A Critique of CRS's "U.S. Manufacturing in International Perspective"

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The CRS report mistakenly suggests that U.S. manufacturing is healthy while dismissing the need for supportive manufacturing policies.

The future of the U.S. economy depends in part on the health of U.S. manufacturing. Unfortunately, over the last 15 years the U.S. manufacturing sector has declined significantly compared to those of competitor nations. In the face of this decline, congressional action is needed more than ever to reduce the effective corporate tax rate; to boost investment incentives, including for R&D; to better enforce trade rules globally; and to support manufacturing innovation and workforce development.

Regrettably, there are those who paint a Panglossian picture of U.S. manufacturing, rationalizing away losses in output and jobs as simply the function of the free market, and a reflection of U.S. economic health, not weakness. When one of these voices comes from a body tasked to provide Congress with objective economic and policy analysis, the Congressional Research Service (CRS), Congress is less likely to take necessary action.

Recently, the CRS issued "U.S. Manufacturing in International Perspective," in response to a congressional request to better ascertain the condition of the sector and the need for policies and programs to support American manufacturing.[1] The CRS report mistakenly suggests that U.S. manufacturing is healthy while dismissing the need for supportive manufacturing policies.

"U.S. Manufacturing in International Perspective" advises that the plethora of proposed legislation to support U.S. manufacturing is both unnecessary and ineffective: "The proponents of such measures frequently contend that the United States is in some way falling behind other countries in manufacturing, and argue that this relative decline can be mitigated by government policy."[2] The report denies 1) that American manufacturing is in trouble, and 2) that congressional action is capable of helping it. Thus, CRS endorses an

agenda of inaction. However, as we demonstrate in this response, the CRS report consistently errs on the side of "all is well" when in fact actual U.S. manufacturing performance is declining significantly.

MANUFACTURING JOB LOSS

Any assessment of the performance of U.S. manufacturing normally begins by examining changes in employment. The CRS report uses data from The Conference Board to measure job loss, which show a 12 percent loss in manufacturing jobs between 2003 and 2013.[3] However, the United States Bureau of Economic Analysis (BEA) statistics, which use a more narrow definition of manufacturing, show a full-time equivalent manufacturing employment loss of 17.4 percent over the same period. [4] (Figure 1)

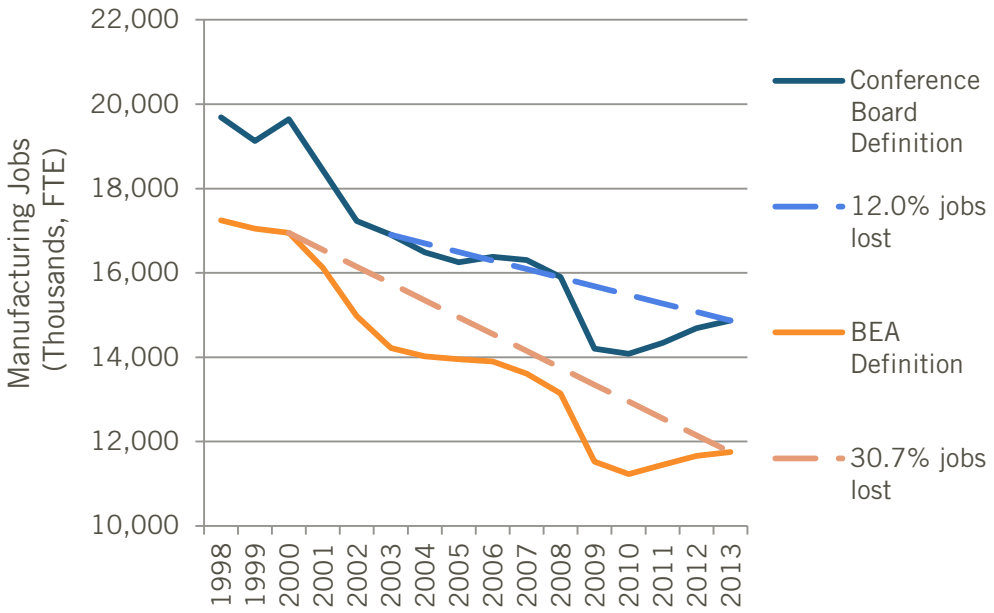

Figure 1: Full-time Equivalent Manufacturing Jobs, as Measured by the BEA and The Conference Board, 1998-2013[5]

Moreover, measuring from 2003 understates job loss. From 2000 to 2003, the United States experienced a recession and lost 16 percent of its manufacturing jobs. Unlike in other sectors, this employment was not added back during the recovery. Based on BEA data, U.S. manufacturing unemployment shrank by 30.7 percent between 2000 and 2013, with a net loss of 5.2 million jobs. As ITIF has noted, this was a greater share of manufacturing job loss than the United States experienced in the Great Depression.[6]

Furthermore, manufacturing jobs should be expected to increase on par with growth in the overall labor force. From 2003 to 2013, overall U.S. employment grew 3.7 percent, thus, the comparative decline of manufacturing jobs in this period is 20.3 percent.[7]

MANUFACTURING OUTPUT

Losing over 30 percent of manufacturing employment in 13 years is a sign of decline. But CRS, like most apologists for U.S. manufacturing decline, explains away job loss by claiming it was the result of superior manufacturing productivity.

Natural shifts toward services as manufacturing productivity increased certainly played a part, but cannot come close to explaining the magnitude of U.S. job loss since 2000. U.S. manufacturing lost 11 times more jobs in the 2000s than in the 1990s although manufacturing productivity growth was comparable in both decades.[8] The CRS report does not address this, nor the fact that during this period the U.S. manufacturing trade deficit skyrocketed as China in particular gained manufacturing jobs at our expense.

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The CRS report also does not include the considerable scholarly work asserting that official U.S. manufacturing output figures are overstated. Even if CRS believes that the official numbers are accurate, in order to objectively inform Congress, the report should have at least presented the analyses of scholars who have argued over the last five years that the output numbers are exaggerated.[9] This is important because if output numbers are truly overstated, then the productivity explanation for job loss is less valid.

The Bureau of Economic Analysis seriously overstates the value-added estimate for computer and electronic products, coded as North American Industry Classification System (NAICS) 334. Computing power doubles every two years (as predicted by Moore's Law). The BEA has trouble measuring such rapid growth in technology, and so treats much of this growth as increased labor productivity. While overall manufacturing value-added increased by 16 percent between 2000 and 2013, NAICS 334 output increased by 198 percent. Yet as ITIF has shown, actual growth of output was likely significantly less.[10] Consider that the actual value of computer and electronic equipment shipments in the United States actually declined by 24 percent over the same period according to the Census Bureau.[11]

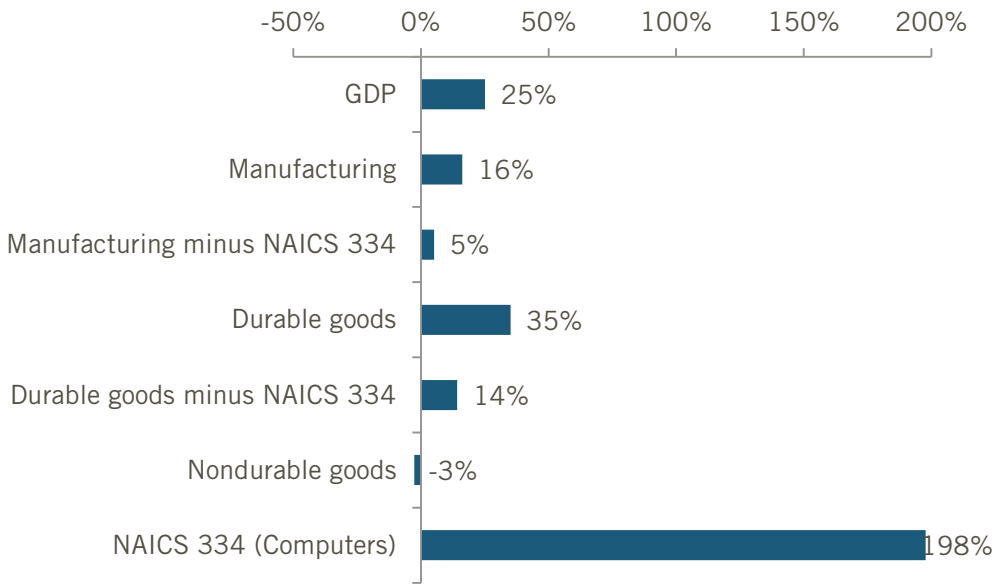

Figure 2: Growth in Real Value-Added, 2000-2013[12]

As Figure 2 makes apparent, manufacturing value-added growth has lagged behind GDP growth since 2000. If we remove the skewed NAICS 334 data, the remaining measures indicate that manufacturing growth has been almost stagnant since 2000, gaining only 5 percent compared with 25 percent GDP growth. In fact, overall growth of high-tech sectors is actually negative for 6 out of 11 durable industries and for 5 out of 8 non-durable industries. (Figure 3) Gains are driven by just a few industries, including computers and electronic products, motor vehicles and transport equipment, and primary metals. Since 2005, manufacturing output has shrunk by 2 percent.[13] And these measures do not account for other factors, such as import substitution price bias, which also appear to have artificially overstated manufacturing output.

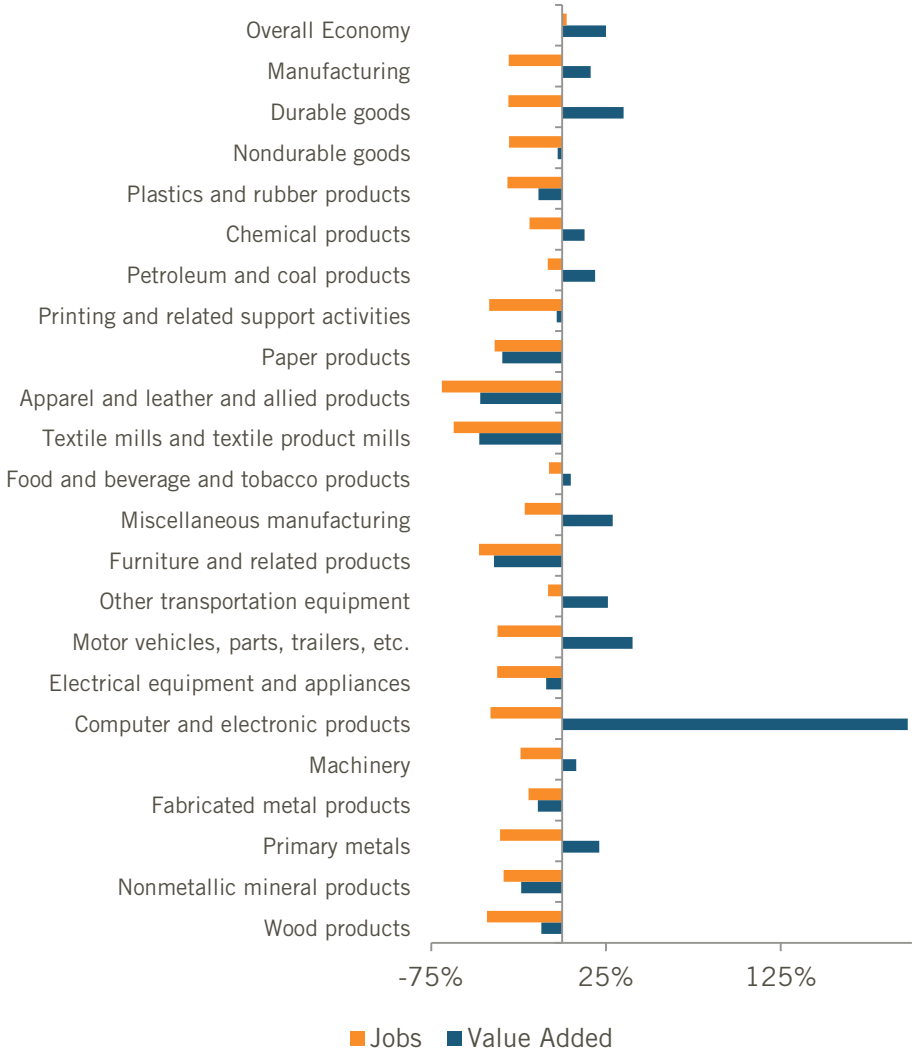

Figure 3: Jobs and Value-Added Growth by Industry, 2000-2013[14]

In short, as ITIF has shown, over 33 percent of America's manufacturing job loss in the 2000s was caused by a fundamental lack of competitiveness and not by productivity gains or sectoral shifts.[15] Despite this, the CRS report asserts that U.S. manufacturing output is at an all-time high.

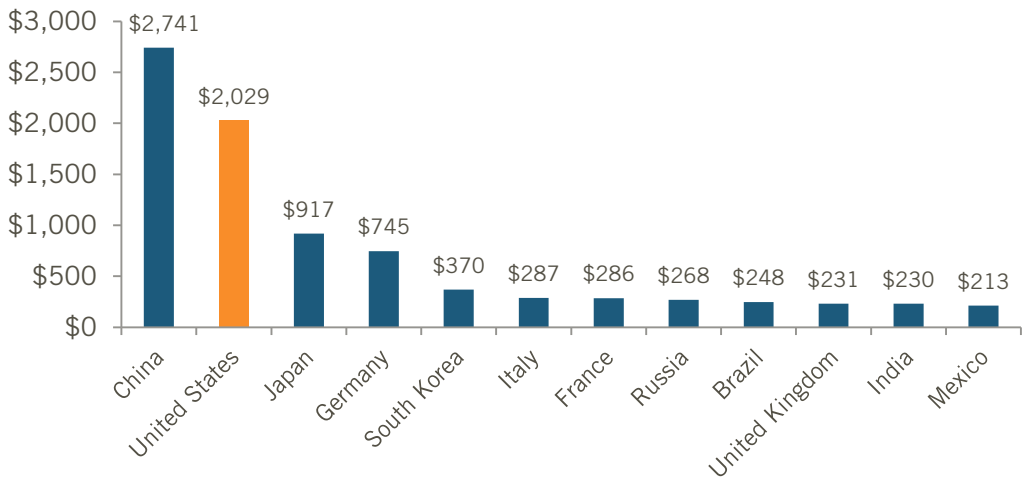

Figure 4: Leading Countries, Value-Added in Manufacturing, Current U.S. Dollars (billions), 2013[16]

A gain of just 5 percent in manufacturing value-added in eight years is a weak accomplishment at best, especially given that real U.S. GDP grew 10.4 percent during this period.

In addition, the report errs in how it compares U.S. manufacturing output to that of other nations. In Figure 4, reproduced from the CRS report, U.S. manufacturing appears to be the second strongest in the world. However, absolute totals give little indication of the relative strength or the growth of respective manufacturing economies. It is not surprising that the United States, with a population of over 330 million, should have a larger manufacturing sector in absolute terms than Japan or South Korea.

When examined as a share of GDP, U.S. manufacturing output is smaller than that of other nations with comparable levels of development. (Figure 5) This did not used to be the case. After World War II the United States led the world in manufacturing and looked poised to access enormous opportunities created by the expansion of global markets. Unfortunately, rather than seize this opportunity, the United State went from producing 29 percent of the world's manufactures to just 17 percent in little over a decade.[17] (Figure 6)

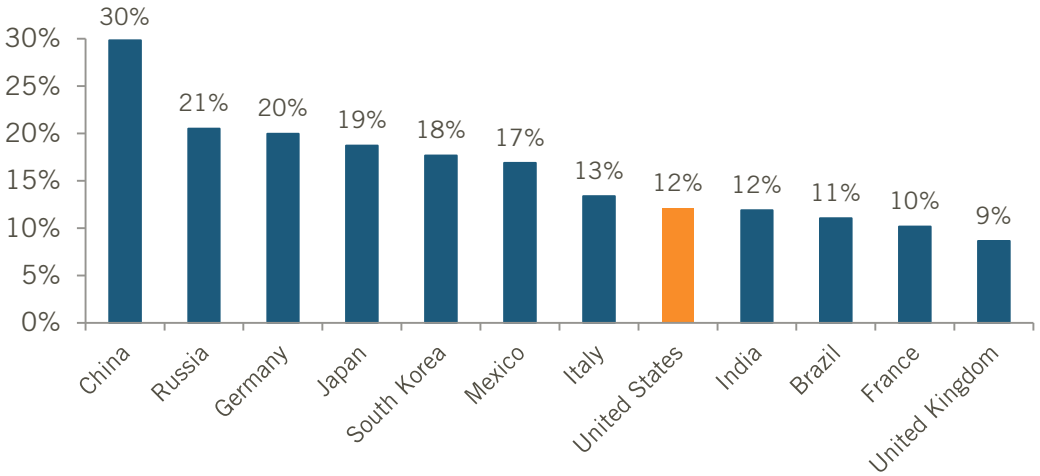

Figure 5: Leading Countries, Value-Added in Manufacturing Relative to GDP, Current U.S. Dollars, 2013[18]

The CRS report also compares nations based on the percentage increase in manufacturing value-added since 2005, and concludes that "the United States appears to have outperformed most other wealthy countries in the growth of manufacturing value-added in recent years."[19] But, as noted above, this does not address the significantly overstated output growth numbers. Moreover, while the United States outperformed some other nations like Italy, Canada, and the United Kingdom from 2005 to 2013, the United States clearly is not doing well at present, especially considering that the nations with lower performances are ones with severe manufacturing crises. (Figure 7) A gain of just 5 percent in manufacturing value-added in eight years is a weak accomplishment at best, especially given that real U.S. GDP grew 10.4 percent during this period. Relative to GDP growth, U.S. manufacturing value-added output actually declined by 7.1 percent between 2000 and 2013.[20]

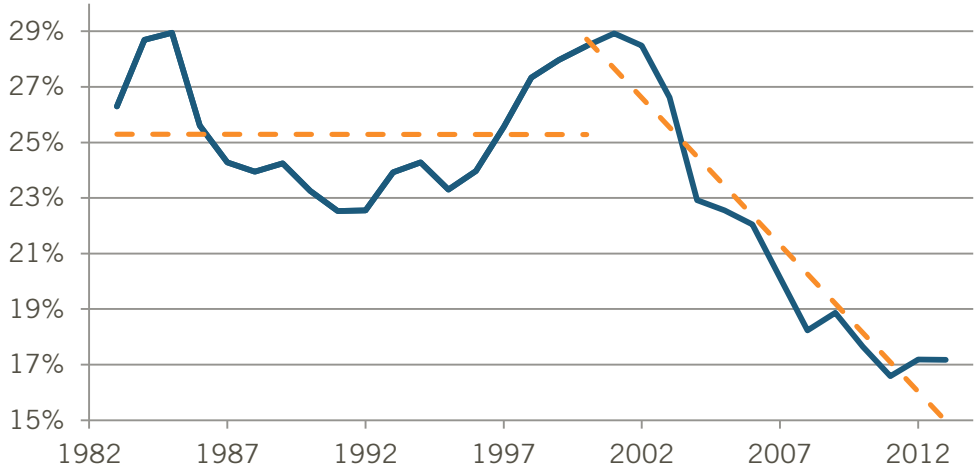

Figure 6: United States Global Share of Manufacturing Value-Added, Current U.S. Dollars, Trend Lines for 1983-2000 and 2000-2013, 1983-2013[21]

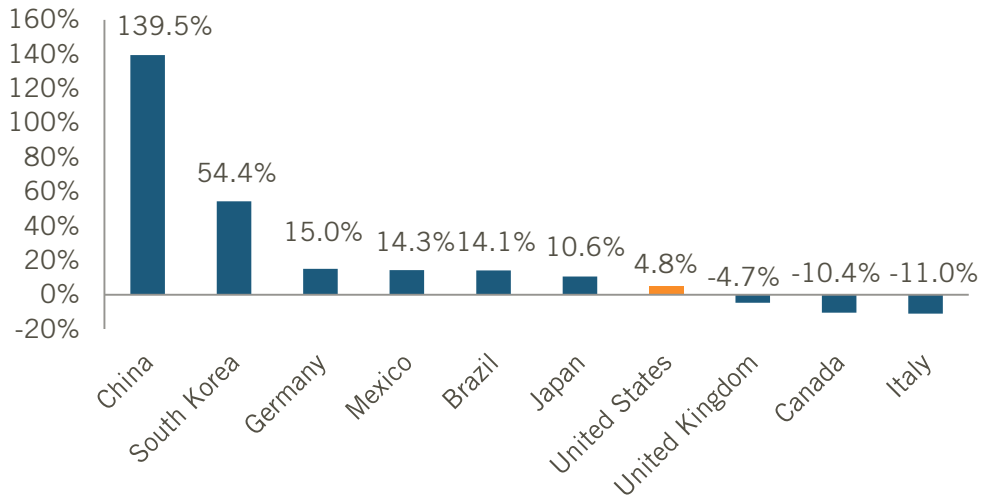

Figure 7: Change in Value-Added in Manufacturing, 2005-2013[22]

Strength in High-tech Industries

The CRS reports that while U.S. performance across the entire manufacturing spectrum has declined modestly, U.S. superiority in advanced industries is secure. This view assumes that while low-technology industries have gone overseas in search of cheap labor, the United States still excels in high-technology industries. The CRS report states that "The share of value added represented by high-technology sectors has been rising in the United States, whereas it has been stable or declining in many other countries."[23] When examining the data source cited by the CRS, the data did not support a claim of steady growth. Instead, the United States had stagnant results on this metric from 1990 to 2007, exhibiting rapid growth in high-technology industries as a percentage of total manufacturing only since 2007.

Unfortunately, much of the data available is relatively old. In fact, the only data set that specifically isolates high-technology manufacturing was discontinued for most countries in 2007 (though the United States has data through 2009). Using this data, U.S. high-tech manufacturing as a percentage of total manufacturing was stagnant until 2007. (Figure 8)

Using a different data series that has data through 2010 and employing our own definition of high-technology manufacturers, we found that the results resemble the those in the previous data series—no change in high-technology industries in the United States until rapid increases starting in 2007.[24] (Figure 9)

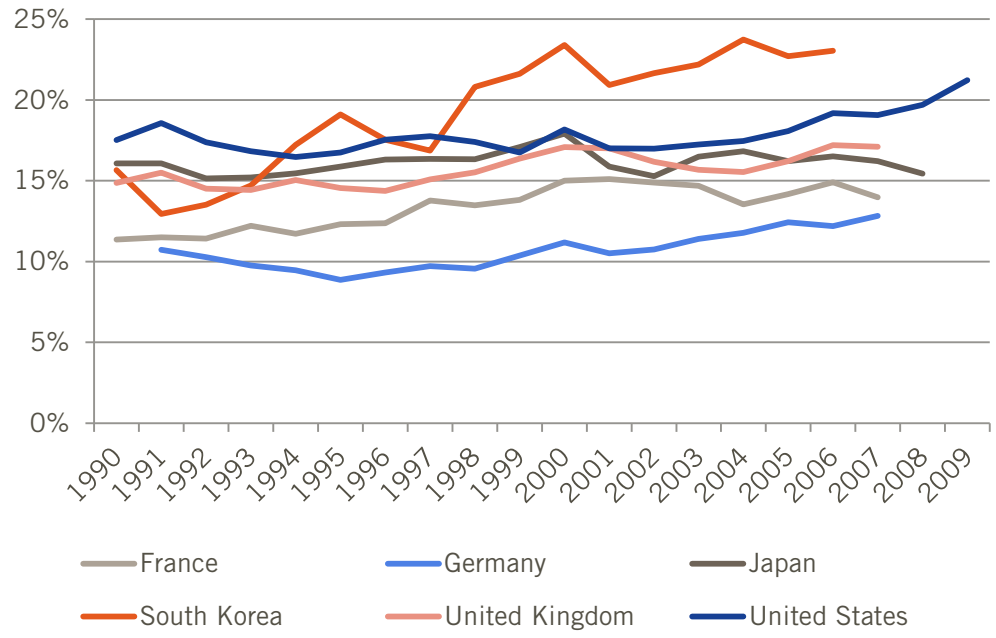

Figure 8: High-Technology Manufacturing Value-Added as a Percentage of Total Manufacturing Value-Added, ISIC Rev. 3, 1990-2009[25]

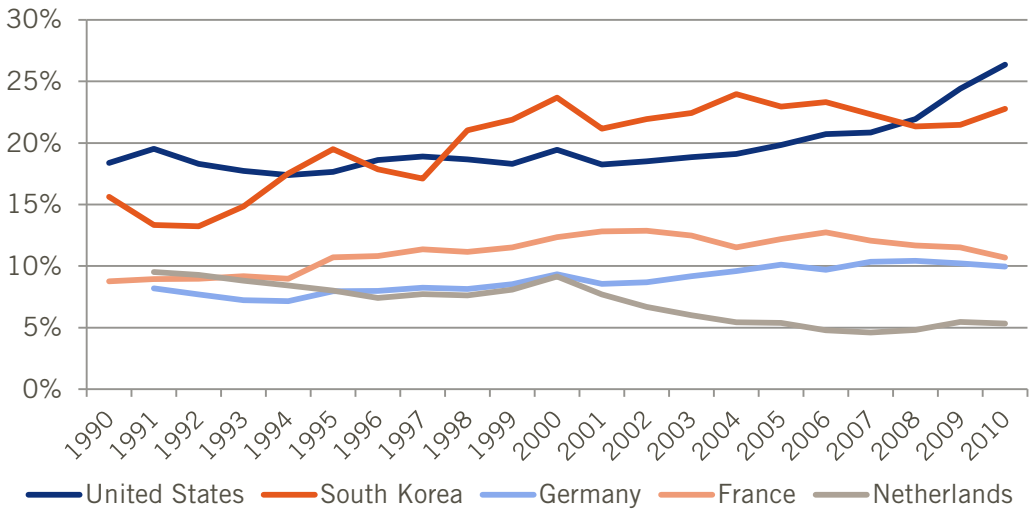

Figure 9: High-Tech Sectors Value-Added as a Share of Manufacturing Value-Added, ISIC Rev. 4, 1990-2010[26]

There is however, a major flaw in the CRS methodology. The report does not measure value added in high-tech industries as a share of GDP, but rather as a share of total manufacturing value added. Thus, if a nation loses significant share of non-high-tech manufacturing—which is what has happened in the United States—this would automatically make its high-tech performance look strong, even if high-tech sectors were not growing as a share of GDP. Instead of comparing to low-tech growth, any measure of high-tech manufacturing performance should be compared to GDP.

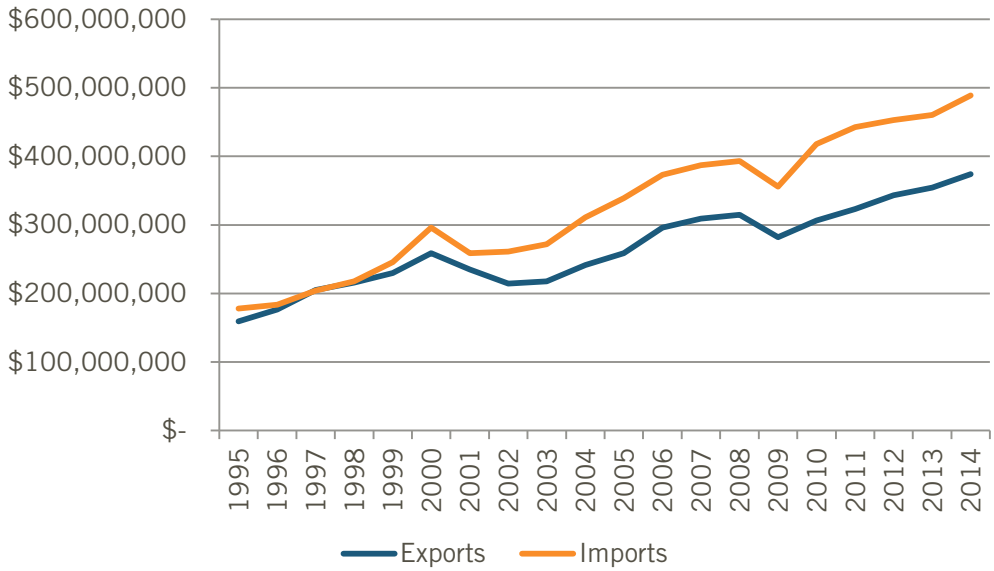

Figure 10: U.S. Exports and Imports in High-Tech Industries, 1995-2014[27]

One more accurate measure would be to examine the trade balance in high-technology goods. While the United States ran a modest trade surplus in high-technology goods as late as 1997, since then it has run a trade deficit in high-technology goods, with imports 29 percent higher than exports.[28] (Figure 10)

SIGNS OF GROWTH?

After largely ignoring poor overall real value-added and employment statistics, the CRS report offers several reasons for optimism on U.S. manufacturing. The report advises Congress not to worry about the health of U.S. manufacturing because the United States has large amounts of manufacturing R&D and foreign direct investment and because the United States sources a large percentage of its manufacturing inputs domestically. Unfortunately, none of these three factors actually indicate a healthy manufacturing economy.

Manufacturing R&D

The CRS report argues that the United States has a high concentration of R&D in manufacturing, citing that manufacturing R&D as a share of manufacturing value-added is around 11 percent, marginally above South Korea and Germany and slightly below Japan.

But there are several reasons not to take this as a sign that all is well. First, U.S. manufacturing is more concentrated in industries with high R&D to value-added ratios (such as aerospace, semiconductors, and life sciences). Controlling for industrial composition factors is necessary when comparing nations on industrial R&D intensity, as ITIF's *State New Economy Index* series does for states.[29] When looking at R&D intensity in individual industries the picture is less optimistic.

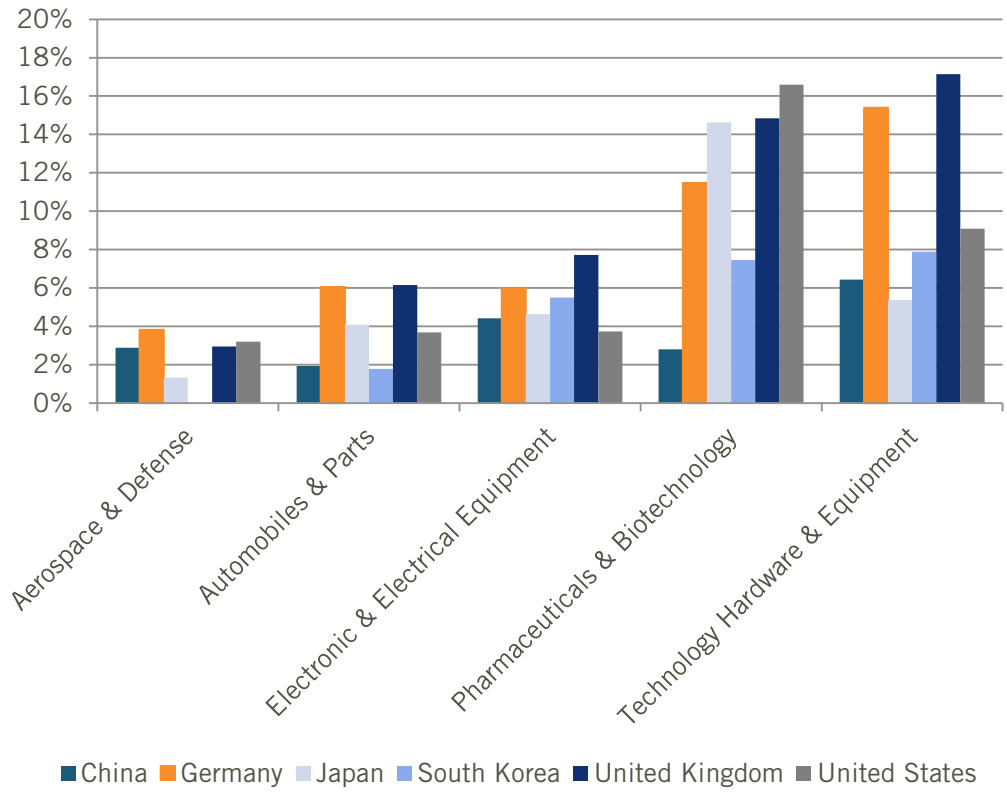

Figure 11: R&D Intensity in Top 2,500 Global Companies by Expenditure on R&D, by Industry, 2013[30]

U.S. manufacturing R&D intensity is average or below average compared to competitor nations in most advanced industries. Data from the European Commission on R&D spending by the 2,500 top global R&D-performing companies indicate that the United States leads in R&D intensity in only one of five advanced industries, pharmaceuticals and biotechnology.[31] (Figure 11) But in the other industries, U.S. companies are roughly average or spend less than competitor nations as a percentage of profits.

Second, while U.S. manufacturers spend more on R&D as a percentage of manufacturing value-added than most other countries, it appears that a greater share is on the D (development) rather than the R (basic and applied research). (Figure 12) Since 2000, all increases in industry R&D have been in development. (Figure 13) Industry investment in basic and applied research reached an apex of $56 billion in 2001 but by 2011 had declined by 7 percent, while spending on development increased by 21 percent over the same period. By way of contrast, during the 1990s, spending on basic and applied research increased by 51 percent.[32]

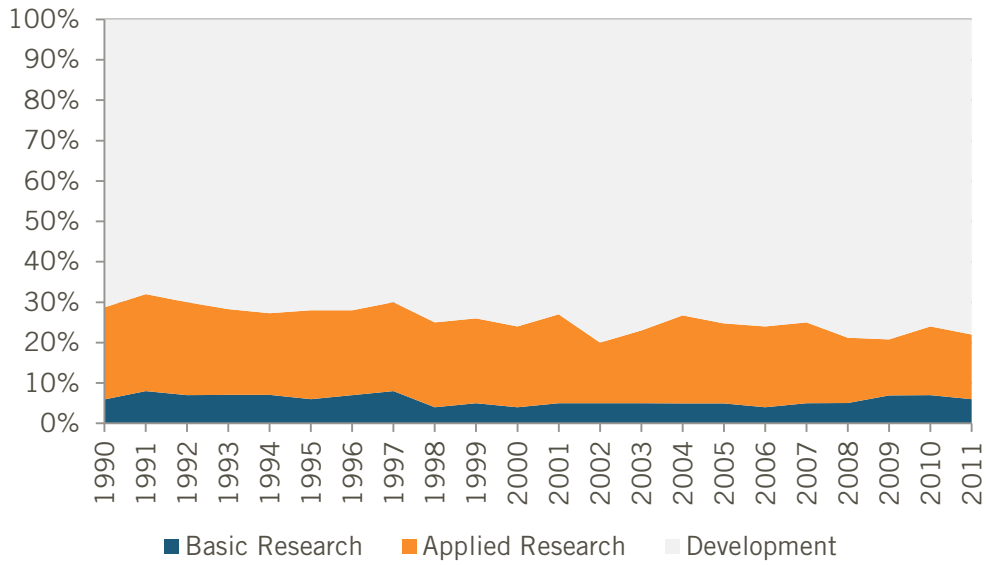

Figure 12: Types of R&D as a Percentage of Total Industry R&D, 1990-2011[33]

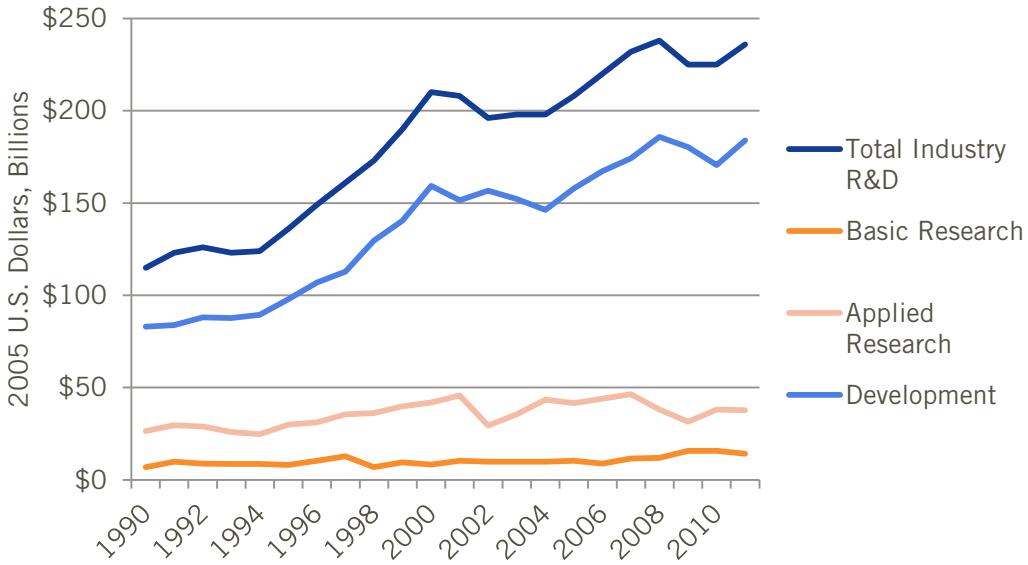

Figure 13: Industry Expenditure on R&D by Type of R&D, 1990-2011, Constant 2005 U.S. Dollars (billions)[34]

Foreign Direct Investment

The CRS report also points to the rate of foreign direct investment (FDI) in U.S. manufacturing as a sign of health. The CRS argues that U.S. FDI investment in manufacturing, at 39 percent of total FDI, is a sign of strength, reasoning that "The United States has been an attractive manufacturing location relative to other high-income countries in recent years."[35]

The report, however, fails to differentiate between greenfield and brownfield investments.[36] A greenfield investment means breaking ground on a new factory or related facility, such as

Volvo building a factory in South Carolina. Brownfield investments, however, are simply existing U.S. manufacturing assets sold to foreign investors. Only greenfield investments represent an expansion of manufacturing capabilities. In 2008, the BEA estimated that only 7 percent of inward FDI was greenfield, and only $8.9 billion out of the total annual investment inflows of $260 billion—a mere 3.4 percent—represented greenfield FDI in manufacturing.[37] (Figure 14)

U.S. manufacturing capital expenditure levels have fallen significantly over the last three decades.

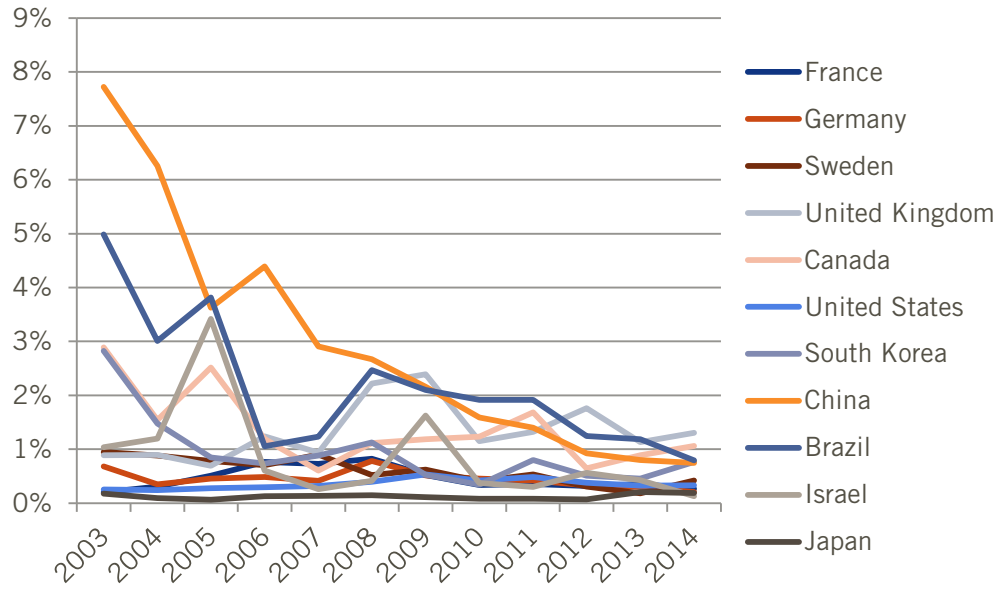

Figure 14: Value of Announced Greenfield FDI Projects by Destination as a Percentage of GDP, 2003-2014[38]

The CRS report also gives little attention to the low overall level of investment in U.S. manufacturing. As ITIF has shown, U.S. manufacturing capital expenditure levels have fallen significantly over the last three decades.[39] The Aspen Institute and MAPI Foundation recently reported similar trends.[40] The CRS report acknowledges that "Gross fixed capital formation in general is comparatively low in the United States," but then hypothesizes that U.S. companies may just use available capital more efficiently, paying "greater attention to return on capital than their counterparts in other countries."[41] But there is no real evidence for this claim. Arguing simultaneously that high FDI levels means everything is just fine in U.S. manufacturing while ignoring overall levels of capital is highly misleading.

Domestically Sourced Inputs

One of the most misleading ways the CRS report tries to convince readers that all is well is by suggesting that U.S. manufacturing is strong because we import fewer inputs for our finished products. This is caused not by U.S. strength in manufacturing but simply because of the large size of the U.S. economy. As a rule, the larger the economy, the lower the share of imports. Europe, for example, imports a significantly smaller share of inputs for manufacturing than any individual EU nation. It is telling that the other country that does "well" on this metric in the two industries the CRS report highlights (transport equipment and electrical and optical equipment) is Brazil, also a large economy. A more appropriate measure would be the share of domestic inputs controlling for the size of the overall economy.

CONCLUSION

The health of U.S. manufacturing is much shakier than the Pollyannaish CRS report suggests. Moreover, the report's assertion that policymakers do not need to and cannot play a positive role in putting U.S. manufacturing back on track is also flawed. The report's dismissal of legislation aiming to help U.S. manufacturers navigate an un-even global playing field, in which foreign governments often try to stack the deck to benefit their own domestic manufacturers, ignores the reality of global competition.[42] In short, Congress needs to proactively advance legislation to help manufacturing prosper in the United States. Failure to do so will lead to more of the same: loss of manufacturing jobs and output, with negative impacts on overall U.S. economic growth.

ENDNOTES

1. Marc Levinson, *U.S. Manufacturing in International Perspective* (Washington, DC: Congressional Research Service, March 17, 2015), https://www.fas.org/sgp/crs/misc/R42135.pdf.
2. Levinson, *U.S. Manufacturing in International Perspective.*
3. The Conference Board, International Comparisons of Annual Labor Force Statistics, Report Tables (Table 1.19, Employment in Manufacturing, 1970-2013; accessed August 8, 2015); https://www.conference-board.org/ilcprogram/index.cfm?id=25628.
4. Bureau of Economic Analysis, Industry Data, GDP-by-industry (Full-time equivalent employment by industry, Annual, 1997-2013; accessed August 1, 2015), http://www.bea.gov/iTable/index_industry_gdpIndy.cfml.
5. The Conference Board, International Comparisons of Annual Labor Force Statistics, Report Tables (Table 1.19, Employment in Manufacturing, 1970-2013; accessed August 8, 2015); https://www.conference-board.org/ilcprogram/index.cfm?id=25628; Bureau of Economic Analysis, Industry Data, GDP-by-industry (Full-time equivalent employment by industry, Annual, 1997-2013; accessed August 1, 2015), http://www.bea.gov/iTable/index_industry_gdpIndy.cfml.
6. Robert D. Atkinson, Luke A. Stewart, Scott M. Andes, and Stephen Ezell, "Worse than the Great Depression: What the Experts Are Missing about American Manufacturing Decline" (Information Technology and Innovation Foundation, March 2012), http://www.itif.org/publications/worse-great-depression-what-experts-are-missing-aboutamerican-manufacturing-decline.
7. Bureau of Economic Analysis, Industry Data, GDP-by-industry (Full-time equivalent employment by industry, Annual, 1997-2013; accessed August 1, 2015), http://www.bea.gov/iTable/index_industry_gdpIndy.cfml.
8. Robert D. Atkinson and Adams B. Nager, "The Myth of America's Manufacturing Renaissance: the Real State of U.S. Manufacturing" (Information Technology and Innovation Foundation, January 2015), http://www2.itif.org/2015-myth-american-manufacturing-renaissance.pdf.
9. Martin Neil Baily and Barry P. Bosworth, "US Manufacturing: Understanding Its Past and Its Potential Future," Journal of Economic Perspectives 28, no. 1 (Winter 2014): 3-26, http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.28.1.3; Michael Mandel, "How much of the productivity surge of 2007-2009 was real?," Mandel on Innovation and Growth (blog), March 2011, http://innovationandgrowth.wordpress.com/2011/03/28/how-much-of-the-productivity-surge-of-2007-2009-was-real/; Susan N. Houseman et al., "Offshoring Bias in U.S. Manufacturing: Implications for Productivity and Value Added" (Board of Governors of the Federal Reserve System, September 2010), http://www.federalreserve.gov/pubs/ifdp/2010/1007/ifdp1007.pdf; Emi Nakamura and Jón Steinsson, "Lost in Transit: Product Replacement Bias and Pricing to Market" (working paper, Columbia University, November 26, 2011), http://www.columbia.edu/~en2198/papers/ippsubs.pdf.
10. Estimate 28 percent real growth in NAICS 334 from 2000 to 2010; Atkinson et. al, *Worse than the Great Depression*.
11. Census Bureau, Manufacturer's Shipments, Inventories, and Orders (historic time series – NAICS, shipments, December 2003 and December 2013; accessed August 12, 2015), http://www.census.gov/manufacturing/m3/historical_data/index.html.
12. Bureau of Economic Analysis, Industry Data, GDP-by-industry (Full-time equivalent employment by industry, Annual, 1997-2013; accessed August 1, 2015), http://www.bea.gov/iTable/index_industry_gdpIndy.cfml.
13. Ibid.
14. Bureau of Economic Analysis, Industry Data, GDP-by-industry (Real Value Added by Industry, Annual, 2000-2013; accessed August 1, 2015), http://www.bea.gov/iTable/index_industry_gdpIndy.cfm.
15. Robert D. Atkinson, Luke A. Stewart, Scott M. Andes, and Stephen Ezell, "Worse than the Great Depression: What the Experts Are Missing about American Manufacturing Decline" (Information Technology and Innovation Foundation, March 2012), http://www.itif.org/publications/worse-great-depression-what-experts-are-missing-aboutamerican-manufacturing-decline.
16. United Nations Statistics Division, National Accounts Main Aggregates Database (Table 2.4: Value added by industry at current prices (ISIC Rev.4), 1946-2013; accessed August 1, 2015); http://unstats.un.org/unsd/snaama/introduction.asp.

17. United Nations, National Accounts Main Aggregates Database (Value Added by Economic Activity, Percentage Distribution (Shares), December 2014; accessed August 7, 2015), http://unstats.un.org/unsd/snaama/selbasicFast.asp.
18. Ibid.
19. Levinson, *U.S. Manufacturing in International Perspective*, 5.
20. Bureau of Economic Analysis, Industry Data, GDP-by-industry (Full-time equivalent employment by industry, Annual, 1997-2013; accessed August 1, 2015), http://www.bea.gov/iTable/index_industry_gdpIndy.cfml.
21. Ibid.
22. National Accounts Main Aggregates Database, Value-Added by Economic Activity, at constant 2005 prices – U.S. dollars, 2005-2013, http://unstats.un.org/unsd/snaama/selbasicFast.asp; http://unstats.un.org/unsd/snaama/selbasicFast.asp.
23. Levinson, *U.S. Manufacturing in International Perspective*.
24. High-tech defined as: Basic pharmaceutical products and pharmaceutical preparations; Computer, electronic and optical products; and Air and spacecraft and related machinery.
25. Organization for Economic Cooperation and Development, Structural Analysis (STAN) Databases (STAN Database for Structural Analysis (ISIC Rev. 3), 1990-2009, Value Added, current prices, HITECH, C15T37; accessed August 15, 2015); http://stats.oecd.org/Index.aspx?DataSetCode=STANI4#.
26. Organization for Economic Cooperation and Development, Structural Analysis (STAN) Databases (STAN Database for Structural Analysis (ISIC Rev. 4), 1990-2011, Value Added, current prices; accessed August 15, 2015); http://stats.oecd.org/Index.aspx?DataSetCode=STANI4#; Author's analysis, High-tech defined as: Basic pharmaceutical products and pharmaceutical preparations; Computer, electronic and optical products; and Air and spacecraft and related machinery.
27. Organization for Economic Cooperation and Development, STAN bilateral Trade in Goods by Industry and End Use (Imports and Exports, World, High Technology Industries, Thousands of USD, Total trade in goods, 1995-2014; accessed July 31, 2015); http://stats.oecd.org/Index.aspx?DataSetCode=BTDIXE.
28. Ibid.
29. Robert D. Atkinson and Adams B. Nager, "The 2014 State New Economy Index" (Information Technology and Innovation Foundation, June 2014), http://www.itif.org/publications/2014/06/11/2014-state-new-economy-index.
30. European Commission, The 2014 EU Industrial R&D Investment Scoreboard (R&D ranking of the world top 2500 companies, 2014; accessed August 3, 2015); http://iri.jrc.ec.europa.eu/scoreboard14.html; No companies listed for South Korea in the Aerospace and Defense sector.
31. Ibid.
32. National Science Foundation, Science and Engineering Indicators, 2014 (Appendix Tables, 4-7, 4-8, and 4-9; accessed August 11, 2015), http://www.nsf.gov/statistics/seind14/index.cfm/appendix.
33. Ibid.
34. Ibid.
35. Levinson, *U.S. Manufacturing in International Perspective*, 7.
36. Luke Stewart, "The Sad Reality Behind Foreign Direct Investment in the United," *Innovation Files,* October 23, 2012, http://www.innovationfiles.org/the-sad-reality-behind-foreign-direct-investment-in-the-united-states/.
37. Thomas Anderson, Foreign Direct Investment in the United States: New Investment in 2008 (Bureau of Economic Analysis, June 2009), http://www.bea.gov/scb/pdf/2009/06%20June/0609_fdius.pdf.
38. United Nations Conference on Trade and Development, World Investment Report 2015: Annex Tables (Value of greenfield FDI projects, by destination, 2003-2014; accessed August 6, 2015); http://unctad.org/en/Pages/DIAE/World%20Investment%20Report/Annex-Tables.aspx.
39. Luke A. Stewart and Robert D. Atkinson, "Restoring America's Lagging Investment in Capital Goods" (Information Technology and Innovation Foundation), http://www2.itif.org/2013-restoring-americas-lagging-investment.pdf.
40. Thomas J. Duesterberg and Donald A. Norman, "Why is Capital Investment Consistently Weak in the 21st Century U.S. Economy?" (MAPI Foundation and Aspen Institute, April 2015),

https://www.mapi.net/newsroom/news-releases/mapi-foundation-aspen-report-why-capital-investment-lagging.

41. Levinson, *U.S. Manufacturing in International Perspective*, 8.
42. Stephen Ezell, Frank Spring, and Katarzyna Bitka, "The Global Flourishing of National Innovation Foundations" (Information Technology and Innovation Foundation, April 2015), http://www2.itif.org/2015-flourishing-national-innovation.pdf; Stephen J. Ezell and Robert D. Atkinson, Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Information Foundation, September 2012), http://www2.itif.org/2012-fifty-ways-competitiveness-woes-behind.pdf.

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