

# The Benefits of Manufacturing Jobs

## Executive Summary

**T**he role of the manufacturing sector in the U.S. economy is more prominent than is suggested solely by its output or number of workers. It is a cornerstone of innovation in our economy: manufacturing firms fund most domestic corporate research and development (R&D), and the resulting innovations and productivity growth improve our standard of living. Manufacturing also drives U.S. exports and is crucial for a strong national defense.

The current economic recovery has witnessed a welcome return in manufacturing job growth. Since its January 2010 low to April 2012, manufacturing employment has expanded by 489,000 jobs or 4 percent<sup>1</sup>— the strongest cyclical rebound since the dual recessions in the early 1980s. From mid-2009 through the end of February 2012, the number of job openings surged by over 200 percent, to 253,000 openings.<sup>2</sup> Coupled with attrition in the coming years from Baby Boomer retirements, this bodes well for continued hiring opportunities in the manufacturing sector.<sup>3</sup>

The rebound in manufacturing is important, not only as a sign of renewed strength, but also because manufacturing jobs are often cited as “good jobs:” they pay well, provide good benefits, and manufacturing workers are less likely to quit than workers in other private sector industries.<sup>4</sup> In fact, our analysis finds evidence in support of these claims. Specifically, this report shows that:

- On average, hourly wages and salaries for manufacturing jobs were \$29.75 an hour in 2010 compared to \$27.47 an hour for non-manufacturing jobs. Total hourly compensation, which includes employer-provided benefits, was \$38.27 for workers in manufacturing jobs and \$32.84 for workers in non-manufacturing jobs, a 17 percent premium.
- Even after controlling for demographic, geographic, and job characteristics, manufacturing jobs maintained significant wage and benefit premiums.
- The educational attainment of the manufacturing workforce is rising steadily. In 2011, 53 percent of all manufacturing workers had at least some college education, up from 43 percent in 1994.
- The innovative manufacturing sector relies more heavily on STEM (science, technology, engineering and mathematics) education than the non-manufacturing sectors. In 2011, nearly 1 out of 3 (32 percent) of college-educated manufacturing workers had a STEM job, compared to 10 percent in non-manufacturing sectors.
- Higher educational attainment for manufacturing workers carries higher premiums, and the size of the premium, including or excluding benefits, increase consistently with educational attainment.
- Furthermore, the compensation premium has risen over the past decade across all levels of educational attainment.

In sum, manufacturing jobs provide benefits to workers with higher overall compensation than other sectors, and to the economy through innovation that boosts our nation’s standard of living.

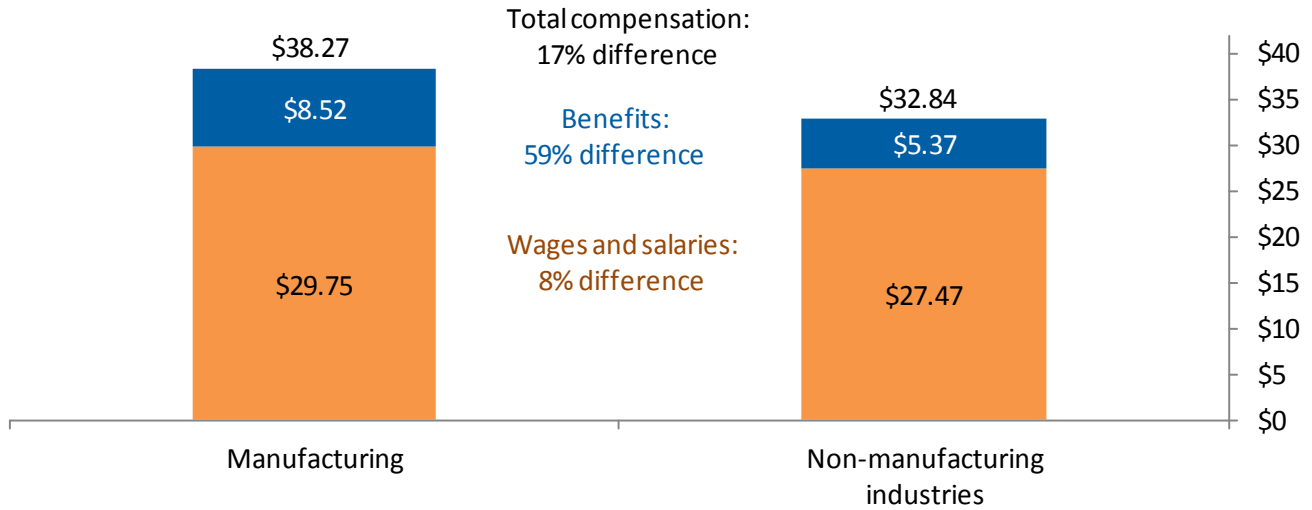
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ESA  
Issue Brief  
#01-12

May  
2012



**Figure 1. Employee Compensation per Hour by Major Industry, 2010**



Source: ESA calculations using unpublished data from the National Income and Product Accounts, Bureau of Economic Analysis.

Note: Wages and salaries include paid leave and supplemental pay, such as overtime and premium pay, shift differentials, and non-production bonuses.

## How Do Manufacturing Jobs Stack Up?

### Basic wage and compensation comparison

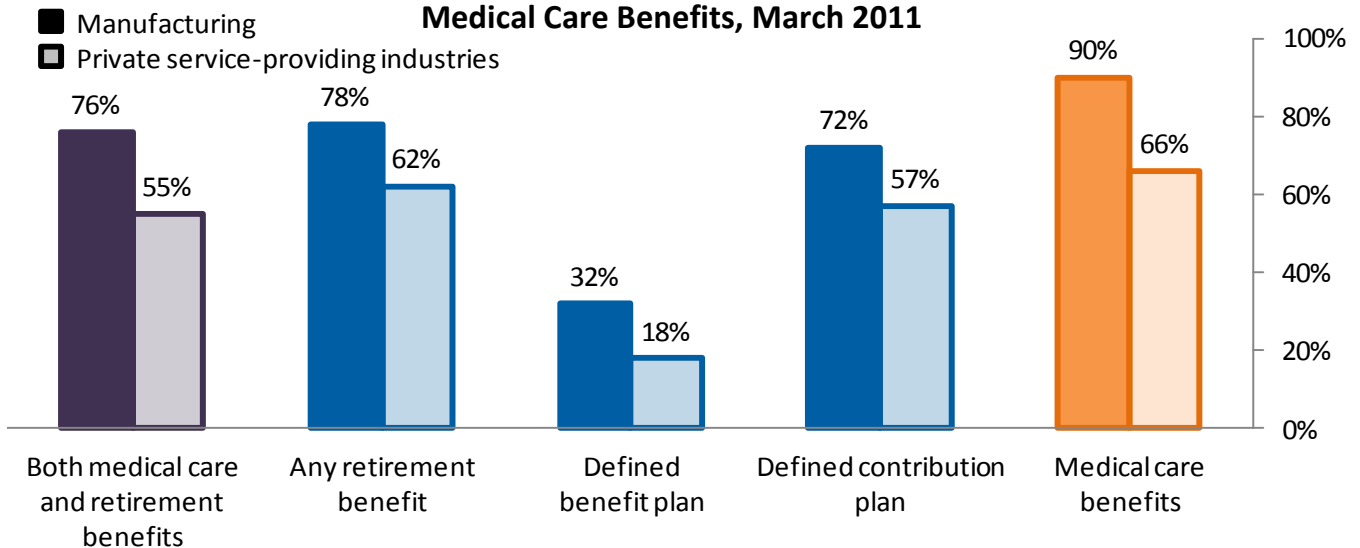
When most people think about job quality, pay levels are the first metric that comes to mind. By this measure, manufacturing jobs are good jobs: a basic comparison of average wages (Figure 1) shows that hourly wages and salaries were 8 percent higher in

manufacturing than other private industries as of 2010, based on National Income and Product Accounts (NIPA) data available from the Commerce Department’s Bureau of Economic Analysis.<sup>5</sup>

### Benefits

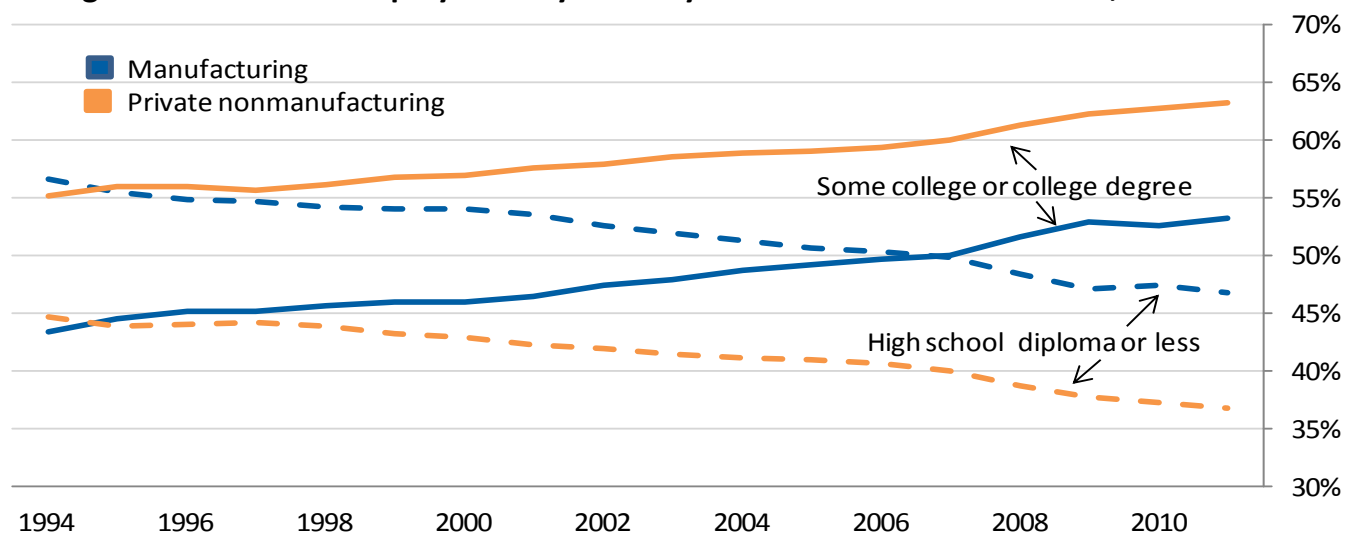
Yet, a trip to the doctor and planning for retirement are two quick reminders that wages alone are an incomplete measure of job quality. Expanding the definition to include benefits makes manufacturing jobs even more attractive to workers than non-

**Figure 2. Percent of Private Industry Workers with Retirement and Medical Care Benefits, March 2011**



Source: National Compensation Survey, Bureau of Labor Statistics.

**Figure 3. Percent of Employment by Industry and Educational Attainment, 1994-2011**



Source: ESA calculations using Current Population Survey public-use Merged Outgoing Rotation Group files, National Bureau of Economic Research.

manufacturing jobs. First, manufacturing workers are more likely to have the option of medical care and retirement benefits, as Figure 2 highlights. Ninety percent of manufacturing employees have access to medical care benefits, compared with 66 percent of workers in private service-providing industries.<sup>6,7</sup> And 78 percent of manufacturing workers receive employer contributions to their retirement benefits (primarily to defined-contribution plans), versus 62 percent of workers in service-providing industries.<sup>8</sup>

Manufacturing workers also are more likely to take advantage of these benefits. In manufacturing establishments, 81 percent of workers take advantage of medical care benefits compared with a 71 percent “take-up rate” in service-providing industries.<sup>9</sup> This is likely driven by the fact that manufacturing employers pay a higher share of health care premiums than their service providing counterparts. For single coverage and family coverage, manufacturing employers pay 82 percent and 75 percent, respectively, as compared to the 79 percent and 68 percent share paid by service industry employers.<sup>10</sup> In dollars and cents, the median monthly employee contribution for family coverage is about \$262 in manufacturing and \$353 in service-providing industries.<sup>11</sup> Similar advantages are also seen in other benefits. For example, manufacturing workers have greater rates of ac-

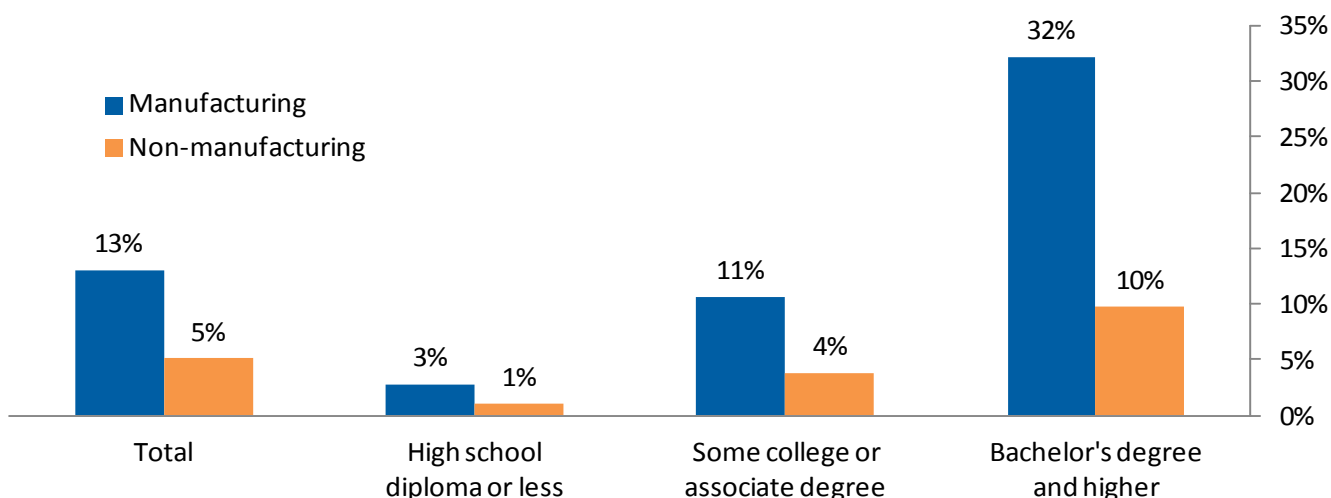
cess to paid leave and paid vacation than workers in service-providing industries.

Taking into account employer contributions to benefits such as medical insurance and retirement highlights an even larger difference between worker compensation in manufacturing and non-manufacturing industries. As seen in Figure 1, the average hourly contributions for insurance, retirement and savings, and legally required benefits sum to \$8.52 in manufacturing, or 59 percent higher than in non-manufacturing industries. As a result, total hourly compensation, including benefit contributions, is 17 percent higher for manufacturing relative to non-manufacturing workers—\$38.27 compared with \$32.84.<sup>12</sup>

### Educational Attainment of the Manufacturing Workforce

The manufacturing sector has been steadily “upskilling” in the last two decades: more manufacturing employees are higher educated and higher skilled than in the past. Figure 3 demonstrates the increasing share over time of workers with at least some college in the manufacturing and non-manufacturing workforces. Since 2007, more than half of all manufacturing workers have completed some college classes, and the proportion continues to increase.<sup>13</sup> The wage and compensation pre-

**Figure 4. Percent of STEM Employment by Industry and Educational Attainment, 2011**



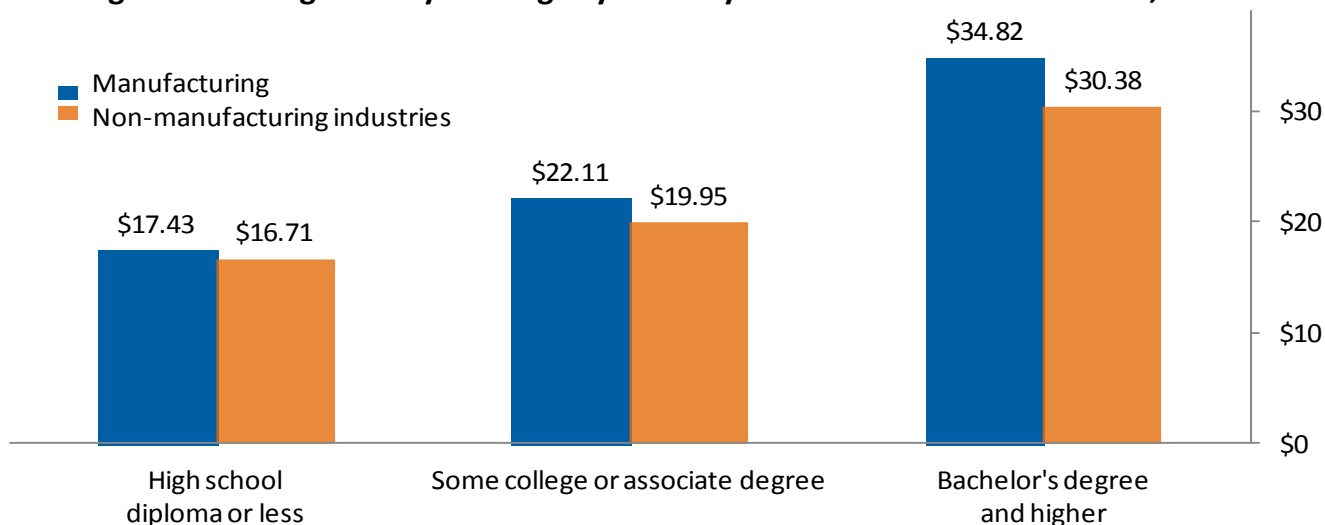
Source: ESA calculations using Current Population Survey public-use microdata.  
 Note: Estimates are for private wage and salary workers age 25 and older.

mium manufacturing workers enjoy relative to their non-manufacturing peers also is tied to educational attainment, as detailed below. On average, higher-educated workers have a larger premium from working in the manufacturing sector.

More generally, workers who drive innovation in our economy earn a premium relative to their peers in other industries or occupations. This innovation premium has been discussed in a series of earlier ESA reports published in 2011 about workers in science, technology, engineering and mathematics (STEM).

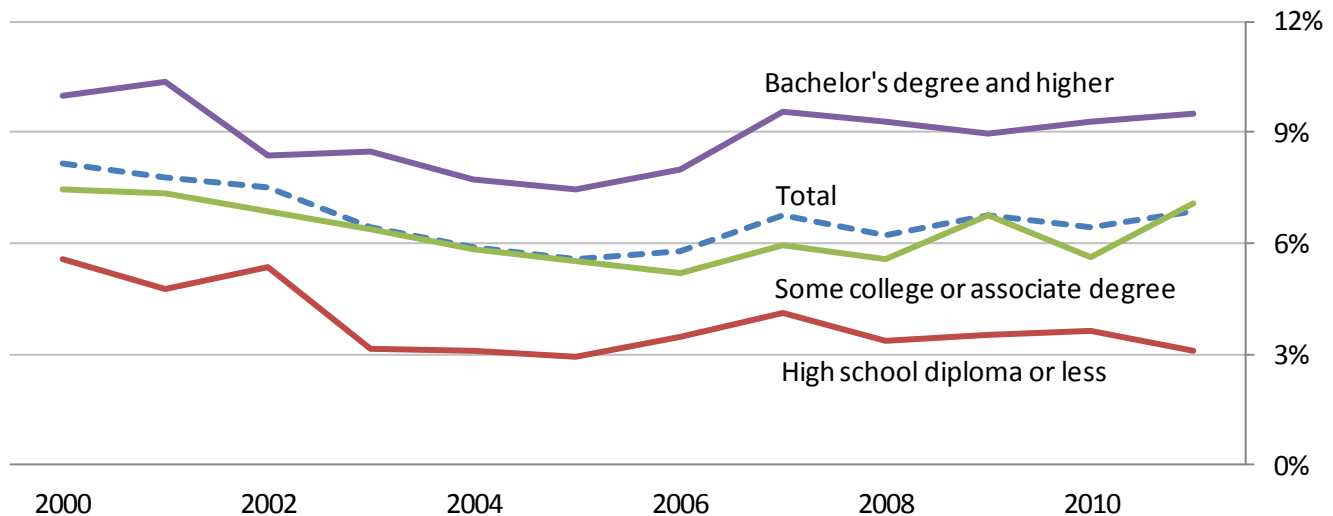
The manufacturing sector is a major employer of STEM workers. As shown in Figure 4, overall 13 percent of manufacturing workers have STEM jobs, compared with 5 percent of workers in other private industries. Because a college education is the main path to many STEM positions, it not surprising that the STEM employment share increases with educational attainment. Nearly one out of three college-educated manufacturing workers has a STEM job; in non-manufacturing industries, the share is one in ten. Interestingly, these relative shares hold across all three categories of educational attainment, as the STEM share in manufac-

**Figure 5. Average Hourly Earnings by Industry and Educational Attainment, 2011**



Source: ESA calculations using Current Population Survey public-use microdata.  
 Note: Estimates are for full-time private wage and salary workers age 25 and older.

**Figure 6: Regression-based Earnings Premium for Manufacturing Workers, 2000-2011**



Source: ESA calculations using CPS public use microdata files for annual merged outgoing rotation groups for 1994 to 2011 from [www.nber.org/data/morg.html](http://www.nber.org/data/morg.html). Regression of log hourly earnings vs. age variables, dummies for gender & marital status, race & Hispanic origin, citizenship, education, metropolitan area, region, union membership, occupation, full-time, manufacturing interacted with time, and time. Top-coded earnings multiplied by 1.5. Coefficients transformed back to percent for graph. Private wage and salary workers 25 years and older with earnings > minimum wage x 0.4.

turing is approximately three times higher than in non-manufacturing industries.

### Wage Premium for Manufacturing Workers

Clearly, manufacturing jobs are attractive relative to other industries. Yet, in order to quantify the extent to which a wage premium really exists in manufacturing, it is important to consider the extent to which factors such as educational attainment, location, and job characteristics of workers affect wages. In order to evaluate the influence of these factors on wages, we used public-use microdata from the U.S. Census Bureau's Current Popu-

lation Survey (CPS).<sup>14</sup> As reflected in Figure 5, the educational attainment of a given worker does matter. The wage premium increases with educational attainment; the manufacturing earnings differential is greatest for those with a bachelor's degree and higher who earned \$34.82 per hour, or 15 percent more per hour than those in non-manufacturing jobs with similar education levels. In contrast, manufacturing workers with a high school diploma or less earn about 4 percent more, on average, than their counterparts in non-manufacturing jobs.

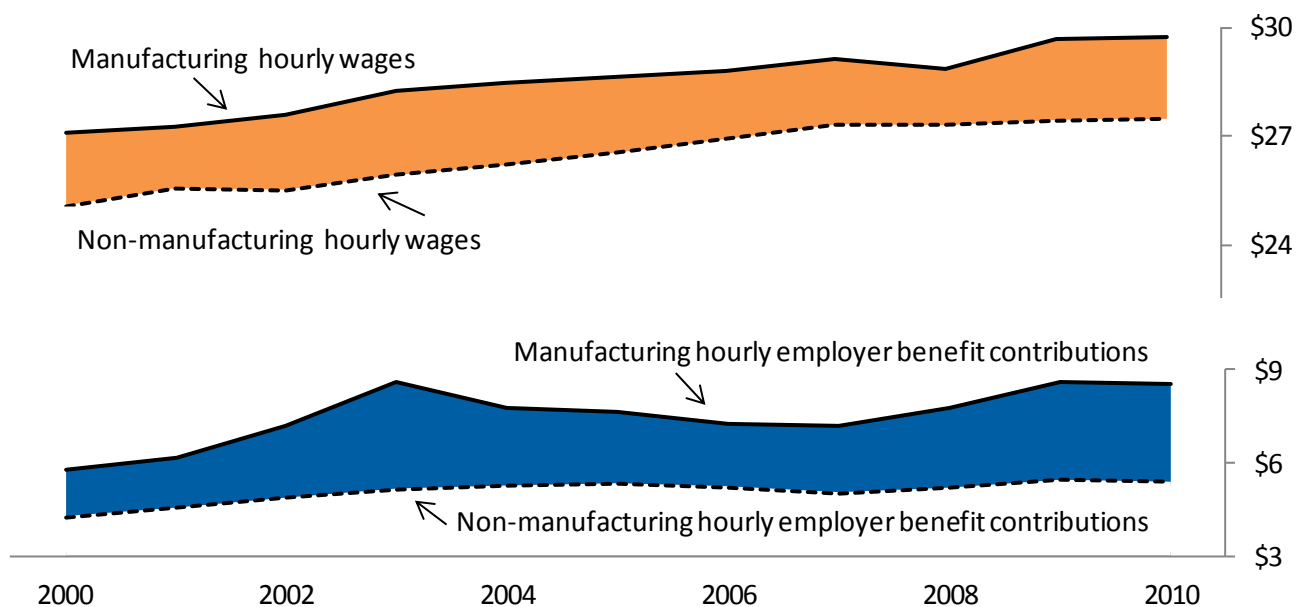
To more fully examine the role of education along with such other characteristics as demographics

#### Why is there a wage premium in manufacturing?

The efficiency wage theory is often cited as one explanation for the existence of a manufacturing wage premium. This states that many firms pay higher wages in order to encourage more cooperation from the workforce and minimize turnover (Krueger and Summers). Others have noted that industries with larger firms tend to pay more (Dickens and Katz). This supports the efficiency theory because workers are more difficult to monitor as firm size increases. Paying these workers more discourages shirking without necessitating higher levels of monitoring. Furthermore, studies have shown that the higher productivity levels and the ratio of real value-added to the number of manufacturing employees accounts for the premium (Genre et al.).

Dickens, William T, Lawrence F. Katz. "Interindustry Wage Differences and Industry Characteristics." NBER Working Paper No. 2014, September 1986.  
 Genre, Veronique, Kohn, Karsten, Daphne Momferatou. "Understanding Inter-Industry Wage Structures in the Euro Area." IZA Discussion Paper No. 4114, April 2009.  
 Krueger, Alan B., Lawrence H. Summers. "Efficiency Wages and the Inter-Industry Wage Structure." *Econometrica*, 56:2, March 1988, 259-293.

**Figure 7: Real Compensation per Hour by Private Industry, 2000-2010 in 2010 dollars**



Source: ESA calculations using data from National Income and Product Accounts, Bureau of Economic Analysis.  
 Note: Real compensation was calculated using the personal consumption expenditures price deflator.

and geographic location, we performed regression analyses investigating the extent to which log hourly earnings were explained by factors including age, marital status, race, ethnicity, region, metropolitan area status, union status, and occupation.<sup>15</sup> After controlling for the impacts of this set of characteristics, the manufacturing wage premium in 2011 was estimated to be 7 percent.<sup>16</sup>

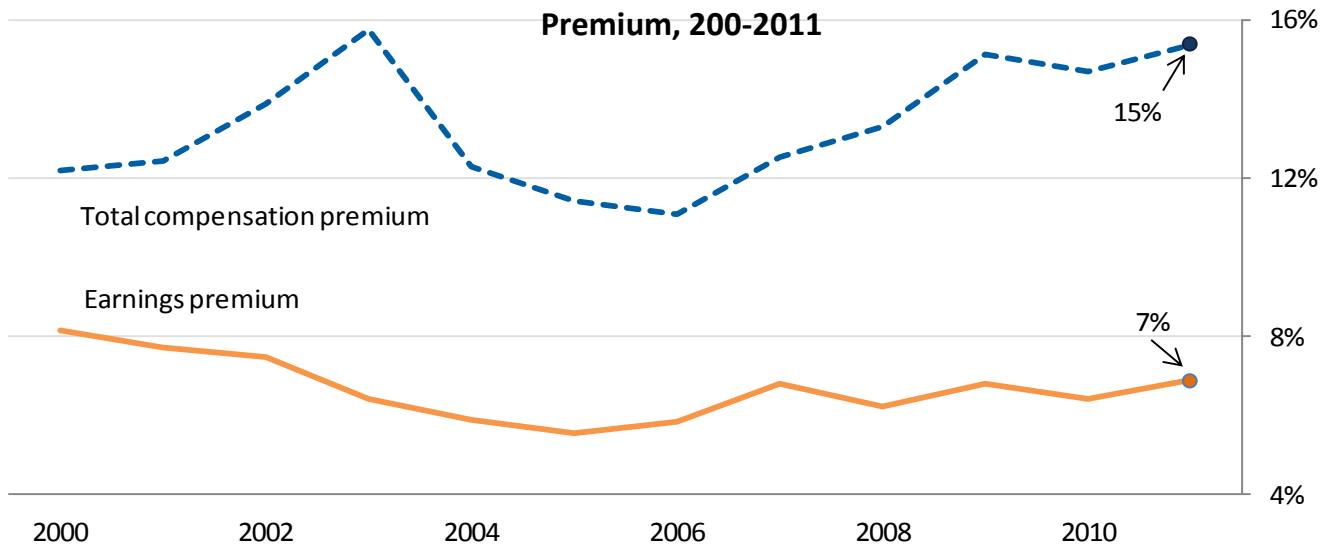
As shown in Figure 6, the regression-adjusted manufacturing premium rises with educational attainment. The other result of note in Figure 6 is that the manufacturing earnings premiums have remained relatively constant for workers with a bachelor's or graduate degree, whose premium ranged from 8 to 10 percent between 2000 and 2011.<sup>17</sup> The premium earned by manufacturing workers with some college or an associate's degree declined during the first half of the decade and largely rebounded in the following years, reaching 7 percent in 2011. Workers with a high school diploma or less saw the premium decline from about 6 percent in 2000 to 3 percent by 2005. Since then, their premium has fluctuated between 3 and 4 percent.

### Regression-adjusted Total Compensation Premium

The monthly CPS does not collect information on employer contributions to benefits; however, it is possible to take into account these contributions by using NIPA data on the share of total compensation that corresponds to benefits (or "supplements to wages and salaries" in NIPA jargon). These compensation data highlight the increasingly important role that benefits have played, particularly in manufacturing. Between 2000 and 2010, real hourly compensation in manufacturing rose more rapidly than in private non-manufacturing industries, 16 percent versus 11 percent. As shown in Figure 7, the differential growth comes largely from the employer contributions to employee benefits, as the 10 percent growth in real wage and salary accruals per full-time equivalent (FTE) in manufacturing modestly exceeded the 8-percent non-manufacturing growth. Benefit contributions per manufacturing FTE climbed practically by half (48 percent) from 2000 to 2010, essentially double the 25 percent growth for non-manufacturing FTEs.

Following the lead of Krueger and Summers,<sup>18</sup> the NIPA data were used to calculate the ratio of total compensation to wage and salary accruals by in-

**Figure 8. Regression-adjusted Manufacturing Earnings and Total Compensation Premium, 2000-2011**



Source: ESA calculations using Current Population Survey public-use microdata and data from the National Income and Product Accounts.  
 Note: Estimates are for private wage and salary workers age 25 and older.

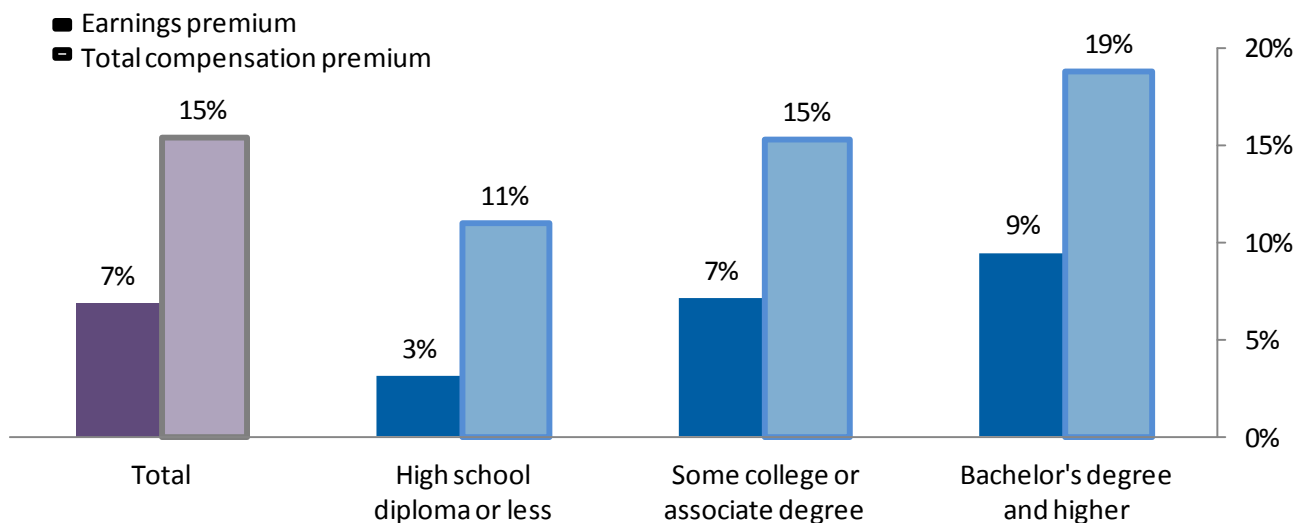
dustry and year. These ratios were applied to the CPS-based hourly wage estimates. The resulting estimate of hourly total compensation can be used to estimate the total compensation premium in manufacturing.

Adjusting for total compensation significantly boosts the regression-adjusted premium associated with manufacturing jobs, as shown in Figure 8. While in 2011 the overall regression-adjusted wage premium was 7 percent, the compensation pre-

mium was more than twice as high, at 15 percent.<sup>19</sup> Also, parallel to the wage results, the compensation premium is correlated with educational attainment: college graduates in manufacturing jobs have total compensation that is about 19 percent higher than workers in other industries. For workers with no more than a high school diploma, the compensation premium was 11 percent (Figure 9).

This consideration of total compensation, as opposed to just wages and salaries, reveals a manu-

**Figure 9. Regression-adjusted Manufacturing Earnings and Total Compensation Premium, 2011**



Source: ESA calculations using Current Population Survey public-use microdata and data from the National Income and Product Accounts.  
 Note: Estimates by educational attainment (blue bars) are for private wage and salary workers age 25 and older.



facturing premium that increased on net over the past decade.<sup>20</sup> As shown in Figure 8, the overall premium entered the 2000s at 12 percent and was 15 percent as of 2011. For workers at all three levels of educational attainment, the premium grew between 2000 and 2011. The premium for workers with a high school diploma or less increased from 9 percent in 2000 to 11 percent in 2011, while the premium for workers with some college or an associate degree rose 4 points to 15 percent as of 2011 and the premium for workers with a bachelor's degree or higher rose 4 points to 19 percent.

## Conclusion

The United States' manufacturing sector has long been a source of well-paid jobs for relatively less-educated workers and thus has helped support a strong middle class. Today, the sector continues to provide good paychecks as well as important fringe benefits. This report highlights the persistent wage and even higher total compensation premium earned by the country's manufacturing workforce. While the premium exists for both low- and high-skilled workers, it does rise with educational attainment. The educational attainment of the manufacturing workforce has been increasing over time, as more than half of manufacturing workers have completed at least some college and those who enter with a high school diploma are likely to continue their education through extensive on-the-job training. Workers who pursue manufacturing jobs now and in the future will earn premium pay and benefits while contributing directly to the competitiveness and innovative capacity of the United States.

## Inter-industry Wage Premiums

While the U.S. economy generates good jobs across industries, wage premiums persist in several industries. Expanding the regression analysis using the CPS microdata, in order to examine a dozen broad industries, uncovers sizeable earnings premiums in mining (27 percent), construction (12 percent), and financial activities (11 percent), followed by durable goods manufacturing (8 percent) in 2011. A 5 percent premium in the nondurable goods manufacturing industry ranked it seventh on the list. At the tail end were leisure and hospitality at -19 percent and retail trade at -17 percent. It is worth noting that the mining, construction, and financial services industries each employ fewer people than manufacturing, which in turn employs fewer people than retail trade and leisure industries. With rising productivity, shifting employment from low wage industries to manufacturing of necessity would result from increasing demand for manufacturing output, either through higher domestic demand, increased exports, or import substitution. Foreign demand has fueled much of the recent surge in manufacturing activity and employment, as exports of manufactured goods rose 38 percent (in current dollars) from 2009 to 2011.



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## Endnotes

<sup>1</sup>Bureau of Labor Statistics, Current Employment Statistics. [www.bls.gov/ces](http://www.bls.gov/ces).

<sup>2</sup>Bureau of Labor Statistics, Job Openings and Labor Turnover Survey. [www.bls.gov/jlt](http://www.bls.gov/jlt).

<sup>3</sup>It is important to distinguish between job opportunities and net job growth. While, the Bureau of Labor Statistics (BLS) recently projected essentially no net change in manufacturing employment between 2010 and 2020, millions of openings in the sector will arise in the coming years in order to replace workers who retire or otherwise leave manufacturing jobs. BLS projects such openings by occupational category, and it estimates that, for example, production occupations (which are predominately in the manufacturing industry) will increase by 356,800 between 2010 and 2020, companies will actually need to fill more than 2.2 million openings over the decade. In short, manufacturing firms will continue to be a good source of good job opportunities. One factor potentially limiting the growth in manufacturing jobs is a mismatch between the skills needed for the jobs and the skills held by those looking for jobs. See, for example, “An economy that works: Job creation and America’s future,” Manyika et al., McKinsey Global Institute (June 2011).

<sup>4</sup>Bureau of Labor Statistics, “Job Openings and Labor Turnover—February 2012,” Table 3. [www.bls.gov/news.release/pdf/jolts.pdf](http://www.bls.gov/news.release/pdf/jolts.pdf).

<sup>5</sup>This report draws heavily upon data from the Current Population Survey and the National Income and Product Accounts when comparing manufacturing and non-manufacturing earnings. These are just two of several potential sources of data on hourly employee compensation by industry. While the multiple sources may differ somewhat in definitions, frequency, and statistical methodology, all show that on average manufacturing workers have higher earnings than workers in other private industries. The NIPA data cited in Figure 1 show that average hourly wages and salaries in manufacturing were 8 percent higher than in non-manufacturing industries in 2010. Current Population Survey data for the same time period show a 4 percent difference. Three other data sources from the Bureau of Labor Statistics are in the same ballpark. Monthly payroll survey (or Current Employment Statistics data) for 2010 have hourly manufacturing earnings 4 percent above non-manufacturing earnings, while Occupational Employment Statistics program estimates show a 7 percent difference. According to unpublished estimates from the National Compensation Survey for September

2011, hourly manufacturing wages and salaries were 9 percent higher than in non-manufacturing industries.

<sup>6</sup>“Service-providing industries” exclude the mining and construction industries and thus are a slightly more narrow industry grouping than “non-manufacturing.” The National Compensation Survey data on benefit access are available for service-providing industries, but not the broader non-manufacturing grouping. Nevertheless, the general conclusions about the benefits access would be the same whether the comparison group is service-providing industries or non-manufacturing industries.

<sup>7</sup>Bureau of Labor Statistics, Employee Benefits Survey, Table 9. [www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table05a.pdf](http://www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table05a.pdf).

<sup>8</sup>Bureau of Labor Statistics, Employee Benefits Survey, Table 2. [www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table02a.pdf](http://www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table02a.pdf).

<sup>9</sup>Bureau of Labor Statistics, Employee Benefits Survey, Table 9. [www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table05a.pdf](http://www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table05a.pdf).

<sup>10</sup>Bureau of Labor Statistics, Employee Benefits Survey, Table 11. [www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table06a.pdf](http://www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table06a.pdf).

<sup>11</sup>Bureau of Labor Statistics, Employee Benefits Survey, Table 16. [www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table11a.pdf](http://www.bls.gov/ncs/ebs/benefits/2011/ownership/private/table11a.pdf).

<sup>12</sup>It is important to highlight two caveats to the benefit contribution data. First, the data do not take into account any intra-industry variation in the ratio of compensation to earnings, although it is likely that the ratio is correlated to workers’ occupation and union status, among other factors. Second, the compensation figures include not just the employer contributions for workers currently on payrolls, but also potentially to some retirees, such as those receiving employer-provided medical insurance. To the extent that manufacturing retirees are more likely than other workers to receive employer contributions, or more generous contributions, for their medical insurance premiums, then this adjustment could bias the manufacturing compensation premium upwards. Estimates from the Medical Expenditure Panel Survey, which is one of the data sources for the NIPA compensation estimates, suggest that there would be little if any upward bias due to the availability of medical insurance. In fact, the estimates show that manufacturing and mining retirees (there are not separate manufacturing estimates) are less likely than retirees from other industries to have access to medical insurance. In 2011, 7.9 percent of manufacturing and mining retirees age 65 and over and 8.4 percent under age 65 were offered insurance, compared to 10.9 percent of retirees age 65

and over and 11.7 percent of younger retirees in other industries. See Tables I.A.1, I.A.2.a, and I.A.2.e at [http://meps.ahrq.gov/mepsweb/data\\_stats/quick\\_tables\\_search.jsp?component=2&subcomponent=1](http://meps.ahrq.gov/mepsweb/data_stats/quick_tables_search.jsp?component=2&subcomponent=1).

<sup>13</sup>One important factor that is not captured by the CPS is up-skilling through on-the-job training. A recently revised taxonomy of occupations by typical on-the-job training highlights the special importance this type of education has for manufacturing workers, particularly those in jobs whose typical entry-level education is a high school diploma. The BLS classifications indicate that 73 percent of the manufacturing jobs necessitate either moderate-term on-the-job training (1 to 12 months) and long-term on-the-job training (more than 12 months), more than double the share for jobs in non-manufacturing industries. The on-the-job training needs in manufacturing reflect in part the fact that a relatively high share (around 62 percent) of manufacturing jobs have a high school diploma as the entry requirement. Yet, even within occupations requiring a high school diploma, the ones that predominate in manufacturing are much more likely to provide on-the-job training. For more information see [www.bls.gov/emp/ep\\_education\\_tech.htm](http://www.bls.gov/emp/ep_education_tech.htm).

<sup>14</sup>A basic comparison of CPS average hourly earnings estimates shows a raw manufacturing premium of 11.9 percent in 2011, similar to the 13.8 percent raw premium derived from the NCS.

<sup>15</sup>More specifically, the earnings regressions control for age (up to a fourth degree polynomial of age), gender, marital status, race and Hispanic origin, nativity and citizenship, educational attainment, metropolitan area, region, union representation, major industry, occupation, time, and manufacturing / non-manufacturing dummy interacted with time.

<sup>16</sup>Consistent with the earnings estimates by educational attainment shown in Figure 3, this wage premium estimate is for private wage and salary workers age 25 and over. The wage premium for workers age 16 and over was 7.3 percent in 2011.

<sup>17</sup>It does turn out, however, that the regression-adjusted earnings premiums for workers with specific levels of educational attainment are somewhat smaller than the raw premiums. These results highlight the value of regression adjustments, as raw comparisons cannot capture the differential effect that other factors may have on specific groups of workers. For example, unionization (defined as being a union member or covered by a union contract) has a positive association with earnings, but more so for workers with lower educational attainment.

<sup>18</sup>Krueger and Summers “Efficiency Wages and the Inter-Industry Wage Structure,” 1988, 266-7.

<sup>19</sup>Because 2011 NIPA data on compensation by industry are not yet available, the 2010 ratios were applied to the 2011 estimates of hourly earnings.

<sup>20</sup>Payments to defined-benefit pension plans are a relatively volatile component of overall employer contributions to benefits. The 2003 uptick in the manufacturing wage premium in Figure 7 and manufacturing benefit contributions per full-time-equivalent employee in Figure 5 reflect catch-up contributions to pension funds among a few large durable goods manufacturers.

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