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Updated employment multipliers for the U.S. economy

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SECTIONS

Summary

When it comes to the ripple effects that spread to the rest of the labor market, one lost dollar of economic output or one lost job is not the same as another.

Each industry has *backward linkages* to economic sectors that provide the materials needed for the industry's output, and each industry has *forward linkages* to the economic sectors where the industry's workers spend their income. Therefore, in addition to the jobs directly supported by an industry, a large number of indirect jobs may also be supported by that industry. The subtraction (or addition) of jobs and output in industries with strong backward and forward linkages to other economic sectors can cause large ripple effects.

This brief calculates *employment multipliers* by industry to illustrate the importance of these linkages, updating earlier work by Bivens (2003) and Baker and Lee (1993). Employment multipliers measure how the creation or destruction of output or employment in a particular industry translates into wider employment changes throughout the economy.

Background and findings

Production in a given economic sector involves *linkages* with other sectors—that is, production in one industry depends on suppliers in other industries (*backward linkages*), while wages earned in the production and supplier sectors are spent in other economic sectors (*forward linkages*). In the case of automobile production, there are backward linkages to industries that produce tires, glass for windshields, and steel for automobile frames (among many others). Forward linkages occur when automobile workers (and suppliers' employees) spend their income in restaurants and retail stores and at the doctor (to name just a few).

Industries that are heavy users of materials are vital to their suppliers. If an automobile factory were to close, its suppliers in the glass, steel, and rubber industries would

have a big hole to fill in demand for their own output. Industries that pay higher wages are vital to their forward-linked industries. If a steel factory closed, surrounding restaurants and retail malls would also have a big hole to fill in demand for their output.

There are two obvious ways to measure how intensive an industry's backward and forward linkages are to the rest of the economy. The first estimates the ripple effects of a given *number of jobs* being lost directly in an industry. In this case, the *direct* job loss is assumed to be, say, 100, and then the resulting backward and forward ripple effects can be estimated. The second takes a given *dollar value* of final demand for an industry's output and calculates how much of this final demand spills over into backward- and forward-linked industries. An example would be assessing the impact of a fall of $1 million in final demand for autos (that is, $1 million less being spent on cars by consumers). This fall in final demand would cost jobs directly in the auto production industry, but would also cause demand to fall in supplier industries and in forward-linked industries that rely on automobile workers (and on workers in the supplier industries) to purchase their output. With the right data, researchers can empirically estimate the number of jobs lost in each link of these chains.

There are virtues and drawbacks to both the output and the employment measures as the bases of employment multipliers (as discussed in the methodology appendix); this paper presents estimates using both measures.

Examples: Employment multipliers by jobs lost or by output lost

Would the closing of a factory that manufactures durable goods and employs 1,000 people have a greater impact on the overall economy than the closing of a retail shopping mall that employs 1,000 people? The direct impacts (1,000 jobs lost) are the same; employment multipliers can show us what the total indirect effects will be. As seen in **Table 1**, the number of indirect jobs lost for every 100 direct jobs lost are 744.1 for durable manufacturing and 122.1 for retail trade. Therefore, the estimated total number of indirect jobs lost if the auto factory closed would be 7,441; the estimated indirect job loss if the shopping mall closed would be 1,221.

We use a similar example to look at the question from a different angle: What are the effects on jobs when the demand for output drops by a certain amount? Specifically, would the disappearance of $1 million in final demand for output from factories producing durable goods have the same aggregate jobs impact as the disappearance of $1 million in retail? In this case, the direct jobs lost in durable manufacturing stemming from a $1 million reduction in final demand would be smaller—about two jobs in durable goods manufacturing compared with about 10 jobs in retail. (See **Table 2**, "durable manufacturing" and "retail

trade" rows.) This is because durable goods production is far more productive than retail and hence fewer direct jobs are needed per dollar of output. However, the backward and forward linkages for durable goods cause this direct output loss to ripple far more widely throughout the job market. The employment multipliers in Table 1 show a total of 16.5 indirect jobs lost per $1 million drop in demand for durable manufacturing, compared with 10.6 indirect jobs lost for the same demand drop in retail. This means that, while direct job loss is much lower in durable manufacturing, total job loss (including both indirect and direct jobs) for a $1 million drop in demand is similar in durable manufacturing and retail (18.3 and 20.5, respectively).

The summary findings for major industry groups are provided in Tables 1 and 2. The appendix describes our methodology in detail, and **Appendix Tables A1** and **A2** provide the employment multipliers for all 179 industries tracked by the data sources we use in this paper. Finally, an accompanying spreadsheet providing the raw data is being released with this paper for those interested in exploring the multipliers.[2]

Conclusion

An understanding of employment multipliers—the degree of backward and forward linkages that exists between industries—may often be useful to policymakers and analysts. As an example, the three largest U.S. automobile firms (General Motors, Ford, and Chrysler) directly employ substantially less than 200,000 workers in the United States. Yet it was widely (and correctly) considered imperative among policymakers to not let these firms fail and become casualties of the financial crisis of late 2008. This belief from policymakers was driven by the fully rational fear that the substantial backward and forward linkages from auto assembly jobs would be large enough to cause mammoth ripple effects throughout the economy. Without understanding the scope of these effects, this decision would be harder to understand.

This report makes these linkages concrete and measurable by calculating employment multipliers two ways and provides estimates for 179 private-sector industries. It also provides a methodology and accompanying spreadsheet to allow others to experiment with calculations.

Acknowledgments

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Table 1

Employment multipliers per 100 direct jobs, by major private-sector industry group

Major industry group	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
Agriculture, forest, fishing, and hunting	100	93.6	134.8	228.5
Mining	100	224.0	166.0	390.0
Utilities	100	515.4	442.2	957.7
Construction	100	88.0	138.1	226.1
Durable manufacturing	100	289.1	454.9	744.1
Nondurable manufacturing	100	184.8	329.5	514.3
Wholesale trade	100	107.3	128.0	235.3
Retail trade	100	46.7	75.4	122.1
Transportation and warehousing	100	112.8	163.3	276.0
Information	100	252.0	321.1	573.1
Finance and insurance	100	149.7	214.7	364.4
Real estate and rental leasing	100	396.6	483.1	879.7
Professional, scientific, and technical services	100	142.1	276.2	418.3
Management of companies	100	144.4	255.4	399.9
Administrative and support services and waste management	100	45.5	89.1	134.5
Educational services	100	63.8	129.9	193.7
Health care and social assistance	100	69.4	136.2	205.6
Arts, entertainment, and recreation	100	123.3	255.2	378.5
Accommodation and food services	100	53.8	107.4	161.2
Other services (except public administration)	100	70.7	139.6	210.3

* Includes materials and capital services supplier jobs

** Includes jobs supported by respending of income from direct jobs and supplier jobs, as well as public-sector jobs supported by tax revenue

Notes: See methods appendix for derivation. The industry-specific multipliers from Appendix Table A1 are weighted and summed across industries within major industry groups to get the multipliers in this table. For the per-100-jobs multipliers, the weight used is hours of work (weights are included in the Bureau of Labor Statistics Employment Requirements Matrices data).

Source: EPI analysis of data from the Bureau of Labor Statistics (BLS) Employment Requirements Matrices, the BLS Current Employment Statistics program, and the Bureau of Economic Analysis GDP-by-industry accounts

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Table 2

Employment multipliers per $1 million in final demand, by major private-sector industry group

Major industry group	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
Agriculture, forest, fishing, and hunting	5.9	5.4	4.8	10.1
Mining	1.3	3.4	2.5	5.9
Utilities	1.0	4.5	5.9	10.4
Construction	5.5	4.8	6.1	10.9
Durable manufacturing	1.8	4.9	11.6	16.5
Nondurable manufacturing	2.6	4.3	10.4	14.7
Wholesale trade	3.8	4.1	4.3	8.4
Retail trade	9.9	4.6	6.1	10.6
Transportation and warehousing	4.7	5.4	6.0	11.3
Information	2.0	4.5	6.4	10.9
Finance and insurance	3.1	4.7	6.2	10.8
Real estate and rental leasing	1.4	5.4	17.2	22.6
Professional, scientific, and technical services	4.3	4.8	10.4	15.3
Management of companies	3.6	5.2	7.2	12.4
Administrative and support services and waste management	10.6	5.0	8.1	13.1
Educational services	9.1	5.4	9.2	14.6
Health care and social assistance	7.8	5.3	8.2	13.5
Arts, entertainment, and recreation	6.5	6.5	16.0	22.5
Accommodation and food services	11.5	6.3	7.0	13.2
Other services (except public administration)	8.7	5.3	8.7	14.0

* Includes materials and capital services supplier jobs

** Includes jobs supported by respending of income from direct jobs and supplier jobs, as well as public-sector jobs supported by tax revenue

Notes: See methods appendix for derivation. The industry-specific multipliers from Appendix Table A2 are weighted and summed across industries within major industry groups to get the multipliers in this table. For the per-$1-million multipliers, the weight used is an output weight (weights are included in the Bureau of Labor Statistics Employment Requirements Matrices data).

Source: EPI analysis of data from the Bureau of Labor Statistics (BLS) Employment Requirements Matrices, the BLS Current Employment Statistics program, and the Bureau of Economic Analysis GDP-by-industry accounts

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Appendix: Data methods for calculating employment multipliers, per dollar and per job

In this report, I estimate two broad categories of indirect job impacts that are spurred by direct employment changes in a given industry: supplier jobs and induced (or respending) jobs (including public-sector jobs). The first category (supplier jobs) defines the backward linkages of an industry. Induced jobs define forward linkages. The total of these influences make up the "employment multiplier."

I calculate the employment multipliers on two different bases: per each 100 jobs in an industry and per each $1 million of final demand for an industry's output.

Supplier jobs

Supplier jobs are generally the most intuitive category of indirect employment changes. Put simply, when jobs are lost in one industry, the industries that provide inputs and materials also suffer losses. Take a concrete example: When coal-mining activity shrinks, it leads to a reduction in demand for industries that provide inputs to coal mining, such as those that provide safety equipment, industrial equipment, and/or transportation equipment and services.

Supplier job estimates can be calculated directly from the employment requirements matrices (ERM) provided by the Bureau of Labor Statistics (BLS). The BLS ERM shows how many jobs are supported by $1 million in final demand in a given industry, jobs both in the industry directly satisfying the final demand as well as ones supplying inputs. For example, each $1 million in final demand for construction services supports jobs in the construction industry, but also supports jobs in concrete production, bulldozer manufacturing, and accounting services. The ERM tracks how many jobs in these supplier industries are supported by each $1 million in construction services purchased.

Materials supplier jobs

To obtain materials supply jobs per each $1 million in final demand, I sum up all rows in the column vector from the ERM, and then subtract out the direct jobs. For construction, I simply sum all nonconstruction entries in the column vector from the ERM.

Because the ERM is set up in terms of dollar flows rather than job flows, translating a given direct employment impact into an effect on supplier jobs requires a small manipulation. Specifically, I take the ratio of jobs supported by a given amount of spending in an industry that are supplier jobs to direct jobs, and then multiply this ratio by the number of direct jobs identified in the ERM. The estimate for supplier jobs supported by each 100 direct jobs in a given industry is calculated using the following equation (with the subscript "total"

representing the sum of direct and material supplies jobs):

$$((ER_{total} - ER_{direct})/ER_{direct}) * 100$$

Even these most basic statistics, derived directly with very little manipulation from the BLS ERM, indicate why using two separate bases for the employment multiplier (per 100 jobs or per $1 million of final demand) might be helpful. Take, for instance, the comparison of *per-job* estimates in two industries—one in which each $1 million in final demand is associated with just one direct job in the industry, but 10 jobs in the materials supplier industries, and another where this split is five direct jobs to six materials supplier jobs. In this case, the sum of direct and material supply jobs in these industries is identical per each $1 million (11 jobs). But comparing them on a *per-job* basis is comparing two very different flows of final demand. In the industry with only one direct job per $1 million of final demand, it takes $100 million in final demand to support 100 direct jobs. But in the industry with five direct jobs per $1 million it takes only $20 million to support 100 direct jobs.

This example might make it seem as if the per-job measure is less useful generally. But that's not necessarily the case. Media reports of plant closings, for example, often report the number of jobs, not the economic output, that will be lost to a local community. Rather than having to guess at the output loss, the per-job multipliers in this report can be used by industry analysts to get an estimate of the economic ripple effects of these losses.

Capital services supplier jobs

One weakness of the BLS ERM is that it does not account for the depreciation of capital goods (plant, equipment, and structures) that is caused by production. This could have nontrivial impacts on jobs supported in capital-intensive industries. Further, because capital-intensive industries often have quite small numbers of direct jobs associated with a dollar of output, not accounting for the capital services supplies to these industries could greatly underestimate their overall effect on the economy.

To correct this failure to account for capital services supplies, I estimate the number of jobs associated with producing the capital goods that would be needed to replace the amount of depreciation associated with each $1 million in final demand and for each 100 direct jobs in an industry.

I first estimate the value of capital services used in each industry's production. To do this, I use data from the Bureau of Economic Analysis (BEA) on gross domestic product by industry. The KLEMS measures from this data (capital, labor, energy, materials, and suppliers) provide an estimate of the capital share of industry output (that is, the share of income generated by each industry that goes to pay owners of capital goods rather than workers or suppliers). Combining industry output (obtained from the BLS ERM data) with the capital share of output provides an estimate of the amount of new capital goods that must be produced each period to replace this capital service flow. Essentially, capital-intensive industries will have to spend more money to replace capital services that are used up during production. Based on ratios that approximately reflect the economywide

division of aggregate capital investment to structures versus equipment, I assume that 40 percent of this total spending flows into construction to replace new structures and that 60 percent flows into equipment manufacturing to replace machinery. I then use the ERM to calculate how many jobs are associated with the production of this structure and equipment investment. This provides my estimate of the number of capital supplier jobs associated with each $1 million in final demand for an industry.

To get a number on capital supplier jobs associated with each direct job in an industry, I make a small manipulation of the data. The first expression, in parentheses, shows how output (measured in dollars) per each 100 workers in a given industry can be calculated. This output measure is then multiplied by the capital share to give the expression for depreciation (or capital service inputs) associated with each 100 jobs in an industry.

$$\left(\frac{\$1{,}000{,}000}{ER_{direct}}\right) * 100 * Capital\ share\ of\ output = Depreciation$$

This measure of depreciation is then used to estimate industry capital demand. From here, the formula for supplier jobs to replace the depreciation involved with every 100 direct jobs in a given industry is:

$$ER_{total\_equipment} * \left(\frac{Depreciation}{\$1{,}000{,}000}\right) * 0.6 + ER_{structures} * \left(\frac{Depreciation}{\$1{,}000{,}000}\right) * 0.4$$

Induced jobs

Another category of indirect jobs concerns those that are supported by the demand that relies on the wage and salary income of both direct jobs and supplier jobs. These jobs define the forward linkages from an industry's output. For example, a job at a construction site also supports jobs in restaurants and diners where construction workers eat, grocery stores where they shop for food, and doctors' offices where they pay for medical services. Public-sector jobs, supported by workers' taxes, also fall into this category.

Jobs supported by respending of income from direct jobs and supplier jobs

The scale of induced jobs supported by each $1 million in final demand or 100 direct jobs in a given industry depends on the overall "respending multiplier," or how much of a worker's earnings are spent on consumption goods. Bivens (2003) reviews evidence on this multiplier and takes 0.5 as a conservative estimate of this effect.[1] Induced jobs also depend on the relative wages of both direct and supplier industries. As an example, if automobile assembly jobs have wages that are 50 percent higher than the economywide average wage, this would lead to spending induced by each 100 jobs in that industry that is 50 percent higher than the economywide average, making the induced spending multiplier this much higher. Further, if the supplier jobs supported by automobile assembly (steel, iron, glass, etc.) pay higher-than-average wages, then this will also increase the induced spending multiplier for the automobile assembly industry.

In this paper, I index hourly wages by industry to establish an economywide average (weighted by hours worked, obtained from the BLS ERM data) equal to 1.0. From here, one can express the induced jobs supported by each $1 million in final demand or 100 direct jobs in an industry as simply 100 times the index of average hourly wages in the industry times 0.5 (our respending multiplier).

For supplier jobs, I multiply the (179 industries) vector of supplier jobs associated with a given $1 million in final demand or 100 direct jobs in the industry by each industry's average hourly wage index, multiply by 0.5 (the respending multiplier), and then sum to estimate the induced spending from *supplier* jobs associated with final demand or direct employment in a given industry.

Public-sector jobs supported by tax revenue

Finally, we can estimate another forward linkage—the number of public-sector jobs (federal, state, and local) associated with each $1 million in final demand or 100 direct jobs in an industry. This measure differs across industries based on the relative wage of the industry. To generate the inputs for this calculation, I multiply each industry's hourly wage by 2,000 to express it as a full-time, full-year salary. For federal taxes, I multiply this figure by 0.2, and for state and local taxes, by 0.1. These provide rough measures of the federal tax revenue and the state and local tax revenue supported by each job in an industry.

I then use BEA data on tax receipts from federal, state, and local governments and BLS CES data on employment counts in these governments to measure how much tax revenue is required to support a public-sector employee in federal employment and how much tax revenue is required to support a public-sector employee in state and local government employment. For each of these two categories of public-sector employment (federal; state and local), I divide the tax revenue generated by each $1 million in final demand or 100 direct jobs in a given industry by this per-employee wage bill, and then sum the two totals, to get a measure of total public-sector employment generated.

Appendix Table A1

Employment multipliers per 100 direct jobs, all private-sector industries

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
Agriculture, forest, fishing, and hunting					
1	Crop production	100.0	74.4	55.2	129.6
2	Animal production and aquaculture	100.0	112.4	68.0	180.4
3	Forestry	100.0	285.7	124.3	410.0
4	Logging	100.0	150.1	88.1	238.2
5	Fishing, hunting, and trapping	100.0	116.5	59.2	175.7
6	Support activities for agriculture and forestry	100.0	79.7	51.2	130.9
Mining					
7	Oil and gas extraction	100.0	376.0	161.3	537.3
8	Coal mining	100.0	330.8	169.6	500.4
9	Metal ore mining	100.0	318.2	154.7	472.9
10	Nonmetallic mineral mining and quarrying	100.0	138.4	96.6	235.0
11	Support activities for mining	100.0	121.4	105.4	226.9
Utilities					
12	Electric power generation, transmission, and distribution	100.0	399.1	165.2	564.3
13	Natural gas distribution	100.0	456.5	182.3	638.8
14	Water, sewage, and other systems	100.0	1,561.7	301.8	1,863.5
Construction					
15	Construction	100.0	88.0	89.6	177.6
Nondurable manufacturing					
16	Animal food manufacturing	100.0	688.1	290.6	978.7
17	Grain and oilseed milling	100.0	1,064.1	424.8	1,488.9
18	Sugar and confectionery product manufacturing	100.0	212.9	118.4	331.3
19	Fruit and vegetable preserving and specialty food manufacturing	100.0	269.4	143.4	412.8

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
20	Dairy product manufacturing	100.0	559.4	255.4	814.9
21	Animal slaughtering and processing	100.0	254.7	126.3	380.9
22	Seafood product preparation and packaging	100.0	134.3	84.6	218.9
23	Bakeries and tortilla manufacturing	100.0	170.5	100.1	270.6
24	Other food manufacturing	100.0	335.9	158.3	494.2
25	Beverage manufacturing	100.0	314.7	159.1	473.8
26	Tobacco manufacturing	100.0	3,394.0	646.2	4,040.2
27	Textile mills and textile product mills	100.0	109.9	94.2	204.1
28	Apparel, leather, and allied product manufacturing	100.0	168.4	122.8	291.2
29	Sawmills and wood preservation	100.0	177.8	112.1	289.9
30	Veneer, plywood, and engineered wood product manufacturing	100.0	137.0	103.2	240.2
31	Other wood product manufacturing	100.0	97.3	86.2	183.5
32	Pulp, paper, and paperboard mills	100.0	468.3	218.3	686.6
33	Converted paper product manufacturing	100.0	186.3	132.7	319.0
34	Printing and related support activities	100.0	92.1	91.3	183.4
35	Petroleum and coal products manufacturing	100.0	945.9	504.7	1,450.7
36	Basic chemical manufacturing	100.0	822.0	329.1	1,151.1
37	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	100.0	635.7	321.9	957.6
38	Pesticide, fertilizer, and other agricultural chemical manufacturing	100.0	510.0	220.0	730.0
39	Pharmaceutical and medicine manufacturing	100.0	394.4	180.4	574.8
40	Paint, coating, and adhesive manufacturing	100.0	294.7	175.8	470.5
41	Soap, cleaning compound, and toilet preparation manufacturing	100.0	360.1	134.9	495.1
42	Other chemical product and preparation manufacturing	100.0	262.6	174.1	436.6
43	Plastics product manufacturing	100.0	167.3	111.0	278.3

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
44	Rubber product manufacturing	100.0	143.5	102.4	245.9
Durable manufacturing					
45	Clay product and refractory manufacturing	100.0	78.6	80.7	159.3
46	Glass and glass product manufacturing	100.0	126.0	96.0	222.0
47	Cement and concrete product manufacturing	100.0	105.5	90.4	195.9
48	Lime, gypsum, and other nonmetallic mineral product manufacturing	100.0	173.7	106.6	280.3
49	Iron and steel mills and ferroalloy manufacturing	100.0	618.2	305.6	923.7
50	Steel product manufacturing from purchased steel	100.0	849.4	439.7	1,289.1
51	Alumina and aluminum production and processing	100.0	214.3	145.0	359.2
52	Nonferrous metal (except aluminum) production and processing	100.0	306.5	169.8	476.2
53	Foundries	100.0	106.6	91.6	198.2
54	Forging and stamping	100.0	186.9	129.3	316.2
55	Cutlery and handtool manufacturing	100.0	166.9	118.1	285.1
56	Architectural and structural metals manufacturing	100.0	115.7	100.3	216.0
57	Boiler, tank, and shipping container manufacturing	100.0	172.6	124.8	297.4
58	Hardware manufacturing	100.0	161.6	118.9	280.5
59	Spring and wire product manufacturing	100.0	132.7	111.5	244.2
60	Machine shops; turned product; and screw, nut, and bolt manufacturing	100.0	85.5	87.8	173.4
61	Coating, engraving, heat treating, and allied activities	100.0	91.5	80.5	172.0
62	Other fabricated metal product manufacturing	100.0	139.1	107.9	247.0
63	Agriculture, construction, and mining machinery manufacturing	100.0	248.3	166.7	415.0
64	Industrial machinery manufacturing	100.0	155.1	149.2	304.4
65	Commercial and service industry machinery manufacturing	100.0	215.1	154.0	369.1
66	HVAC equipment manufacturing	100.0	157.8	111.1	268.9

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
67	Metalworking machinery manufacturing	100.0	107.9	105.2	213.1
68	Engine, turbine, and power transmission equipment manufacturing	100.0	275.3	186.9	462.2
69	Other general purpose machinery manufacturing	100.0	200.3	142.4	342.7
70	Computer and peripheral equipment manufacturing	100.0	56.3	102.5	158.8
71	Communications equipment manufacturing	100.0	128.4	128.5	256.9
72	Audio and video equipment manufacturing	100.0	155.4	117.1	272.5
73	Semiconductor and other electronic component manufacturing	100.0	92.9	99.3	192.2
74	Navigational, measuring, electromedical, and control instruments manufacturing	100.0	158.7	129.7	288.4
75	Manufacturing and reproducing magnetic and optical media	100.0	123.7	137.7	261.4
76	Electric lighting equipment manufacturing	100.0	124.2	120.7	244.9
77	Household appliance manufacturing	100.0	141.8	124.5	266.3
78	Electrical equipment manufacturing	100.0	117.8	104.8	222.6
79	Other electrical equipment and component manufacturing	100.0	166.8	114.5	281.3
80	Motor vehicle manufacturing	100.0	935.8	492.1	1,428.0
81	Motor vehicle body and trailer manufacturing	100.0	251.1	180.6	431.7
82	Motor vehicle parts manufacturing	100.0	209.8	161.2	371.0
83	Aerospace product and parts manufacturing	100.0	180.2	156.0	336.2
84	Railroad rolling stock manufacturing	100.0	229.6	186.3	415.9
85	Ship and boat building	100.0	113.9	114.9	228.8
86	Other transportation equipment manufacturing	100.0	342.1	206.7	548.8
87	Household and institutional furniture and kitchen cabinet manufacturing	100.0	74.7	75.3	150.0
88	Office furniture (including fixtures) manufacturing	100.0	124.9	92.0	217.0
89	Other furniture-related product manufacturing	100.0	163.0	107.5	270.6
90	Medical equipment and supplies manufacturing	100.0	153.2	108.3	261.4

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
91	Other miscellaneous manufacturing	100.0	160.4	116.8	277.2
Wholesale trade					
92	Wholesale trade	100.0	107.3	95.1	202.5
Retail trade					
93	Motor vehicle and parts dealers	100.0	52.2	64.6	116.8
94	Food and beverage stores	100.0	30.6	40.6	71.2
95	General merchandise stores	100.0	30.7	42.6	73.4
96	Other retail	100.0	57.9	57.6	115.5
Transportation and warehousing					
97	Air transportation	100.0	161.3	116.5	277.8
98	Rail transportation	100.0	161.6	100.1	261.7
99	Water transportation	100.0	545.5	228.4	773.9
100	Truck transportation	100.0	108.2	83.1	191.3
101	Transit and ground passenger transportation	100.0	109.9	61.3	171.3
102	Pipeline transportation	100.0	218.5	99.3	317.8
103	Scenic and sightseeing transportation and support activities for transportation	100.0	134.5	87.9	222.4
104	Couriers and messengers	100.0	84.5	72.6	157.1
105	Warehousing and storage	100.0	53.2	58.5	111.7
Information					
106	Newspaper, periodical, book, and directory publishers	100.0	154.7	113.6	268.3
107	Software publishers	100.0	193.6	180.3	373.8
108	Motion picture, video, and sound recording industries	100.0	96.5	96.4	192.9
109	Radio and television broadcasting	100.0	195.3	141.2	336.5
110	Cable and other subscription programming	100.0	711.8	314.1	1,025.9

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
111	Wired telecommunications carriers	100.0	284.0	161.7	445.7
112	Wireless telecommunications carriers (except satellite)	100.0	936.9	374.2	1,311.1
113	Satellite, telecommunications resellers, and all other telecommunications	100.0	266.7	171.9	438.6
114	Data processing, hosting, and related services	100.0	337.3	233.0	570.3
115	Other information services	100.0	218.0	164.5	382.5
Finance and insurance					
116	Monetary authorities, credit intermediation, and related activities	100.0	112.7	100.4	213.1
117	Securities, commodity contracts, funds, trusts, and related activities	100.0	293.6	216.4	510.0
118	Insurance carriers	100.0	189.4	146.4	335.8
119	Agencies, brokerages, and other insurance related activities	100.0	63.2	88.8	152.0
Real estate and rental leasing					
120	Real estate	100.0	382.0	165.9	547.9
121	Automotive equipment rental and leasing	100.0	376.3	194.3	570.6
122	Consumer goods rental and general rental centers	100.0	150.1	96.0	246.1
123	Commercial and industrial machinery and equipment rental and leasing	100.0	344.9	178.9	523.8
124	Lessors of nonfinancial intangible assets (except copyrighted works)	100.0	4,374.7	1,625.0	5,999.7
Professional, scientific, and technical services					
125	Legal services	100.0	89.2	111.3	200.5
126	Accounting, tax preparation, bookkeeping, and payroll services	100.0	52.0	81.3	133.4
127	Architectural, engineering, and related services	100.0	90.0	114.1	204.1
128	Specialized design services	100.0	67.5	97.4	164.9
129	Computer systems design and related services	100.0	134.1	149.3	283.4
130	Management, scientific, and technical consulting services	100.0	91.1	116.5	207.6
131	Scientific research and development services	100.0	519.3	323.7	842.9
132	Advertising, public relations, and related services	100.0	460.9	270.7	731.6

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
133	Other professional, scientific, and technical services	100.0	70.8	83.6	154.3
Management of companies					
134	Management of companies and enterprises	100.0	144.4	138.6	283.1
Administrative and support services and waste management					
135	Office administrative services	100.0	51.9	88.4	140.3
136	Facilities support services	100.0	140.2	96.5	236.7
137	Employment services	100.0	31.3	50.1	81.4
138	Business support services	100.0	54.6	62.2	116.7
139	Travel arrangement and reservation services	100.0	133.7	106.3	240.0
140	Investigation and security services	100.0	30.8	47.0	77.9
141	Services to buildings and dwellings	100.0	29.8	46.3	76.1
142	Other support services	100.0	119.9	95.8	215.7
143	Waste management and remediation services	100.0	131.4	99.7	231.1
Educational services					
144	Elementary and secondary schools (private)	100.0	24.3	65.2	89.5
145	Junior colleges, colleges, universities, and professional schools (private)	100.0	93.9	88.1	182.0
146	Other educational services (private)	100.0	47.7	73.7	121.4
Health care and social assistance					
147	Offices of physicians	100.0	87.5	115.3	202.8
148	Offices of dentists	100.0	56.9	86.0	142.9
149	Offices of other health practitioners	100.0	43.1	68.3	111.4
150	Outpatient care centers	100.0	72.1	88.0	160.1
151	Medical and diagnostic laboratories	100.0	84.6	92.0	176.6
152	Home health care services	100.0	41.6	56.5	98.1
153	Other ambulatory health care services	100.0	81.9	78.1	160.0

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
154	Hospitals (private)	100.0	123.7	112.7	236.5
155	Nursing and residential care facilities	100.0	44.6	52.1	96.7
156	Individual and family services	100.0	22.9	43.7	66.6
157	Community and vocational rehabilitation services	100.0	60.5	59.8	120.3
158	Child day care services	100.0	23.8	38.8	62.7
Arts, entertainment, and recreation					
159	Performing arts companies	100.0	208.9	151.6	360.5
160	Spectator sports	100.0	132.5	114.4	246.9
161	Promoters of events, and agents and managers	100.0	265.6	181.4	447.0
162	Independent artists, writers, and performers	100.0	73.7	99.7	173.5
163	Museums, historical sites, and similar institutions	100.0	75.7	76.5	152.2
164	Amusement parks and arcades	100.0	59.7	49.0	108.7
165	Gambling industries (except casino hotels)	100.0	817.9	228.6	1,046.5
166	Other amusement and recreation industries	100.0	52.5	55.2	107.6
Accommodation and food services					
167	Accommodation	100.0	78.2	62.8	141.0
168	Food services and drinking places	100.0	49.6	46.8	96.4
Other services (except public administration)					
169	Automotive repair and maintenance	100.0	125.5	88.8	214.3
170	Electronic and precision equipment repair and maintenance	100.0	281.2	166.5	447.7
171	Commercial and industrial machinery and equipment repair and maintenance	100.0	171.1	119.5	290.6
172	Personal and household goods repair and maintenance	100.0	200.7	115.1	315.8
173	Personal care services	100.0	30.6	47.4	77.9
174	Death care services	100.0	38.7	57.1	95.8

Appendix Table A1 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
175	Drycleaning and laundry services	100.0	66.6	53.0	119.6
176	Other personal services	100.0	130.2	74.6	204.8
177	Religious organizations	100.0	32.7	55.6	88.2
178	Grantmaking and giving services and social advocacy organizations	100.0	56.7	87.6	144.3
179	Civic, social, professional, and similar organizations	100.0	31.0	67.2	98.2

* Includes materials and capital services supplier jobs

** Includes jobs supported by respending of income from direct jobs and supplier jobs, as well as public-sector jobs supported by tax revenue

Note: See methods appendix for derivation.

Source: EPI analysis of data from the Bureau of Labor Statistics (BLS) Employment Requirements Matrices, the BLS Current Employment Statistics program, and the Bureau of Economic Analysis GDP-by-industry accounts

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Appendix Table A2

Employment multipliers per $1 million in final demand, all private-sector industries

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
Agriculture, forestry, fishing, and hunting					
1	Crop production	6.96	5.18	3.84	9.02
2	Animal production and aquaculture	5.13	5.77	3.49	9.26
3	Forestry	2.62	7.49	3.26	10.74
4	Logging	5.45	8.18	4.80	12.98
5	Fishing, hunting, and trapping	3.03	3.53	1.79	5.32
6	Support activities for agriculture and forestry	5.09	4.06	2.61	6.66
Mining					
7	Oil and gas extraction	0.72	2.72	1.17	3.89
8	Coal mining	1.27	4.19	2.15	6.34
9	Metal ore mining	1.17	3.73	1.81	5.54
10	Nonmetallic mineral mining and quarrying	2.69	3.72	2.60	6.31
11	Support activities for mining	3.55	4.31	3.74	8.06
Utilities					
12	Electric power generation, transmission, and distribution	1.06	4.23	1.75	5.98
13	Natural gas distribution	0.99	4.52	1.80	6.32
14	Water, sewage, and other systems	0.67	10.46	2.02	12.48
Construction					
15	Construction	5.45	4.80	4.88	9.68
Nondurable manufacturing					
16	Animal food manufacturing	0.98	6.72	2.84	9.55
17	Grain and oilseed milling	0.69	7.38	2.95	10.33
18	Sugar and confectionery product manufacturing	2.59	5.52	3.07	8.58
19	Fruit and vegetable preserving and specialty food manufacturing	2.50	6.75	3.59	10.34

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
20	Dairy product manufacturing	1.39	7.80	3.56	11.36
21	Animal slaughtering and processing	2.80	7.13	3.54	10.67
22	Seafood product preparation and packaging	3.44	4.62	2.91	7.53
23	Bakeries and tortilla manufacturing	4.40	7.50	4.40	11.90
24	Other food manufacturing	1.87	6.29	2.96	9.25
25	Beverage manufacturing	1.95	6.13	3.10	9.23
26	Tobacco manufacturing	0.22	7.52	1.43	8.96
27	Textile mills and textile product mills	3.81	4.19	3.59	7.78
28	Apparel, leather, and allied product manufacturing	3.50	5.89	4.30	10.19
29	Sawmills and wood preservation	3.42	6.08	3.83	9.91
30	Veneer, plywood, and engineered wood product manufacturing	3.93	5.38	4.05	9.43
31	Other wood product manufacturing	4.88	4.75	4.20	8.95
32	Pulp, paper, and paperboard mills	1.24	5.79	2.70	8.50
33	Converted paper product manufacturing	2.47	4.60	3.27	7.87
34	Printing and related support activities	4.88	4.49	4.46	8.95
35	Petroleum and coal products manufacturing	0.22	2.08	1.11	3.20
36	Basic chemical manufacturing	0.69	5.63	2.25	7.89
37	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	0.73	4.67	2.36	7.03
38	Pesticide, fertilizer, and other agricultural chemical manufacturing	0.89	4.54	1.96	6.49
39	Pharmaceutical and medicine manufacturing	1.14	4.49	2.06	6.55
40	Paint, coating, and adhesive manufacturing	1.50	4.43	2.64	7.08
41	Soap, cleaning compound, and toilet preparation manufacturing	1.39	5.01	1.88	6.89
42	Other chemical product and preparation manufacturing	1.60	4.20	2.79	6.99
43	Plastics product manufacturing	2.93	4.90	3.25	8.15

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
44	Rubber product manufacturing	3.15	4.53	3.23	7.76
Durable manufacturing					
45	Clay product and refractory manufacturing	5.31	4.17	4.28	8.46
46	Glass and glass product manufacturing	3.71	4.68	3.56	8.24
47	Cement and concrete product manufacturing	4.32	4.56	3.91	8.47
48	Lime, gypsum, and other nonmetallic mineral product manufacturing	2.85	4.95	3.04	7.99
49	Iron and steel mills and ferroalloy manufacturing	0.81	5.01	2.47	7.48
50	Steel product manufacturing from purchased steel	0.80	6.79	3.51	10.30
51	Alumina and aluminum production and processing	2.03	4.35	2.94	7.29
52	Nonferrous metal (except aluminum) production and processing	1.40	4.29	2.38	6.67
53	Foundries	4.01	4.28	3.67	7.95
54	Forging and stamping	2.47	4.62	3.20	7.81
55	Cutlery and handtool manufacturing	2.87	4.79	3.39	8.18
56	Architectural and structural metals manufacturing	4.00	4.63	4.01	8.63
57	Boiler, tank, and shipping container manufacturing	2.51	4.34	3.13	7.47
58	Hardware manufacturing	2.83	4.57	3.36	7.93
59	Spring and wire product manufacturing	3.62	4.81	4.04	8.85
60	Machine shops; turned product; and screw, nut, and bolt manufacturing	5.03	4.30	4.41	8.71
61	Coating, engraving, heat treating, and allied activities	4.63	4.23	3.73	7.96
62	Other fabricated metal product manufacturing	3.29	4.58	3.55	8.12
63	Agriculture, construction, and mining machinery manufacturing	1.87	4.64	3.11	7.75
64	Industrial machinery manufacturing	2.83	4.38	4.22	8.60
65	Commercial and service industry machinery manufacturing	2.26	4.85	3.47	8.33
66	HVAC equipment manufacturing	2.89	4.56	3.21	7.76

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
67	Metalworking machinery manufacturing	4.36	4.70	4.59	9.29
68	Engine, turbine, and power transmission equipment manufacturing	1.75	4.83	3.28	8.10
69	Other general purpose machinery manufacturing	2.28	4.57	3.25	7.82
70	Computer and peripheral equipment manufacturing	4.37	2.46	4.48	6.95
71	Communications equipment manufacturing	1.65	2.12	2.12	4.24
72	Audio and video equipment manufacturing	3.05	4.74	3.58	8.32
73	Semiconductor and other electronic component manufacturing	2.96	2.75	2.93	5.68
74	Navigational, measuring, electromedical, and control instruments manufacturing	2.13	3.38	2.76	6.14
75	Manufacturing and reproducing magnetic and optical media	2.76	3.42	3.80	7.22
76	Electric lighting equipment manufacturing	3.67	4.56	4.43	9.00
77	Household appliance manufacturing	3.23	4.58	4.02	8.60
78	Electrical equipment manufacturing	3.35	3.94	3.51	7.45
79	Other electrical equipment and component manufacturing	2.45	4.09	2.81	6.90
80	Motor vehicle manufacturing	0.50	4.71	2.48	7.19
81	Motor vehicle body and trailer manufacturing	2.02	5.08	3.65	8.73
82	Motor vehicle parts manufacturing	2.03	4.26	3.27	7.53
83	Aerospace product and parts manufacturing	2.13	3.85	3.33	7.17
84	Railroad rolling stock manufacturing	1.91	4.39	3.56	7.96
85	Ship and boat building	3.93	4.47	4.51	8.98
86	Other transportation equipment manufacturing	1.38	4.72	2.85	7.57
87	Household and institutional furniture and kitchen cabinet manufacturing	6.59	4.93	4.97	9.89
88	Office furniture (including fixtures) manufacturing	4.02	5.03	3.70	8.73
89	Other furniture-related product manufacturing	3.51	5.71	3.77	9.48
90	Medical equipment and supplies manufacturing	3.03	4.63	3.28	7.91

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
91	Other miscellaneous manufacturing	3.35	5.38	3.92	9.30
Wholesale trade					
92	Wholesale trade	3.79	4.07	3.61	7.68
Retail trade					
93	Motor vehicle and parts dealers	7.37	3.85	4.76	8.61
94	Food and beverage stores	13.62	4.17	5.53	9.70
95	General merchandise stores	13.77	4.23	5.87	10.10
96	Other retail	8.57	4.96	4.93	9.89
Transportation and warehousing					
97	Air transportation	2.50	4.03	2.91	6.93
98	Rail transportation	2.64	4.27	2.64	6.91
99	Water transportation	1.06	5.80	2.43	8.22
100	Truck transportation	5.01	5.42	4.16	9.58
101	Transit and ground passenger transportation	8.04	8.84	4.93	13.77
102	Pipeline transportation	1.46	3.18	1.45	4.63
103	Scenic and sightseeing transportation and support activities for transportation	4.99	6.71	4.39	11.11
104	Couriers and messengers	6.90	5.83	5.01	10.83
105	Warehousing and storage	9.18	4.88	5.37	10.25
Information					
106	Newspaper, periodical, book, and directory publishers	3.44	5.33	3.91	9.24
107	Software publishers	1.96	3.80	3.54	7.34
108	Motion picture, video, and sound recording industries	3.42	3.30	3.29	6.59
109	Radio and television broadcasting	2.24	4.38	3.17	7.55
110	Cable and other subscription programming	0.62	4.38	1.93	6.32

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
111	Wired telecommunications carriers	1.49	4.24	2.41	6.65
112	Wireless telecommunications carriers (except satellite)	0.50	4.71	1.88	6.58
113	Satellite, telecommunications resellers, and all other telecommunications	1.65	4.41	2.84	7.25
114	Data processing, hosting, and related services	1.92	6.46	4.47	10.93
115	Other information services	2.37	5.17	3.90	9.07
Finance and insurance					
116	Monetary authorities, credit intermediation, and related activities	3.73	4.20	3.74	7.94
117	Securities, commodity contracts, funds, trusts, and related activities	1.78	5.23	3.85	9.08
118	Insurance carriers	2.55	4.83	3.73	8.56
119	Agencies, brokerages, and other insurance related activities	6.44	4.07	5.72	9.79
Real estate and rental leasing					
120	Real estate	1.40	5.34	2.32	7.66
121	Automotive equipment rental and leasing	1.61	6.05	3.12	9.17
122	Consumer goods rental and general rental centers	4.55	6.82	4.36	11.19
123	Commercial and industrial machinery and equipment rental and leasing	1.41	4.87	2.53	7.39
124	Lessors of nonfinancial intangible assets (except copyrighted works)	0.13	5.77	2.14	7.91
Professional, scientific, and technical services					
125	Legal services	4.07	3.63	4.53	8.16
126	Accounting, tax preparation, bookkeeping, and payroll services	6.42	3.34	5.22	8.56
127	Architectural, engineering, and related services	5.41	4.87	6.17	11.04
128	Specialized design services	7.48	5.05	7.29	12.34
129	Computer systems design and related services	4.03	5.41	6.02	11.43
130	Management, scientific, and technical consulting services	5.12	4.66	5.96	10.63
131	Scientific research and development services	1.29	6.68	4.17	10.85
132	Advertising, public relations, and related services	1.43	6.58	3.87	10.45

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
133	Other professional, scientific, and technical services	6.10	4.32	5.10	9.41
Management of companies					
134	Management of companies and enterprises	3.59	5.18	4.97	10.16
Administrative and support services and waste management					
135	Office administrative services	7.71	4.00	6.81	10.81
136	Facilities support services	4.44	6.23	4.29	10.52
137	Employment services	12.79	4.01	6.41	10.41
138	Business support services	10.99	6.00	6.83	12.83
139	Travel arrangement and reservation services	4.59	6.13	4.88	11.00
140	Investigation and security services	14.74	4.54	6.93	11.47
141	Services to buildings and dwellings	15.18	4.52	7.03	11.55
142	Other support services	5.77	6.92	5.53	12.45
143	Waste management and remediation services	4.30	5.66	4.29	9.95
Educational services					
144	Elementary and secondary schools (private)	19.35	4.71	12.61	17.32
145	Junior colleges, colleges, universities, and professional schools (private)	6.15	5.77	5.41	11.19
146	Other educational services (private)	10.29	4.91	7.58	12.49
Health care and social assistance					
147	Offices of physicians	5.10	4.47	5.88	10.35
148	Offices of dentists	7.15	4.06	6.15	10.21
149	Offices of other health practitioners	9.40	4.05	6.42	10.48
150	Outpatient care centers	6.93	5.00	6.10	11.10
151	Medical and diagnostic laboratories	5.38	4.55	4.94	9.49
152	Home health care services	13.32	5.54	7.53	13.07
153	Other ambulatory health care services	6.06	4.97	4.73	9.70

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
154	Hospitals (private)	4.86	6.01	5.48	11.49
155	Nursing and residential care facilities	13.25	5.91	6.91	12.82
156	Individual and family services	22.36	5.12	9.77	14.89
157	Community and vocational rehabilitation services	9.73	5.89	5.82	11.70
158	Child day care services	21.17	5.04	8.23	13.27
Arts, entertainment, and recreation					
159	Performing arts companies	3.55	7.41	5.38	12.78
160	Spectator sports	3.43	4.55	3.93	8.47
161	Promoters of events, and agents and managers	2.98	7.92	5.41	13.33
162	Independent artists, writers, and performers	6.90	5.09	6.88	11.97
163	Museums, historical sites, and similar institutions	8.25	6.24	6.31	12.55
164	Amusement parks and arcades	7.37	4.40	3.61	8.01
165	Gambling industries (except casino hotels)	1.20	9.83	2.75	12.57
166	Other amusement and recreation industries	12.31	6.46	6.79	13.25
Accommodation and food services					
167	Accommodation	7.05	5.51	4.43	9.94
168	Food services and drinking places	13.15	6.53	6.15	12.67
Other services (except public administration)					
169	Automotive repair and maintenance	5.41	6.79	4.80	11.59
170	Electronic and precision equipment repair and maintenance	2.37	6.65	3.94	10.59
171	Commercial and industrial machinery and equipment repair and maintenance	3.18	5.44	3.80	9.24
172	Personal and household goods repair and maintenance	3.50	7.03	4.03	11.06
173	Personal care services	12.78	3.90	6.05	9.95
174	Death care services	6.20	2.40	3.54	5.94

Appendix Table A2 (cont.)

	Industry	Direct jobs	Supplier jobs*	Induced jobs**	Total indirect jobs
175	Drycleaning and laundry services	9.06	6.03	4.80	10.83
176	Other personal services	4.39	5.72	3.28	9.00
177	Religious organizations	18.85	6.16	10.47	16.63
178	Grantmaking and giving services and social advocacy organizations	6.89	3.90	6.03	9.93
179	Civic, social, professional, and similar organizations	10.67	3.31	7.17	10.48

* Includes materials and capital services supplier jobs

** Includes jobs supported by respending of income from direct jobs and supplier jobs, as well as public-sector jobs supported by tax revenue

Note: Methods described in appendix.

Source: EPI analysis of data from the Bureau of Labor Statistics (BLS) Employment Requirements Matrices, the BLS Current Employment Statistics program, and the Bureau of Economic Analysis GDP-by-industry accounts

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Endnotes

1. This might seem too conservative at first glance, as most workers aren't able to save half of their earnings. But this respending multiplier also includes the effect of taxes on earnings (which reduces the share of gross earnings available to be spent by workers on consumption goods) as well as the effect of imports—spending by workers that does not support demand in other domestic sectors of the economy. Even accounting for these effects, 0.5 might be too small. However, changing this parameter does not change the ranking of industries' importance in generating induced jobs, just the raw numbers.

2. The spreadsheet is downloadable at go.epi.org/jobmultiplierdata.

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