trades	\$ 504	2
73 Other construction trades and relat	\$ 749	3
74 Extraction workers	\$ 688	3
75 Supervisors of installation, mainte	\$ 937	4
76 Electrical and electronic equipment	\$ 828	4
77 Vehicle and mobile equipment mechan	\$ 736	3
78 Other installation, maintenance, an	\$ 793	3
79 Supervisors, production workers	\$ 857	4
80 Assemblers and fabricators	\$ 527	2
81 Food processing occupations	\$ 470	1
82 Metal workers and plastic workers	\$ 664	3
83 Printing occupations	\$ 631	2

Occupation	Median Weekly Wage Rate	Group
84 Textile, apparel, and furnishings o	\$ 374	1
85 Woodworkers	\$ 641	2
86 Plant and system operators	\$ 828	4
87 Other production occupations	\$ 582	2
88 Supervisors, transportation and mat	\$ 761	3
89 Air transportation occupations	\$ 1,390	5
90 Motor vehicle operators	\$ 674	3
91 Rail transportation occupations	\$ 1,145	5
92 Water transportation occupations	\$ 593	2
93 Other transportation workers	\$ 401	1
94 Material moving occupations	\$ 498	2