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Updated Employment Multipliers for the U.S. Economy (2003)

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I. Background

The manufacturing sector in the United States is facing a historic crisis. From 1967 to 1998, total employment in manufacturing never fell below 16.5 million. In February 2004, manufacturing employment is 14.6 million. This is the lowest level of manufacturing employment in the United States since 1958.

There is a long tradition of economic thought that emphasizes the role of manufacturing as crucial to economic growth. This is both because economies of scale are more likely to be realized in capital-intensive manufacturing sectors and because the nature of manufacturing makes it more likely that capital investment and technological change will lead to faster productivity growth.[1] The experience of the past two decades lends support to this view - rates of productivity growth in manufacturing are significantly higher than in the rest of the economy.

Further, manufacturing has historically been a primary source for middle-class jobs characterized by decent wages and benefits, especially for workers without a college degree (still over 70% of the workforce).

Besides these differential productivity and wage effects, another argument advanced in support of manufacturing's importance to the wider economy is the number of *secondary* jobs it supports. Calculating *employment multipliers* by industry can help provide an empirical test of this claim.

Employment multipliers measure how job creation or destruction in a particular industry translates into wider employment changes throughout the economy. Will, for example, the closing of an auto factory that 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 what the total *indirect* effects will be.

This paper shows that employment multipliers are much higher in manufacturing industries than in the rest of the economy. Each 100 jobs in manufacturing supports 2.91 jobs elsewhere in the economy, compared to 1.54 jobs in business services and 88 jobs in retail trade. (See **Table 1**.)

[1] See Kaldor (1957) and Baumol (1967) for exemplars of this argument.

Table 1: Employment Multipliers in major sectors

	Manufacturing	Health Services	Retail Trade	Personal/Business Services
Supplier jobs: materials	128.92	28.30	24.10	54.08
Supplier jobs: capital services	38.63	22.00	16.71	27.95
respending employment	116.46	66.05	46.35	68.80
state + local government	6.78	1.60	1.29	2.88
TOTAL	290.78	117.94	88.45	153.71

The indirect employment (or, *employment multipliers*) associated with jobs in any given industry results from three effects: *supplier* effects, *respending* effects, and *government employment* effects. *Supplier* effects are impacts that job-creation or destruction in an industry has on supplier industries. For example, when an automobile plant closes, this will affect (among other things) the steel industry jobs that supply materials to the auto plant. *Respending* effects are the impacts that job creation or destruction in an industry has on those sectors where workers spend their paychecks. For example, when an automobile plant closes, this will affect (among other things) the apparel industry that supplies the clothes that workers from the auto plant used to spend their wages on. *Government employment* effects refers to the taxes that support jobs in federal, state, and local government; if workers in private industries lose their jobs, this erodes the tax base that supports government employment.

This study calculates the different components that make up these broad effects (supplier, respending, and government). Each component will be explained and presented individually. The sums of these will be presented as the *total* indirect employment effects of job creation or destruction in an industry and labeled *employment multipliers.* These sums are, of course, not perfect forecasts of employment changes, for a number of reasons.

First, occasionally supplier industries may be able to quickly recover from job loss in an industry that they supply to, and the indirect employment effects will be less. If, for example, Boeing moves production overseas, it might still buy some supplies (aluminum, say) from industries in the United States; lessening the indirect employment effect of the Boeing plant relocation.

Second, the respending effects calculated here assume that workers have no income after job loss. In reality, workers may collect unemployment insurance or be able to find other jobs quickly, resulting in less powerful respending employment effect. These respending measures may still be useful, however, in that they identify higher paying industries as more important for generating indirect employment (since higher paid workers have more money to respend in other industries). This is true regardless whether the income of a high paid worker goes to zero, or, is supported through unemployment insurance and other government transfers.

Third, the estimates are essentially static. That is, they take as given the relative levels of productivity between industries. Over time, different industries have different rates of productivity growth and innovation, which have important effects for the overall

economy (as mentioned briefly in the introduction). These effects are not captured in employment multipliers at any given point in time, which is why it is useful to occasionally update them.

Employment multipliers do show how job creation or destruction in a particular industry will affect the economy as a whole, and, they provide a basis of comparison for how important to aggregate employment certain industries are. For example, every 100 jobs in durable manufacturing support 372 jobs in other industries (both in supplier industries and in respending employment industries where steelworkers spend their money), while every 100 jobs in business services supports 164 jobs elsewhere in the economy. From these numbers, one can surmise that job loss in durable manufacturing would have larger ripple effects throughout the larger economy than similar job loss in business services.

The calculations follow Baker and Lee's (1993) innovations in calculating aggregate multiplier effects for large sectors (manufacturing, services, etc…), in taking account of how wage variations between industries affect workers' respending, and in taking account of capital service usage in calculating the supplier employment effects. These innovations set apart the Baker and Lee (1993) calculations from previous studies and are worth preserving here. This study essentially follows the methodology of Baker and Lee (1993) in calculating employment multipliers. It presents the steps in the calculation and will identify those that seem more contestable in their usefulness. It allows the reader to identify those aspects of the employment multiplier that seem most useful for their particular purpose, and also provides aggregate multipliers that sum all of the different components of various effects.

II. Employment multipliers by broad industry grouping

The first set of comparisons laid out in table 1 show the total employment multipliers for the following sectors: manufacturing, health services, retail trade, and personal and business services. Employment multipliers by industry were weighted by industry employment to yield these sectoral averages. As can be seen, employment multipliers are much larger in manufacturing (291) than in other sectors of the economy - more than three times as large as retail trade (88), over two times as large as health services (117), and almost twice as large as personal and business services (154).

The bulk of this difference is due to differences in supplier jobs generated by manufacturing employment. Manufacturing employment supports more than four times

as many supplier jobs than retail trade (168 to 41), more than three times as many supplier jobs as health care (50) and more than twice as many as personal and business services (82). The higher wages paid in manufacturing also contribute to the larger secondary employment impacts, both in re-spending effects and in government revenue effects.

Employment multipliers, both within and between sectors, demonstrate large variability. The tables that follow show employment multipliers for some key industries within the manufacturing sector. Even taking this variability into account, it remains true that almost every industry within manufacturing supports much more secondary employment than other sectors.

Table 2 shows employment multipliers for apparel and textile industries. Even employment in these industries, generally thought to be at the low-end of the technology frontier in the United States, supports more indirect employment than the retail trade or personal and business services sector.[2] This is due mostly because of the high number of supplier jobs supported by apparel and textile production. Wages in this sector are (generally) lower than in the economy-wide average, meaning that re-spending effects from apparel and textiles employment are less important.

Table 3 shows three industries with some of the largest employment multipliers in the entire economy: automobiles, aerospace, and primary metals. Employment in the automobile parts and assembly industry (SIC code 3711 and 3714) supports more than three times as many indirect jobs (464) as employment in personal and business services and more than five times as many jobs as retail trade. This is due both because of the large number of supplier jobs supported in the automobile trade and because high wages in this sector generate more re-spending employment and government jobs.

Table 4 shows employment multipliers for machinery (non-electrical and electrical) industries. The computer equipment and office machinery industry has the single highest employment multiplier in the entire manufacturing sector; 905 indirect jobs are supported for each 100 jobs in this sector. This industry is also an outlier in terms of

[2] It should be noted that the apparel and textile sectors are actually quite separate. Textile production tends to highly capital intensive while apparel production is not. However, these two sectors are often lumped together, so, it was thought useful to present data on them together.

Table 2: Apparel and textile industries

	Apparel (SIC 231-238)	Misc Fabric (SIC 239)	Weaving/Finishing (SIC 221-24,226,228)	Knitting Mills (SIC 225)	Carpets and Rugs (SIC 227)	All Textiles (229)
Supplier jobs: materials	92.23	82.64	118.27	71.56	137.94	131.76
Supplier jobs: capital services	10.21	10.09	20.61	14.98	28.13	28.64
respending employment	68.30	77.89	97.40	88.20	103.83	114.56
state + local government	4.84	4.35	6.21	3.78	7.24	6.92
TOTAL	175.58	174.98	242.50	178.52	277.14	281.87

Table 3: Autos, aerospace, and steel

	Aircraft (SIC 3721)	Auto Stampings (SIC 3465)	Blast Furnaces Basic Steel (SIC 331)	Automobile parts (SIC 371)
Supplier jobs: materials	78.28	230.19	145.92	230.19
Supplier jobs: capital services	30.37	50.64	40.77	50.64
respending employment	122.16	191.66	135.86	171.17
state + local government	4.16	12.08	7.67	12.08
TOTAL	234.96	484.57	330.21	464.08

Table 4: Machinery industries

	Farm & Garden Machinery (SIC 352)	Construction & Related Machinery (SIC 353)	Metalworking Machinery (SIC 354)	Special Industry Machinery (SIC 355)
Supplier jobs: materials	131.71	118.51	57.07	121.62
Supplier jobs: capital services	25.86	22.07	12.71	25.86
respending employment	125.76	117.03	88.83	124.11
state + local government	6.93	6.24	3.03	6.40
TOTAL	290.26	263.85	161.65	277.99

	General Industry Machinery (SIC 356)	Computer equipment & office machinery (SIC 357)	Refrigeration & Service Industry Machinery (SIC 358)	Miscellaneous Industrial Machinery (SIC 359)
Supplier jobs: materials	78.34	467.18	105.33	41.43
Supplier jobs: capital services	16.68	105.60	20.94	10.01
respending employment	98.24	307.64	106.78	81.02
state + local government	4.14	24.44	5.54	2.22
Total	197.41	904.86	238.59	134.68

employment supported per $1,000,000 in final sales, so, it seems that results for it should be viewed with some caution.[3] The rest of the machinery industries, however, also show relatively high employment multipliers, both due to lots of employment supported in supplying industries and high wages leading to high re-spending and government employment.

III. Detailed Methodology of Employment Multiplier Computations

Baker and Lee (1993) trace out three channels though which job creation in a particular industry can support indirect employment in other industries. First, there are supplier jobs in industries that produce inputs for production in the originating industry. Second, workers spend their paychecks in other industries, which creates demand for employment in other industries. Third, government jobs are supported in part by taxes on workers' wages.

1. Indirect Employment in Supplier Industries

A. Material Supplies

The Bureau of Labor Statistics (BLS) publishes a set of statistics on industry *employment requirements*. These tables trace all the labor inputs into a given industry, giving the total amount of direct and indirect employment per million dollars of sales.

For example, a million dollars of demand for steel products results both in the direct employment of steel workers ($EmpReq_{direct}$), and, spurs demand in the industries that supply intermediate inputs for steel production ($EmpReq_{indirect}$). For example, to produce $1,000,000 worth of steel, 10 jobs may be needed in the primary metals industry, and 10 jobs in the trucking industry, and so on. The total number of indirect supplier jobs supported by $1,000,000 of final demand in the steel industry is the sum of all of these supplier demands. The total amount of employment in steel spurred by $1,000,000 in demand is the sum of direct and indirect employment requirements ($EmpReq_{total}$).

[3] Disputes over how to account for very rapid quality-adjusted price declines in this sector makes statistics related to input-output accounting subject to some uncertainty.

Given these numbers - jobs supported per million dollars of final sales in steel - a figure for how many indirect jobs are supported by 100 jobs in each industry can be calculated as follows:

(1) $[(EmpReq_{total} - EmpReq_{direct})/EmpReq_{direct}] * 100 = EmpReq_{indirect\ per\ 100\ jobs}$

B. Capital Services

Baker and Lee (1993) note that these employment requirements tables from the BLS only count indirect employment resulting from the supply of parts and materials to the originating industry, but, not the capital stock that is used up in the production process. That is, production in the steel industry uses iron and trucking services as parts and materials, and, it also leads to the depreciation of foundries and blast furnaces, necessitating their replacement over time. Replacing this depleted capital generates employment, as workers are needed in the industries that produce new capital goods.

To account for this, Baker and Lee (1993) calculate the amount of capital goods used up per one hundred workers in a given industry. To make this calculation, they use another set of tables from the BLS, called the Multifactor Productivity Tables (MPT). These tables provide estimates of the share of total industry output attributable to capital services for broad industry groupings.

For manufacturing industries, this information is available at the 2-digit level of aggregation in the Standard Industrial Classification (SIC) system. For other industries, the only detailed industry available is utilities, railroad transportation, and the generic "non-farm business sector". Given that this latter number and the numbers for manufacturing, utilities, and railroad transportation, an average number is backed out for capital's share in total output for all non-manufacturing, non-utility, and non-railroad industries. This capital service usage number for non-manufacturing, non-utility, and non-railroad industries contains no variation, however. These limitations imply that some of the numbers on capital service usage in **table 9** at the end of this paper may not be as reliable and/or informative as the other components of employment multipliers. For that reason, an alternative employment multiplier taking these effects out is provided in this table.

To calculate the effects of capital service usage on employment, the capital services share in total output for an industry is multiplied by the *total value of output produced per one hundred employees* in an industry. This gives us the value of capital services used up per hundred employees in an industry. This can expressed as the following:

(2) [($1,000,000/EmpReq$_{direct}$) * 100] * Capital's Share in Total Output

The expression in brackets in (2) gives us the *value of total output generated per one hundred employees* in a given industry. *EmpReq$_{direct}$* is the measure of how many jobs are created by $1,000,000 of spending in an industry. Say that this number is 10. This implies that each worker in this industry creates, on average, $100,000 in industry output. Now, if we want to know how much 100 workers in this industry would create, we could just multiply $100,000 (which is just the first expression in the brackets ($1,000,000/EmpReq$_{direct}$)) by 100 to get $10,000,000 in total output created per one hundred employees.

If, say, capital's share in total output were 20 percent, we would multiply $10,000,000 by .2 to get $2,000,000 in capital services used up per one hundred employees. Given the total dollar amount of capital services used up by an industry per hundred employees, Baker and Lee (1993) take this dollar figure and use the employment requirements table to get an estimate of jobs supported by "capital goods industries".

Capital investment has two components: equipment and structures. Baker and Lee (1993) assume that 60 percent of all capital investment goes to equipment and 40 percent to structures, based on the proportion for the economy as a whole. This means that 40 percent of the capital services spending will create jobs in the construction industry (structures), and, the other 60 percent in the capital equipment industry (which were identified as those industries that have equipment or machinery in their descriptions). The weighted average of employment requirements for capital equipment industries was used, with the share of employment serving as the weight. So, the total employment supported by capital service usage in an industry can be calculated as:

(3) {EmpReq$_{total_equipment}$ * [(Equation 2)/$1,000,000] * .6} + {EmpReq$_{total_construction}$ * [(Equation 2)/$1,000,000] * .4}

Total indirect employment from supplier industries is then calculated as expression (1) plus the employment supported by the capital services industries as described above in expression (3). **Table 5** shows these two components for indirect employment for a range of industries.

2. Workers' Responding Effects

A. Direct Respending

The first step in calculating the respending effects on indirect employment is to estimate each industry's workers direct relative purchasing power. First, the base of 100 direct jobs is multiplied by the ratio of hourly wages in that industry to the economy-wide average. This yields the *direct employment purchasing power adjustment* identified in tables below. This reflects the fact that higher paying industries will generate more indirect employment through respending, all else equal.

Next, these adjusted industry wages need to be translated into demand for the output of other industries. This is done through the use of "respending multipliers". The "respending multiplier" helps translate wages in a particular industry to demand for products in other industries spurred by workers' spending their paychecks. Workers generally spend (rather than save) the bulk of their wages, and this spending creates demand and spurs employment in other industries. The size of the respending multiplier depends on the level of workers' wages and their propensity to spend (rather than save) their wages. It essentially tries to measure the impact of initial rounds of spending by workers plus the impacts generated by successive rounds of re-spending of those initial dollars. The magnitude of the respending multiplier depends upon what proportion of their paycheck that workers spend as well as their wage levels.

There is wide variation in the literature reviewed by Baker and Lee (1993) as to the size of the assumed respending multiplier. Baker and Lee (1993) assume a respending multiplier of .5, which seems to the mode used in most the literature. It seems a pretty conservative measure of this (in the literature they survey, estimates range from .25 to 1.9). The value of .5 will be used in this update as well.[4]

Thus, the adjusted measure of *direct employment purchasing power* described above is multiplied by .5 to get the respending effects; which measures the amount of employment supported by 100 jobs in a given industry through workers' spending their

[4] For more on the size of the respending multiplier, see WEFA (1988,1992) and Adams and Klein (1989).

Table 5: Supplier industry effects, by sector

Industry Grouping	Supplier Jobs: Parts and Materials	Supplier Jobs: Capital Services	Supplier Jobs: Total
Agriculture, Forestry, Fisheries	22.31	13.57	35.88
Mining	64.33	52.72	117.05
Construction	70.59	24.64	95.23
Manufacturing	128.92	38.63	167.54
Durable Manufacturing	173.76	58.94	232.69
Non-durable Manufacturing	112.98	34.62	147.59
Automobiles	230.19	50.64	280.83
Transportation	57.65	29.99	87.64
Communications	84.69	63.14	147.83
Utilities	246.42	144.43	390.84
Wholesale Trade	46.64	36.47	83.11
Retail Trade	24.10	16.71	40.81
Eating + Drinking Establishments	40.63	12.25	52.88
FIRE	83.38	60.32	143.70
Business Services	54.08	27.95	82.03
Other Services	34.64	17.98	52.62

paychecks on output from other industries. It should be noted that the assumption regarding the size of the respending multiplier does not affect the *relative* size of employment effects stemming from respending effects. If a smaller or larger respending multiplier is assumed, this will make the respending effects larger or smaller for all industries, but, higher-paying industries will still generate more respending employment than others.

B. Indirect Effects

This same method is used for all supplier employment supported by 100 jobs in the originating industry. The ratio of hourly wages in each supplier industry to the economy-wide average is multiplied by the employment supported by jobs in the originating industry. This adjustment takes into account the fact that if an industry supports high paying jobs not just in its *direct* employment, but also in its *supplier* industries, job creation or destruction there will have greater effects. The automobile industry pays high wages itself, and, many of the supplier industries whose employment is *supported* by jobs in the auto industry (steel, for example) also pay higher than average wages. This means that total employment spurred by the automobile industry through respending, both direct and indirect, will be high.

An example of calculating respending effects goes as follows. Say that the automobile industry employs 100 people directly and supports employment for 50 people in the steel industry and 40 people in the rubber industry. Further, assume that wages in the auto industry are 30 percent over the economy-wide average, wages in the steel industry are 20 percent over the economy-wide average, and wages in the rubber industry are 10 percent below the economy-wide average. We want to calculate what the direct and indirect employment effects of respending are for the automobile industry - that is, how much employment is supported both through auto workers spending their paychecks and the spending done by workers in the automobile industry's supplier industries.

Direct respending is easy: multiply the base of 100 automobile workers by the ratio of their hourly wages to the economy wide average (1.3, from the example above), then, multiply by .5 (the respending multiplier as described above):

(4) 100 * 1.3 *.5 = 65.

So, direct respending effects per 100 jobs in the automobile industry is 65 jobs supported in other industries.

Indirect respending is calculated by multiplying automobile industry-supported employment in supplier industries (steel and rubber in our example) by the ratio of their hourly wages to the economy-wide average. Then, each value is multiplied by .5 and summed to get the total indirect employment resulting from respending of supplier jobs supported by automobiles.

Steel industry employment supported by 100 jobs in autos is 50. The ratio of steel wages to the economy-wide average is 1.2. Rubber industry employment supported by 100 jobs in autos is 40, and, the ratio of rubber wages to the economy-wide average is .9. Indirect respending effects can thus be calculated as:

(5) Steel: 50 * 1.2 * .5 = 30
(6) Rubber: 40 * .9 *.5 = 18

Respending employment resulting from jobs *supported* by every 100 jobs in autos is the sum of these: 48.

Total respending employment resulting from each 100 jobs in the automobile industry is the sum of direct (65) and indirect (48) respending effects (65 + 48 = 113).

Wage data by industry is obtained from the BLS Employment and Earnings survey and is based on establishment surveys. Re-spending employment by broad sectoral grouping is displayed below in **Table 6**.

3. Government Employment

Federal, state, and local employees represent an enormous block of employment in the United States (about 15 percent of total employment). This employment is supported through the collection of taxes. The bulk of federal, state, and local tax revenue is obtained from taxes on incomes. Wages represent the vast majority of income earned in the United States. It thus seems reasonable to calculate how much government employment is supported by various industries through wage taxation. To make this number comparable with the other calculations of this paper, we can express this as how many government jobs are supported (through taxes) per 100 jobs in a given industry.

This study assumes that federal taxes claim 20 percent of wages earned and state and local governments 10 percent. This is just under the government sector's

Table 6: Respending employment, by sector

Industry Grouping	Re-Spending: Direct Purchasing Power Adjustment	Re-Spending: Indirect Purchasing Power Adjustment	Re-Spending Total Employment
Agriculture, Forestry, Fisheries	91.00	22.14	56.57
Mining	102.17	62.55	82.36
Construction	118.04	64.12	91.08
Manufacturing	102.08	130.84	116.46
Durable Manufacturing	102.31	157.13	129.72
Non-durable Manufacturing	101.86	104.55	103.20
Automobiles	129.56	212.78	171.17
Transportation	96.29	56.02	76.15
Communications	119.80	78.91	99.35
Utilities	143.27	292.16	217.72
Wholesale Trade	100.68	42.05	71.37
Retail Trade	71.23	21.46	46.35
Eating + Drinking Establishments	72.74	31.65	52.19
FIRE	108.44	76.82	92.63
Business Services	107.27	50.50	78.88
Other Services	82.85	31.10	56.98

share in total Gross Domestic Product (GDP). Some taxes, of course, fall on non-wage income that may not be as affected by the loss of jobs domestically in a particular industry (for example, if GM opens a plant overseas, wage income from domestic jobs lost is no longer taxed, but, GM still earns profits that may be taxed).

However, just like the assumed size of the respending multiplier, the assumption regarding the rate of taxation will not change the *relative* ranking of industries by the size of their employment multipliers. Assuming higher or lower rates of taxation will make the government employment effects larger or smaller across all industries, but, higher paying industries will still support more government employment than lower paying industries.

For each industry, the amount of tax revenue generated per 100 jobs, both in direct and indirect employment, is calculated. This tax revenue is translated into government jobs by calculating the ratio of total government revenue to total government employment. This ratio is calculated separately for federal and state and local governments.

To get the amount of tax revenue supported annually per 100 jobs in each industry, the wages of workers directly employed are multiplied by the average hourly wage in the industry and then by 2000 (roughly, the number of hours worked per year). Then, the number of jobs indirectly supported is similarly multiplied by their industry's average hourly wage and then by 2000. 20 percent of this is total wage bill is assumed to go to the federal government, and 10 percent to state and local governments. It is true that the average number of hours worked per year may differ substantially across industries. However, what these numbers can tell us is how much government employment is supported by a given number of full-time equivalent (FTE) jobs in any given industry, which is still a useful comparison.

To provide an example of government employment effects, take the earlier case with 100 jobs in the automobile industry supporting 90 jobs in supplier industries: 50 in steel and 40 in rubber. Say that the average hourly wage in the automobile industry is $13, the average hourly wage in the steel industry is $12, and the average hourly wage in the rubber industry is $9.

Total federal tax revenue supported by every 100 jobs in the automobile industry is the sum of direct and indirect tax revenues. Direct tax revenues can be calculated:

(7) 100 jobs * $13 (hourly wage) * 2000 (annual hours) * .2 (federal tax rate) = $520,000

Indirect tax revenues can be calculated as the sum of tax revenues from the steel and rubber industry:

(8) Steel: 50 jobs * $12 (hourly wage) * 2000 (annual hours) * .2 = $240,000
(9) Rubber: 40 jobs * $9 (hourly wage) * 2000 (annual hours) *.2 = $144,000

Total federal tax revenues supported by every 100 jobs in the automobile industry thus becomes:

$520,000 + $240,000 + $144,000 = $904,000

For state and local taxes, repeat the following, but change the federal tax rate of .2 to .1, the state and local tax share of wages. This yields $452,000 in state and local tax revenues supported by every 100 jobs in the automobile industry.

To translate these tax revenues into employment figures, total tax revenue collected in 2002 was divided by the number of government employees. For the federal government, these figures show that 1 federal government job was supported by every $714,285 in tax revenue. For state and local governments, 1 government job was supported by every $103,703.

From the example above, this would imply that 1.27 federal government jobs and 4.4 state and local government jobs were supported per 100 jobs in the automobile industry.

In sum, federal government employment effects can be expressed as:

(10) [(7) + (8) + (9)]/[Federal Government Revenue/Federal Government Employment]

An analogous measure can be constructed for state and local government revenue and employment. Federal and State and Local government employment supported per 100 jobs in each industry is shown below in **Table 7**.

4. Total Indirect Employment

Total indirect employment supported per 100 jobs in each industry is the sum of employment in supplier industries, respending employment, and government employment. These sums for each industry, as well as each component part, are shown

Table 7: Government employment, by sector

Industry Grouping	Federal Government Employment	State and Local Gov Employment	Total Government Employment
Agriculture, Forestry, Fisheries	0.21	1.00	1.21
Mining	0.59	2.82	3.41
Construction	0.64	3.10	3.74
Manufacturing	1.17	5.61	6.78
Durable Manufacturing	1.57	7.55	9.12
Non-durable Manufacturing	1.02	4.93	5.95
Automobiles	2.08	10.00	12.08
Transportation	0.53	2.53	3.06
Communications	0.77	3.71	4.48
Utilities	2.22	10.71	12.93
Wholesale Trade	0.43	2.06	2.49
Retail Trade	0.22	1.07	1.29
Eating + Drinking Establishments	0.37	1.79	2.16
FIRE	0.76	3.65	4.41
Business Services	0.49	2.38	2.88
Other Services	0.32	1.53	1.85

below in **Tables 8 and 9**. The last row of this table shows an estimate of employment that is supported directly and indirectly per $1,000,000 in sales. One can see that with dollar sales as opposed to employment as the scale, the general pattern of the employment multipliers is reversed - every $1,000,000 in sales supports far fewer jobs in manufacturing sectors than in others.

This is due to both the high wages prevailing in manufacturing as well as the large number of material and equipment purchases required for manufacturing production. These two influences mean that each manufacturing job is more costly in other sectors, but that each manufacturing job supports more employment in other sectors.

This is another example of how the employment multipliers calculated in this study are useful. Looking just at the raw numbers presented in the employment requirements tables from the BLS, one can get the mistaken impression that final demand or sales directed towards the manufacturing sectors is an inefficient way to create jobs, as any given amount of final sales in manufacturing generates fewer jobs than an equivalent amount spent in other sectors. This is only true because of the high wages and high capital requirements in manufacturing. Using jobs instead of sales as the relevant denominator, however, it can be seen that employment in manufacturing supports much more secondary employment than in other sectors.

Indirect employment figures for a broad range of detailed, 2-digit Standard Industrial Classification (SIC) groups are shown below in Table 9.

5. Conclusion

All job loss is not alike, in terms of its effects on the wider economy. The employment multipliers calculated in this paper support the proposition that layoffs in the manufacturing sector tend to have much larger spillover effects in terms of indirect employment loss than layoffs in other sectors. There are essentially two reasons for this: manufacturing production tends to require many more intermediate goods and capital equipment than do many other sectors (especially retail trade and business and

Table 8: Employment multipliers, by sector

Industry Grouping	Downstream Employment	Re-spending Employment	Government Employment	Employment Multiplier
Agriculture, Forestry, Fisheries	35.88	56.57	1.21	93.66
Mining	117.05	82.36	3.41	202.82
Construction	95.23	91.08	3.74	190.06
Manufacturing	167.54	116.46	6.78	290.78
Durable Manufacturing	232.69	129.72	9.12	371.53
Non-durable Manufacturing	147.59	103.20	5.95	256.74
Automobiles	280.83	171.17	12.08	464.08
Transportation	87.64	76.15	3.06	166.85
Communications	147.83	99.35	4.48	251.67
Utilities	390.84	217.72	12.93	621.50
Wholesale Trade	83.11	71.37	2.49	156.96
Retail Trade	40.81	46.35	1.29	88.45
Eating + Drinking Establishments	52.88	52.19	2.16	107.23
FIRE	143.70	92.63	4.41	240.73
Business Services	82.03	78.88	2.88	163.79
Other Services	52.62	56.98	1.85	111.44

Table 9

SIC Number	SIC Name	Supplier Jobs	Re-spending Jobs	Government Jobs	Employment Multiplier	Jobs/$1,000,000	Multipliers, minus capital service usage
1_9	Agriculture, Forestry, Fisheries	35.9	56.6	1.2	93.7	20.3	80.1
10	Metallic ore mining	167.5	113.4	5.9	286.8	8.5	230.7
12	Coal mining	42.2	24.4	1.3	67.9	6.5	50.7
13	Petroleum and Natural Gas	99.8	77.0	2.8	179.6	8.6	131.7
14	Nonmetallic minerals, except fuel	100.3	80.2	3.3	183.8	9.6	145.7
15_17	Construction	95.2	91.1	3.7	190.1	15.6	165.4
20	Food and beverage processing	398.9	157.0	18.0	573.9	16.5	518.7
21	Tobacco	479.6	216.2	17.7	713.6	6.0	572.0
22	Textiles	134.5	88.3	5.9	228.8	13.9	207.3
23	Apparel	102.0	68.7	4.8	175.5	15.9	165.3
24	Lumber and wood, except furniture	132.5	87.2	5.7	225.4	15.3	201.8
25	Furniture and fixtures	97.4	77.4	4.3	179.2	13.3	164.0
26	Paper and allied products	195.2	122.7	7.2	325.1	0.8	266.3
27	Printing and publishing	94.7	79.1	3.3	177.1	9.5	144.4
28	Chemicals	332.0	152.8	10.0	494.8	12.2	353.3
29	Petroleum refining and products	836.0	329.0	24.5	1189.5	7.5	821.1
30	Rubber and plastics	106.4	82.2	4.4	192.9	3.9	170.0
31	Leather products	105.7	62.6	3.9	172.3	11.0	141.3
32	Stone, clay, and glass	118.8	82.0	4.2	204.9	10.8	166.3
33	Primary metals	166.7	112.7	6.9	286.2	9.1	250.1
331	Blast furnaces and basic steel	186.7	121.6	7.7	315.9	8.2	275.1
34	Fabricated metals	126.7	91.7	4.8	223.2	11.0	187.5
35	Industrial machinery, non-electrical	125.6	100.8	5.4	231.9	11.5	209.5
36	Electrical machinery	228.1	116.9	7.5	352.5	7.9	266.6
371	Automobiles	280.8	171.2	12.1	464.1	9.4	413.4
37	Transportation equipment	106.9	99.5	4.2	210.6	9.9	183.3
38	Scientific and professional equipment	104.1	94.4	4.8	203.2	9.0	190.4
39	Miscellaneous Manufacturing	107.3	73.8	4.0	185.2	13.8	154.0
40	Railroad transportation	120.6	77.1	3.9	201.5	15.1	154.1
41	Local and interurban rail	87.7	77.6	3.7	169.1	10.4	151.8
42	Trucking/Warehousing	85.4	71.7	3.0	160.1	28.0	130.5
44	Water transportation	184.5	139.2	6.6	330.3	15.0	271.8
45	Air transportation	74.6	72.8	2.5	149.9	11.0	121.7
46	Pipelines	284.6	145.5	7.6	437.8	14.8	297.5
47	Passenger transportation services	62.6	72.2	2.1	136.8	4.9	112.9
48	Communications	147.8	99.7	4.5	252.0	16.4	188.8
49	Utilities	390.8	110.0	12.9	513.8	8.9	369.3
50_51	Wholesale trade	83.1	71.4	2.5	157.0	6.1	120.5
52_7,9	Retail trade, except food and drink	40.8	46.3	1.3	88.4	11.4	71.7
58	Eating and drinking places	52.9	52.2	2.2	107.2	21.1	95.0
60	Depository institutions	147.4	82.6	4.7	234.7	32.6	175.7
61/67	Nondepository and investment institutio	102.4	85.6	3.6	191.6	9.1	157.3
62	Security and commodity brokers	137.5	108.4	3.5	249.4	13.9	177.5
64	Insurance agents, brokers, services	70.2	79.6	2.4	152.2	6.5	126.4
65	Real estate	208.4	110.6	6.1	325.1	16.0	232.2
70	Hotels and lodging	46.4	45.7	1.6	93.7	6.6	77.3
72	Laundry, cleaning services	46.4	50.4	1.6	98.4	22.5	82.2
73	Beauty and barber shops	80.1	73.1	2.8	156.0	28.7	129.2
75	Automobile rental and parking	256.6	124.1	10.5	391.2	24.0	335.5
78	Motion picture and movie rental service	67.8	72.9	2.2	142.9	0.0	142.8
79	Recreational services	82.8	56.3	3.2	142.4	16.7	116.6
80	Health services	50.3	66.0	1.6	117.9	21.4	96.2
81	Legal services	71.7	87.4	2.1	161.1	19.0	140.4
82	Educational services	36.9	45.5	1.3	83.7	11.9	50.5
83	Social services	27.1	42.9	1.0	70.9	38.6	57.8
84	Museums, zoos, botanical gardens	55.0	60.0	2.2	117.2	39.6	108.0
86	Membership organizations	30.8	73.4	1.1	105.4	27.7	91.0
87	Other business services	78.7	86.2	2.7	167.6	30.8	156.6

personal services), and manufacturing jobs pay relatively high wages that lead to larger re-spending and government employment effects.

While there is substantial variation in employment multipliers within manufacturing (from 175 in apparel to 464 in automobile production to 904 in computer equipment and office machinery), manufacturing industries across-the-board support more secondary employment than the retail trade or business and personal service sector.

This finding has implications for the current crisis in manufacturing employment in the United States. This sector has lost 2.7 million jobs since January 1998. After thirty years where the employment level never dipped below 16.5 million workers, manufacturing employment in the United States now stands at 14.8 million, its lowest level since 1958. These manufacturing job losses have had profound implications on the larger labor market of the United States, as indirect employment supported by these jobs have suffered as well. There are a number of reasons why the manufacturing sector is important to the overall economic health of the United States: manufacturing jobs pay high wages, especially for workers without a 4-year college degree, manufacturing industries lead the economy in productivity growth, and, manufacturing exports are needed to reconcile the current (historically high) trade deficit. This study provides one more dimension along which manufacturing employment is crucial for the wider economy - it generates more secondary employment than other sectors.

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