The U.S. Software Industry: An Engine for Economic Growth and Employment

Executive Summary

DEVELOPED FOR THE PUBLIC POLICY DIVISION OF THE SOFTWARE & INFORMATION INDUSTRY ASSOCIATION (SIIA)

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For the past generation, information and communication technologies (ICT) have been a major driver of the American economy. Software, which provides the operating systems and applications for ICT, has become a central feature or component of most businesses, products and services. Using empirical analysis, this study assesses the economic role of the software industry in U.S. economic growth, productivity, exports and employment. The software industry is defined here as companies operating within the sub-industries of computer systems design (and related services), software publishing; and data processing, hosting, and information services.

Software Drives U.S. Economic Growth and Increases Exports

The data confirm that software is an enabling technology, used in virtually every sector and industry in the economy. As a result, the software industry contributes an increasing amount to GDP, both directly and indirectly, as well as to U.S. exports.

From 1997 to 2012, software industry production increased from $149 to $425 billion. Not only has the software industry shown consistent growth, it also has grown faster than the rest of the economy. Its average annual growth of more than 7.2 percent is two-thirds greater than the growth rate of the overall economy during the same period. As a result, from 1997 to 2012, the share of GDP attributable to the software industry grew from 1.7 percent to 2.6 percent, an increase of more than 50 percent.

U.S. Software Industry Output

Source: Bureau of Economic Analysis

The software industry is also a growing factor in U.S. exports. In recent years, foreign demand for U.S. software has outpaced the demand for all U.S. exports as a whole. Exports of software and related services have grown by 9 to 10 percent per-year since 2006, nearly 50 percent faster than all U.S. exports. The software industry’s growing contributions to GDP and exports illustrates the industry’s increasing role as a driver of U.S. economic prosperity.
The Software Industry Creates Jobs

The software industry also is a substantial job creator, increasing employment in three ways. First, it directly employs increasing numbers of workers. From 1990 to 2014, direct employment by the U.S. software industry increased from 778,000 to 2.5 million. Moreover, the employment growth in the software industry consistently outpaces the growth in overall private employment in the U.S. As a result, the software industry’s share of the private workforce has increased from 0.9 percent in 1990 to 2.2 percent in 2014.

This is only part of the story. The software industry also creates jobs by creating demand for the products and services needed to design, develop and produce software.

In order to produce $425 billion in output in 2012, U.S. software companies consumed $212 billion in goods and services produced by other industries. Based on data from the Bureau of Economic Analysis, we estimate that the economic demand from the software industry supported an additional 1.1 million jobs in other industries. This calculation uses an employment multiplier of about 1.5 – so that every ten jobs in the software industry supports five more jobs in other industries. This multiplier is significantly higher than the employment multiplier of other industries that contribute to job growth.

Finally, the software industry creates jobs by increasing the productivity of the industries that purchase and use software. Contrary to claims that software destroys jobs, the industries that have invested most heavily in software over the 15 years from 1997 to 2012 (including financial services, scientific and technical services, education) had strong rates of job growth, while industries investing the least in software experienced both high levels (mining) and low levels (apparel) of job growth. Overall, we found a modest but significant correlation between business purchases of software and job gains by industry.

While software, on balance creates many more jobs than it displaces, the positions created by investments in software often require very different skills from those possessed by people displaced by software investment. As software’s role in economic life continues to expand, all Americans who need it should have access to job training.
Software Increases Economic Productivity

The software industry, as a driver of innovation and efficiency, also contributes greatly to rising output and productivity in other industries and sectors. Recent research by economists at the Federal Reserve Board attributes 12.1 percent of all U.S. labor productivity gains from 1995 to 2004, and 15.4 percent of those gains from 2004 to 2012, to the use of software in other industries. Thus, we estimate that software accounted for 9.5 percent of all gains in U.S. output from 1995 to 2004, and 15.0 percent of those gains from 2004 to 2012. In 2012, the productivity gains in other industries attributable to their use of software added $101 billion to U.S. GDP. Therefore, in 2012, the software industry contributed a total of $526 billion to GDP [$425 billion + $101 billion], or 3.2 percent of GDP.

U.S. Businesses Investment Demonstrates the Critical Role of Software

From 1990 to 2012, business investments in software grew at more than twice the rate of all fixed business investment; and from 2010 to 2012, software accounted for 12.2 percent of all fixed investment, compared to 3.5 percent for computers and peripherals.

The productivity gains enjoyed by those who invest in IT have driven the increasing business expenditures on software and IT hardware. Throughout the 1990s, the U.S. economy experienced a sustained period of strong growth and low unemployment with modest inflation. Those favorable conditions rested on an historic acceleration in productivity. Studies covering the second half of the 1990s have estimated that capital deepening in software and other IT accounted for 45 percent of the increases in labor productivity over that period, and advances in these technologies accounted for another 25 percent.

These investments in IT also have been linked to investments in intangible forms of capital. Research has shown that firms that invest in computers and software also undertake complementary investments in intangible assets—such as training, organizational reforms, R&D, and new business processes.

In recent years, software has accounted for an increasing share of all IT investments. In the 1970s, business invested about as much in IT hardware as in software; in the 1980s, however, businesses invested about one-third more in software than in hardware. Moreover, from 2000 to 2009, U.S. businesses invested 2.6 times as much in software as in hardware; and from 2010 to 2012, they invested 3.5 times as much in software as in hardware. Given software’s role in boosting productivity, it is unsurprising that software has become the main driver of IT investment by U.S. businesses.
The Software Industry Grew and Created Jobs During the 2008-09 Recession and Current Recovery

The software industry has been a leading contributor to the growth and health of the U.S. economy. This performance is especially impressive in the context of the recent economic crisis and recession.

From 1997 to 2012, the software industry grew 67 percent faster than the overall economy. Moreover, since 2012, the software industry has grown at an average annual rate of 5.3 percent, compared to 2.3 percent for the overall economy - that is, 130.4 percent faster than the rest of the economy.

Software’s strong and sustained growth has been accompanied by strong gains in software employment. From 2000 to 2014, employment in the software industry increased from just under 2 million to about 2.5 million positions, or about 1.7 percent per year.

The software industry has also been a leading source of new jobs in the American economy during and following the financial crisis and subsequent recession. From 2007 to 2014, employment in the software industry has grown at an average annual rate of 3.1 percent, even as total nonfarm employment over those years declined by 0.1 percent.

In addition, the jobs created by software companies are, on average, much higher quality than those created by other industries with large employment gains. During the period 2008-2014, five industries created large numbers of new jobs: software, home health care, individual and family services, retail, and restaurants. The new software workers on average earn three times more than workers in the four other industries.

Software Industry Compared to Other Leading Job Creators by Workers’ Average Annual Salary, 2008-2014

<table>
<thead>
<tr>
<th>Industry</th>
<th>Average Annual Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restaurant Workers</td>
<td>$15.9K</td>
</tr>
<tr>
<td>Retail Workers</td>
<td>$22.5K</td>
</tr>
<tr>
<td>Individual and Family Services Workers</td>
<td>$23.4K</td>
</tr>
<tr>
<td>Home Healthcare Services Workers</td>
<td>$28.3K</td>
</tr>
<tr>
<td>Computer Systems Design and Related Services Workers</td>
<td>$86.5K</td>
</tr>
</tbody>
</table>

Note: Computer Systems Design and Related Services Workers account for 85 percent of all software industry employment.

Source: Bureau of Labor Statistics
The software industry is a critical driver of productivity, growth, and employment. Software, as an enabling technology across all sectors, has had disproportionately positive effects on the health of the U.S. economy. To summarize our main findings:

- From 1997 to 2012, software industry production grew from $149 to $425 billion.
- From 1997 to 2012, the software industry’s direct share of U.S. GDP increased from 1.7 to 2.6 percent, or by more than 50 percent.
- Software accounted for 12.1 percent of all U.S. labor productivity gains from 1995 to 2004, and 15.4 percent of those gains from 2004 to 2012.
- Software accounted for 9.5 percent of all gains in U.S. output from 1995 to 2004, and 15.0 percent of those gains from 2004 to 2012.
- In 2012, software and the productivity gains it provides accounted for $101 billion in production by other industries.
- In total, the software industry contributed $526 billion to GDP in 2012 – or 3.2 percent of GDP.
- About 12 percent of U.S. software production is exported, totaling between $50 and $57 billion in 2012.
- From 2006 to 2014, exports of software and related services have grown at an average annual rate of 9 to 10 percent, nearly 50 percent faster than all U.S. exports.
- From 1990 to 2012, business investments in software grew at more than twice the rate of all fixed business investments.
- From 2010 to 2012, software accounted for 12.2 percent of all fixed investment, compared to 3.5 percent for computers and peripherals.
- Direct employment in the software industry increased from 778,000 jobs in 1990 and 1,083,000 jobs in 1995, to 2,095,000 in 2010 and 2,501,000 in 2014.
- Since software industry employment grew faster than other jobs, the industry’s share of all jobs rose from 0.9% in 1990 and 1.1% in 1995 to 1.9% in 2010 and 2.2% in 2014.
- In 2012, software companies purchased $212 billion in goods from other industries and those purchases supported another 1,080,000 jobs in those industries.
- In total, the software industry was responsible for 3.42 million jobs in 2012.
- In some instances, software displaces existing jobs. However, the use of software also creates jobs to maintain and operate its systems; and the additional wealth created by productivity improvements tied to software also lead to more job creation.
- On balance, there is no correlation between industries that invest most heavily in software and net employment losses.
- From 2007 to 2014, as overall private-sector employment has declined at an average annual rate of 0.1 percent, software industry employment grew on average by 3.1 percent per-year.
- Five industries created large numbers of new jobs from 2007 to 2014: software, home health care, individual and family services, retail, and restaurants. However, new software workers are paid on average three times as much as workers in the four other industries.
About SIIA

The Software & Information Industry Association is the leading association representing the software and digital content industries. SIIA represents approximately 800 member companies worldwide that develop software and digital information content. SIIA provides global services in government relations, business development, corporate education and intellectual property protection to the leading companies that are setting the pace for the digital age. SIIA supports the development of a robust global electronic marketplace that is diverse and highly competitive. To that end, SIIA is the leading voice of the software & digital content industries across a wide-range of issues, including intellectual property protection, privacy and data security, e-government and information policy, taxation of electronic commerce, security, education technology and workforce development. For more information, please visit www.siia.net.

The SIIA report “The U.S. Software Industry: An Engine for Economic Growth and Employment” from which this executive summary draws was authored by Robert J. Shapiro, chairman and co-founder of Sonecon, LCC. The views and conclusions are solely those of the author.