THE WORLD KLEMS INITATIVE: MEASURING PRODUCTIVITY AT THE INDUSTRY LEVEL

Dale W. Jorgenson, Samuel W. Morris University Professor, Harvard University

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Introduction

The World KLEMS Initiative was established at the First World KLEMS Conference, held at Harvard University in August 2010[1]. The purpose of the Initiative is to generate industry-level datasets, consisting of outputs and inputs of capital (K) and labor (L), together with inputs of energy (E), materials (M), and services (S). Productivity for each industry is defined as output per unit of all inputs. These datasets provide a new framework for analyzing the sources of economic growth at the industry and aggregate levels for countries around the world. This framework has closed a critical gap in systems of national accounts.

Growth of output, inputs, and productivity at the industry level is important for understanding changes in the structure of an economy and the contributions of different industries to economic growth. International comparisons of differences in productivity levels based on purchasing power parities of outputs and inputs at the industry level provide a second focus for industry-level productivity research. These comparisons are essential in assessing changes in comparative advantage and formulating strategies for economic growth.

The EU (European Union) KLEMS study provides industry-level datasets on the sources of growth for 25 of the 27 EU member countries[2]. These datasets are essential for analyzing the slowdown in European economic growth that preceded the current financial and fiscal crisis. The datasets and results were presented at the Final EU KLEMS Conference in Groningen, The Netherlands, in June 2008[3]. Marcel P. Timmer, Robert Inklaar, Mary O'Mahony, and Bart van Ark (2010) describe the datasets and analyze the sources of economic growth in Europe at the industry level.

The EU KLEMS project also included datasets for Australia, Canada, Japan, Korea, and the United States. Matilde Mas and Robert Stehrer (2012) present international comparisons within Europe and between Europe and the advanced economies in Asia and North America. As European policy-makers focus on removing barriers to the revival of economic growth, international differences in the sources of growth have become central in understanding the impacts of changes in economic policy.

The EU KLEMS project identified the failure to develop a knowledge economy as the most important source of the slowdown in European economic growth. Development of a knowledge economy will require investments in human capital, information technology, and intellectual property. An important policy implication is that extension of the single market to the services industries, which are particularly intensive in the use of information technology, will be essential for the removal of barriers to the knowledge economy.

The Second World KLEMS Conference was held at Harvard University on August 2012[4]. The conference included reports on recent progress in the development of industry-level datasets, as well as extensions and applications.[5] Regional organizations in Asia and Latin America have now joined the European Union in supporting research on industry-level datasets. Due to the growing recognition of the importance of these datasets, an effort is underway to extend the new framework to emerging and transition economies, such as Brazil, China, India, and Russia.

LA-KLEMS, the Latin American Chapter of the World-KLEMS Initiative, was established in December 2009 at a conference at ECLAC, the Economic Commission for Latin America and the Caribbean, in Santiago, Chile[6]. This Chapter is coordinated by ECLAC and includes seven research organizations in four leading Latin American countries – Argentina, Brazil, Chile, and Mexico.[7] Mario Cimoli, Andre Hofman, and Nanno Mulder (2010) have summarized the results of the initial phase of the LA-KLEMS project.

A detailed report on Mexico KLEMS was published in 2013 by INEGI, the National Institute of Statistics and Geography.[8] This was presented at an international seminar at the Instituto Techologico Autonoma de Mexico (ITAM) in Mexico City on October 2013[9]. Mexico KLEMS includes a complete industry-level productivity database for 1990-2011 that is integrated with the Mexican national accounts. This database will be updated annually. A very important finding is that productivity has not grown in Mexico since 1990. Periods of positive economic growth have been offset by the negative impacts of the Mexican sovereign debt crisis of 1995, the U.S. dot-com crash in 2000, and the U.S. financial and economic crisis of 2007-2009.

Asia KLEMS, the Asian Chapter of the World KLEMS Initiative, was founded in December 2010 and the first Asia KLEMS Conference was held at the Asian Development Bank Institute in Tokyo in July 2011[10]. Asia KLEMS includes the Japan Industrial Productivity database[11], the Korean Industrial Productivity database[12], and the China Industrial Productivity database[13]. Industry-level databases have been constructed for Taiwan and work is underway to develop a similar database for Malaysia. These databases were discussed at the Second Asia KLEMS Conference, held at the Bank of Korea in Seoul in August 2013[14].

Kyoji Fukao (2012, 2013) has employed the JIP data base in analyzing the slowdown in productivity growth in Japan after 1991, now extending into the Two Lost Decades. The initial downturn in productivity growth followed the collapse of the “bubble” in Japanese real estate prices in 1991. A brief revival of productivity growth after 2000 ended with the sharp decline in Japanese exports in 2008-2009. This followed the rapid appreciation of the Japanese yen, relative to the U.S. dollar, after the adoption of a monetary policy of quantitative easing by the Federal Reserve, the U.S. central bank. When the Bank of Japan failed to respond, Japan experienced a much more severe downturn in productivity growth and a larger decline in output than the U.S. in the aftermath of the financial and economic crisis of 2007-2009.

The Third World KLEMS Conference was held in Tokyo in May 2014[15]. This conference, discussed industry-level datasets for more than 40 countries, including those that participate in the three regional organizations that make up the World KLEMS Initiative – EU KLEMS in Europe, LA KLEMS in Latin America, and Asia KLEMS in Asia. In addition, the conference considered research on linking datasets for the 40 countries through the World Input-Output Database (WIOD)[16]. Another important theme of the conference was the extension of the measurement of capital inputs to include intangibles, such as human capital and intellectual property, as well as the familiar tangible assets – plant, equipment, and inventories.

Linked data sets are especially valuable in analyzing the development of global value chains in Asia, North America, and Europe. For this purpose international trade can be decomposed by tasks performed at each link of the value chain. Trade in tasks can be compared with trade in commodities, which involves "double-counting" of intermediate goods as products pass through the value chain. A central finding is that regional value chains are now merging into global value chains involving all the major countries in the world. The World Input-Output Database is now undergoing a substantial expansion at the OECD with support from the World Trade Organization[17].

The Third World KLEMS Conference included reports on new industry-level data sets for India and Russia. Russia KLEMS was released in July 2013 by the Laboratory for Research in Inflation and Growth at the Higher School of Economics in Moscow[18]. Russia's recovery from the sharp economic downturn that followed the dissolution of the Soviet Union and the transition to a market economy has been very impressive. Surprisingly, increases in productivity growth widely anticipated by observers inside and outside Russia have characterized only the service industries, which were underdeveloped under central planning. Mining industries have attracted large investments, but these have not been accompanied by gains in efficiency. The recent collapse in world oil prices poses an important challenge for the future growth of the Russian economy.

The India KLEMS database was released in July 2014 by the Reserve Bank of India[19], shortly after the Third World KLEMS Conference in Tokyo. This database covers 26 industries for the period 1980-2011. Beginning in the 1980's, liberalization of the Indian economy has resulted in a gradual and sustained acceleration in economic growth and a transfer of resources from agriculture and manufacturing to the service industries. The most surprising feature of the acceleration in Indian economic growth has been the stagnant share of manufacturing and the rapid growth in the share of services. Given the shrinking share of agriculture and the size of the Indian agricultural labor force, another surprise is that growth of capital input has been the most important source of growth in manufacturing and services, as well as more recently in agriculture.

The New Framework for Productivity Measurement.

Jorgenson, Frank M. Gollop, and Barbara M. Fraumeni (1987) constructed the first data set containing annual time series data on output, inputs of capital, labor, and intermediate goods, and productivity for all the industries in the U.S. economy. This study has provided the model for the methods of economy-wide and industry-level productivity measurement presented in Paul Schreyer's (2001) OECD *Productivity Manual*. The hallmarks of the new framework for productivity measurement are constant quality indexes of capital and labor services at the industry level and indexes of energy, materials, and services inputs constructed from a time series of input-output tables.

Jorgenson, Mun S. Ho, and Kevin J. Stiroh (2005) updated the U.S. dataset and revised it to include investment in information technology (IT). This required developing new data on the production of hardware, telecommunications equipment, and software, as well as inputs of IT capital services. The new dataset has demonstrated the importance of industry-level productivity growth in understanding the U.S. investment boom of the 1990s. Jorgenson, Ho, and Stiroh (2205) have provided the framework for the new datasets and international comparisons for Europe, Japan, and the U.S. presented by Jorgenson (2009).

The key idea underlying a *constant quality index of labor input* is to capture the heterogeneity of different types of labor inputs. Hours worked for each type of labor input are combined into a constant quality index of labor input, using labor compensation per hour as weights. Constant quality indexes of labor input for the United States at the industry level are discussed in detail by Jorgenson, Ho, and Stiroh (2005, Chapter 6, pp. 201-290).

Similarly, a *constant quality index of capital input* deals with the heterogeneity among different types of capital inputs. These capital inputs are combined into a constant quality index, using rental prices of the inputs as weights, rather than the asset prices used in measuring capital stocks. This makes it possible to incorporate differences among asset-specific inflation rates that are particularly important in analyzing the impact of investments in information technology, as well as differences in depreciation rates and tax treatments for different assets. Constant quality indexes of capital input for the United States at the industry level are presented by Jorgenson, Ho, and Stiroh (2005, Chapter 5, pp. 147-200).

The new framework for productivity measurement incorporates a time series of input-output tables in current and constant prices. Estimates of intermediate inputs of energy, materials, and services are generated from these tables. Details on the construction of the time series of input-output tables and estimates of intermediate inputs are presented by Jorgenson, Ho, and Stiroh (2005, Chapter 4, pp. 87-146).

Jorgenson and Steven Landefeld (2006) developed a new architecture for the U.S. national income and product accounts (NIPAs) that includes prices and quantities of capital services for all productive assets in the U.S. economy. This was published in a volume on the new architecture by Jorgenson, Landefeld, and Nordhaus (2006). The incorporation of the price and quantity of capital services into the United Nations' *System of National Accounts 2008* (*2009*) was approved by the United Nations Statistical Commission at its February-March 2007 meeting. Schreyer, then head of national accounts at the OECD, prepared an OECD Manual, *Measuring Capital*, published in 2009. This provides detailed recommendations on methods for the construction of prices and quantities of capital services.

In Chapter 20 of *SNA 2008* (page 415), estimates of capital services are described as follows: "By associating these estimates with the standard breakdown of value added, the contribution of labor and capital to production can be portrayed in a form ready for use in the analysis of productivity in a way entirely consistent with the accounts of the System." The measures of capital and labor inputs in the prototype system of U.S. national accounts presented by Jorgenson and Landefeld (2006) are consistent with the *OECD Productivity Manual*, *SNA 2008*, and the OECD Manual, *Measuring Capital*.

The new architecture for the U.S. national accounts was endorsed by the Advisory

Committee on Measuring Innovation in the 21st Century Economy to the U.S. Secretary of Commerce[20]:

> The proposed new 'architecture' for the NIPAs would consist of a set of income statements, balance sheets, flow of funds statements, and productivity estimates for the entire economy and by sector that are more accurate and internally consistent. The new architecture will make the NIPAs much more relevant to today's technology-driven and globalizing economy and will facilitate the publication of much more detailed and reliable estimates of innovation's contribution to productivity growth.

In response to the Advisory Committee's recommendations, BEA and BLS produced an initial set of multifactor productivity estimates integrated with the NIPAs. Data on capital and labor inputs are provided by BLS. The results are reported by Michael Harper, Brent Moulton, Steven Rosenthal, and David Wasshausen (2009) and will be updated annually.[21] This is a critical step in implementing the new architecture. The omission of productivity statistics from the NIPAs and *SNA 1993* has been a serious barrier to assessing potential growth.

Reflecting the international consensus on productivity measurement at the industry level, the Advisory Committee on Measuring Innovation in the 21st Century Economy to the U.S. Secretary of Commerce (2008, page 7) recommended that the Bureau of Economic Analysis (BEA) should:

> Develop annual, industry-level measures of total factor productivity by restructuring the NIPAs to create a more complete and consistent set of accounts integrated with data from other statistical agencies to allow for the consistent estimation of the contribution of innovation to economic growth.

In December 2011 the Bureau of Economic Analysis (BEA) released a new industry-level data set. This integrated three separate industry programs – benchmark input-output tables released every five years, annual input-output tables, and gross domestic product by industry, also released annually. The input-output tables provide data on the output side of the national accounts along with intermediate inputs in current and constant prices. BEA's industry-level data set is described in more detail by Nicole M. Mayerhauser and Erich H. Strassner (2010).

BEA's annual input-output data are employed in the industry-level production accounts presented by Susan Fleck, Rosenthal, Matthew Russell, Erich Strassner, and Lisa Usher

(2014) in their paper for the Second World KLEMS Conference, “A Prototype BEA/BLS Industry-Level Production Account for the United States.” The paper covers the period 1998-2009 for the 65 industrial sectors used in the NIPAs. The capital and labor input are provided by BLS, while the data on output and intermediate inputs are generated by BEA. This paper was published in a second volume on the new architecture for the U.S. national accounts by Jorgenson, Landefeld, and Schreyer (2014).

Stefanie H. McCulla, Alyssa E. Holdren, and Shelly Smith (2013) have summarized the 2013 benchmark revision of the NIPAs. A particularly significant innovation is the addition of intellectual property products, such as research and development and entertainment, artistic, and literary originals. Investment in intellectual property is treated symmetrically with other types of capital expenditures. Intellectual property products are included in the national product and the capital services generated by these products are included in the national income. Donald D. Kim, Strassner and Wasshausen (2014) discuss the 2014 benchmark revision of the industry accounts, including the incorporation of intellectual property.

The 2014 benchmark revision of the U.S. industry accounts is incorporated into the paper by Steven Rosenthal, Matthew Russell, Samuels, Strassner, and Lisa Usher (2015), “Integrated Industry-Level Production Account for the United States: Intellectual Property Products and the 2007 NAICS.” The paper covers the period 1997-2012 for the 65 industrial sectors used in the NIPAs. The capital and labor inputs are provided by BLS, while output and intermediate inputs are generated by BEA.[22] This paper was presented at the Third World KLEMS Conference and will be published in a new volume by Jorgenson, Fukao, and Timmer (2015) that will contain papers presented at the conference.

A Prototype Industry-Level Production Account for the United States, 1947-2012.

Jorgenson and Schreyer (2013) have shown how to integrate a complete system of production accounts at the industry level into the *2008 System of National Accounts.* To illustrate the application of these production accounts, I will summarize the prototype production account for the United States for 1947-2012 constructed by Jorgenson, Ho, and Jon Samuels (2015) in a paper presented at the Third World KLEMS Conference. The lengthy time series is especially valuable in comparing recent changes in the sources of economic growth with longer-term trends.

Jorgenson, Ho, and Samuels (2015) illustrate the application of the prototype industry-level production account by analyzing postwar U.S. economic history for three broad periods. These are the Postwar Recovery, 1947-1973, the Big Slump following the energy crisis of 1973, 1973-1995, and the period of Growth and Recession, 1995-2012. To provide more detail on the period of Growth and Recession, they consider the sub-periods 1995-2000, 2000-2007, and 2007-2010 – the Investment Boom, the Jobless Recovery, and the Great Recession.

The NAICS industry classification includes the industries identified by Jorgenson, Ho, and Samuels (2015) as IT-producing industries, namely, computers and electronic products and two IT-services industries, information and data processing and computer systems design.

Jorgenson, Ho and Samuels (2015) have classified industries as IT-using if the intensity of IT capital input is greater than the median for all U.S. industries that do not produce IT equipment, software and services. All other industries are classified as Non-IT.

Value added in the IT-producing industries during 1947-2012 is only 2.5 percent of the US economy, in the IT-using industries about 47.5 percent, and the Non-IT industries the remaining fifty percent. The IT-using industries are mainly in trade and services and most manufacturing industries are in the Non-IT sector. The NAICS industry classification provides much more detail on services and trade, especially the industries that are intensive users of IT. I begin by discussing the results for the IT-producing sectors, now defined to include the two IT-service sectors.

Figure 1.1 reveals a steady increase in the share of IT-producing industries in the growth of value added since 1947. This is paralleled by a decline in the contribution of the Non-IT industries, while the share of IT-using industries has remained relatively constant through 1995. Figure 1.2 decomposes the growth of value added for the period 1995-2012. The contributions of the IT-producing and IT-using industries peaked during the Investment Boom of 1995-2000 and have declined since then. The contribution of the Non-IT industries also declined substantially. Figure 1.3 gives the contributions to value added for the 65 individual industries over the period 1947-2012.

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The growth rate of aggregate productivity includes a weighted average of industry productivity growth rates, using an ingenious weighting scheme originated by Domar (1961). In the Domar weighting scheme the productivity growth rate of each industry is weighted by the ratio of the industry's gross output to aggregate value added. A distinctive feature of Domar weights is that they sum to more than one, reflecting the fact that an increase in the rate of growth of the industry's productivity has two effects. The first is a direct effect on the industry's output and the second an indirect effect via the output delivered to other industries as intermediate inputs.

The rate of growth of aggregate productivity also depends on the reallocations of capital and labor inputs among industries. The rate of aggregate productivity growth exceeds the weighted sum of industry productivity growth rates when these reallocations are positive. This occurs when capital and labor inputs are paid different prices in different industries and industries with higher prices have more rapid input growth rates. Aggregate capital and labor inputs then grow more rapidly than weighted averages of industry capital and labor input growth rates, so that the reallocations are positive. When industries with lower prices for inputs grow more rapidly, the reallocations are negative.

Figure 1.4 shows that the contributions of IT-producing, IT-using, and Non-IT industries to aggregate productivity growth are similar in magnitude for the period 1947-2012. The Non-

IT industries greatly predominated in the growth of value added during the Postwar Recovery, 1947-1973, but this contribution became negative after 1973. The contribution of IT-producing industries was relatively small during this Postwar Recovery, but became the predominant source of growth during the Long Slump, 1973-1995, and increased considerably during the period of Growth and Recession of 1995-2012.

Place Figure 1.4 here

The IT-using industries contributed substantially to U.S. economic growth during the postwar recovery, but this contribution disappeared during the Long Slump, 1973-1995, before reviving after 1995. The reallocation of capital input made a small but positive contribution to growth of the U.S. economy for the period 1947-2012 and for each of the sub-periods. The contribution of reallocation of labor input was negligible for the period as a whole. During the Long Slump and the period of Growth and Recession, the contribution of the reallocation of labor input was slightly negative.

Considering the period 1995-2012 in more detail in Figure 1.5, the IT-producing industries predominated as a source of productivity growth during the period as a whole. The contribution of these industries remained substantial during each of sub-periods – 1995-2000, 2000-2007, and 2007-2012 – despite the strong contraction of economic activity during the Great Recession of 2007-2009. The contribution of the IT-using industries was slightly greater than that of the IT-producing industries during the period of Jobless Growth, but dropped to nearly zero during the Great Recession. The Non-IT industries contributed positively to productivity growth during the Investment Boom of 1995-2000, but these contributions were almost negligible during the Jobless Recovery and became substantially negative during the Great Recession. The contributions of reallocations of capital and labor inputs were not markedly different from historical averages.

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Figure 1.6 gives the contributions of each of the 65 industries to productivity growth for the period as a whole. Wholesale and retail trade, farms, computer and peripheral equipment, and semiconductors and other electronic components were among the leading contributors to U.S. productivity growth during the postwar period. About half the 65 industries made negative contributions to aggregate productivity for the period 1947-2012 as a whole. These include non-market services, such as health, education, and general government, as well as resource industries, such as oil and gas extraction and mining, affected by resource depletion. Other negative contributions reflect the growth of barriers to resource mobility in product and factor markets due, in some cases, to more stringent government regulations.

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The price of an asset is transformed into the price of the corresponding capital input by the *cost of capital*, introduced by Jorgenson (1963). The cost of capital includes the nominal rate of return, the rate of depreciation, and the rate of capital loss due to declining prices. The distinctive characteristics of IT prices – high rates of price decline and rates of depreciation –

imply that cost of capital for the price of IT capital input is very large relative to the cost of capital for the price of Non-IT capital input.

The contributions of college-educated and non-college-educated workers to U.S. economic growth are given by the relative shares of these workers in the value of output, multiplied by the growth rates of their labor input. Personnel with a college degree or higher level of education correspond closely with “knowledge workers” who deal with information. Of course, not every knowledge worker is college-educated and not every college graduate is a knowledge worker.

Figure 1.8 reveals that all of the sources of economic growth contributed to the U.S. growth resurgence during the 1995-2000 boom, relative to the Long Slump of 1973-1995 represented in Figure 1.7. Jorgenson, Ho, and Stiroh (2005) have analyzed the sources of the U.S. growth resurgence in greater detail. After the dot-com crash in 2000 the overall growth rate of the U.S. economy dropped to well below the long-term average of 1947-2012. The contribution of investment also declined below the long-term average, but the shift from Non-IT to IT capital input continued. Jorgenson, Ho, and Stiroh (2008) argue that the rapid pace of U.S. economic growth after 1995 was not sustainable.

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The contribution of labor input dropped precipitously during the period of Growth and Recession, accounting for most of the decline in the rate of U.S. economic growth during the Jobless Recovery. The contribution to growth by college-educated workers continued at a reduced rate, but that of non-college workers was negative. The most remarkable feature of the Jobless Recovery was the continued growth in productivity, indicating a continuing surge of innovation.

Both IT and Non-IT investment continued to contribute substantially to U.S. economic growth during the Great Recession period after 2007. Productivity growth became negative, reflecting a widening gap between actual and potential growth of output. The contribution of college-educated workers remained positive and substantial, while the contribution of non-college workers became strongly negative. These trends represent increased rates of substitution of capital for labor and college-educated workers for non-college workers.

Conclusions

The new framework for productivity measurement reveals that replication of established technologies explains by far the largest proportion of U.S. economic growth. Replication takes place through the augmentation of the labor force and the accumulation of capital. International productivity comparisons reveal similar patterns for the world economy, its major regions, and leading industrialized, developing, and emerging economies.[23] Studies are now underway to extend these comparisons to the countries included in the World KLEMS Initiative.

Innovation is indicated by productivity growth and accounts for a relatively modest portion of U.S. economic growth. Innovation is far more challenging than replication of established technologies and subject to much greater risk. The diffusion of successful innovation requires substantial financial commitments. These fund the investments that replace outdated products and processes and establish new organization structures, systems, and business models. Although innovation accounts for a modest portion of economic growth, this is vital for maintaining gains in the U.S. standard of living in the long run.

Industry-level production accounts are now prepared on a regular basis by national statistical agencies in Australia, Canada, Denmark, Finland, Italy, Mexico, The Netherlands, Sweden, and the United Kingdom, as well as the United States. These accounts provide current information about the growth of outputs, inputs, and productivity at the industry level and can be used in international comparisons of patterns of structural change like those presented by Jorgenson and Timmer (2011). The World KLEMS Initiative has made it possible to extend these comparisons to countries around the world, including important emerging and transition economies.

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[1] For the program and participants see: http://www.worldklems.net/conference1.htm
[2] Updated data are available for the EU countries are posted on the EU KLEMS website: http://www.euklems.net/eukNACE2.shtml
[3] For the program and participants see: http://www.euklems.net/conference.html
[4] For the program and participants see: http://www.worldklems.net/conference2.htm
[5] The conference program and presentations are available at: http://www.worldklems.net/conference2.htm
[6] For the program and participants see: http://www.cepal.org/de/agenda/8/38158/Agenda.pdf
[7] Additional information about LA-KLEMS is available on the project website: http://www.cepal.org/cgi-bin/getprod.asp?xml=/la-klems/noticias/paginas/4/40294/P40294.xml&xsl=/la-klems/tpl-i/p18f-st.xsl&base=/la-klems/tpl-i/top-bottom.xsl
[8]http://www.inegi.org.mx/inegi/contenidos/espanol/prensa/Boletines/Boletin/Comunicados/Especiales/2013/agosto/comunica9.pdf
[9] For the program and participants see: http://www.inegi.org.mx/eventos/2013/contabilidad_mexico/presentacion.aspx
[10] For the program and participants see: http://asiaklems.net/conferences/conferences.asp Asia KLEMS was preceded by International Comparison of Productivity among Asian Countries (ICPAC). The results were reported by Jorgenson, Kuroda, and Motohashi (2007).
[11] http://www.rieti.go.jp/en/database/JIP2014/index.html Data are available for 108 industries covering the period
1070-2011.
[12] http://www.kpc.or.kr/eng/state/2011_kip.asp?c_menu=5&s_menu=5_4
[13] http://www.rieti.go.jp/en/database/CIP2011/index.html
[14] For the program and participants see: http://asiaklems.net/conferences/conferences.asp
[15] http://scholar.harvard.edu/jorgenson/world-klems
[16] http://www.wiod.org/new_site/home.htm
[17] See: http://www.oecd.org/sti/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm
[18] See: http://www.hse.ru/en/org/hse/expert/lipier/ruklems
[19] http://www.rbi.org.in/scripts/PublicationReportDetails.aspx?UrlPage=&ID=785
[20] The Advisory Committee was established on December 6, 2007, with ten members from the business community, including Carl Schramm, President and CEO of the Kauffman Foundation and chair of the Committee. The Committee also had five academic members, including myself. The Advisory Committee met on February 22 and September 12, 2007, to discuss its recommendations. The final report was released on January 18, 2008.
[21] The most recent data set is available at: http://www.bea.gov/national/integrated_prod.htm

[22] For current data, see: http://www.bea.gov/industry/index.htm#integrated.
[23] See Jorgenson and Vu (2013),

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Figure 1.1: Contributions of Industry Groups to Value Added Growth, 1947-2012

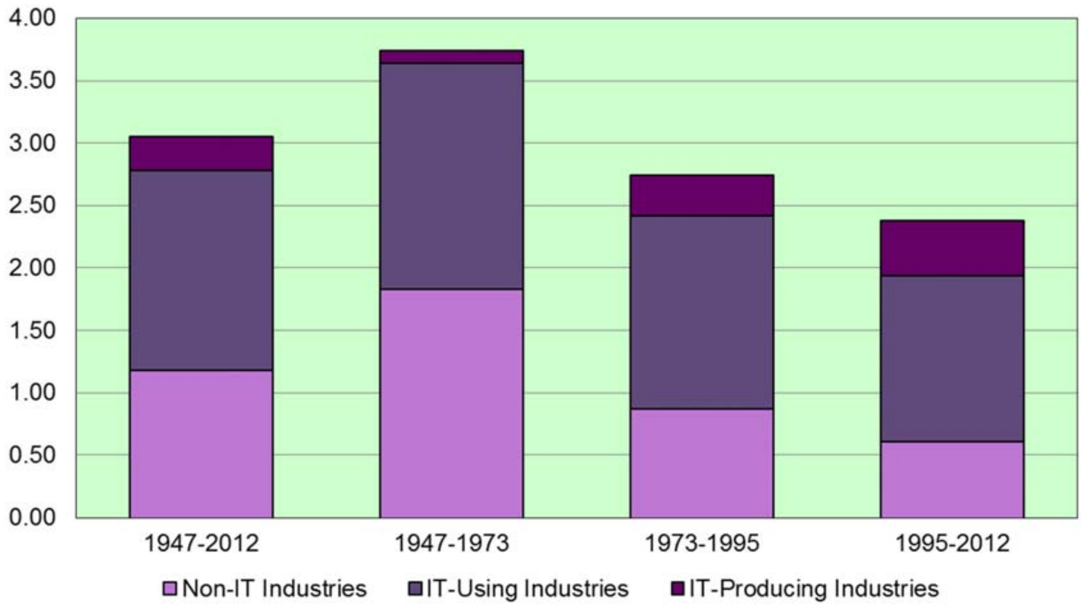

Figure 1.2: Contributions of Industry Groups to Value Added Growth, 1995-2012

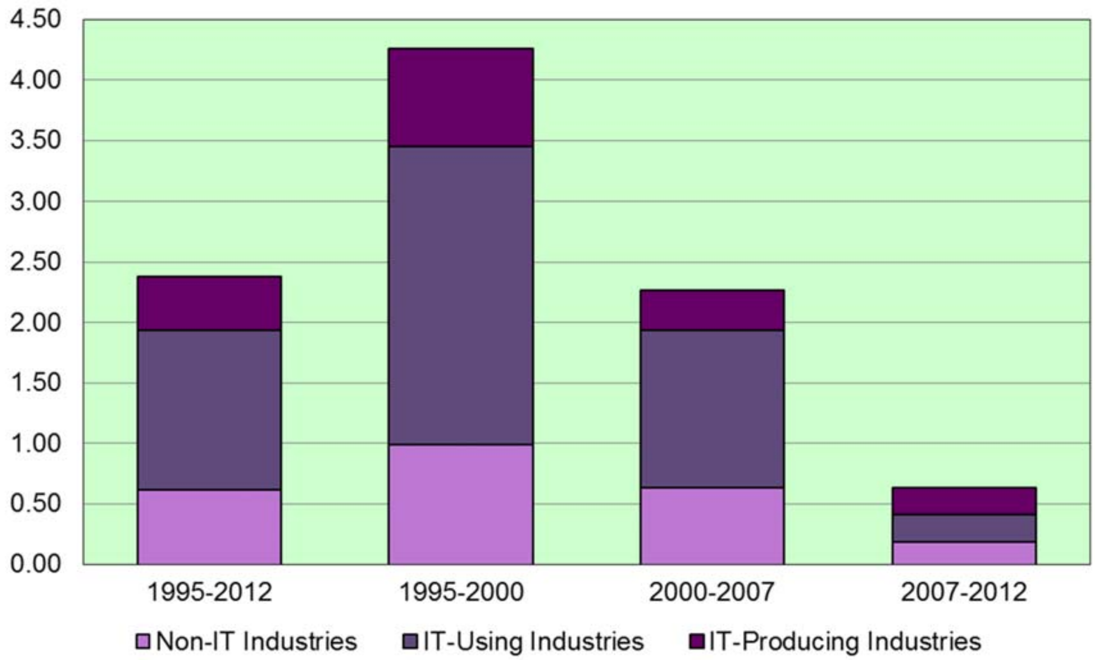

Figure 1.3: Contributions of Individual Industries to Value Added 1947-2012

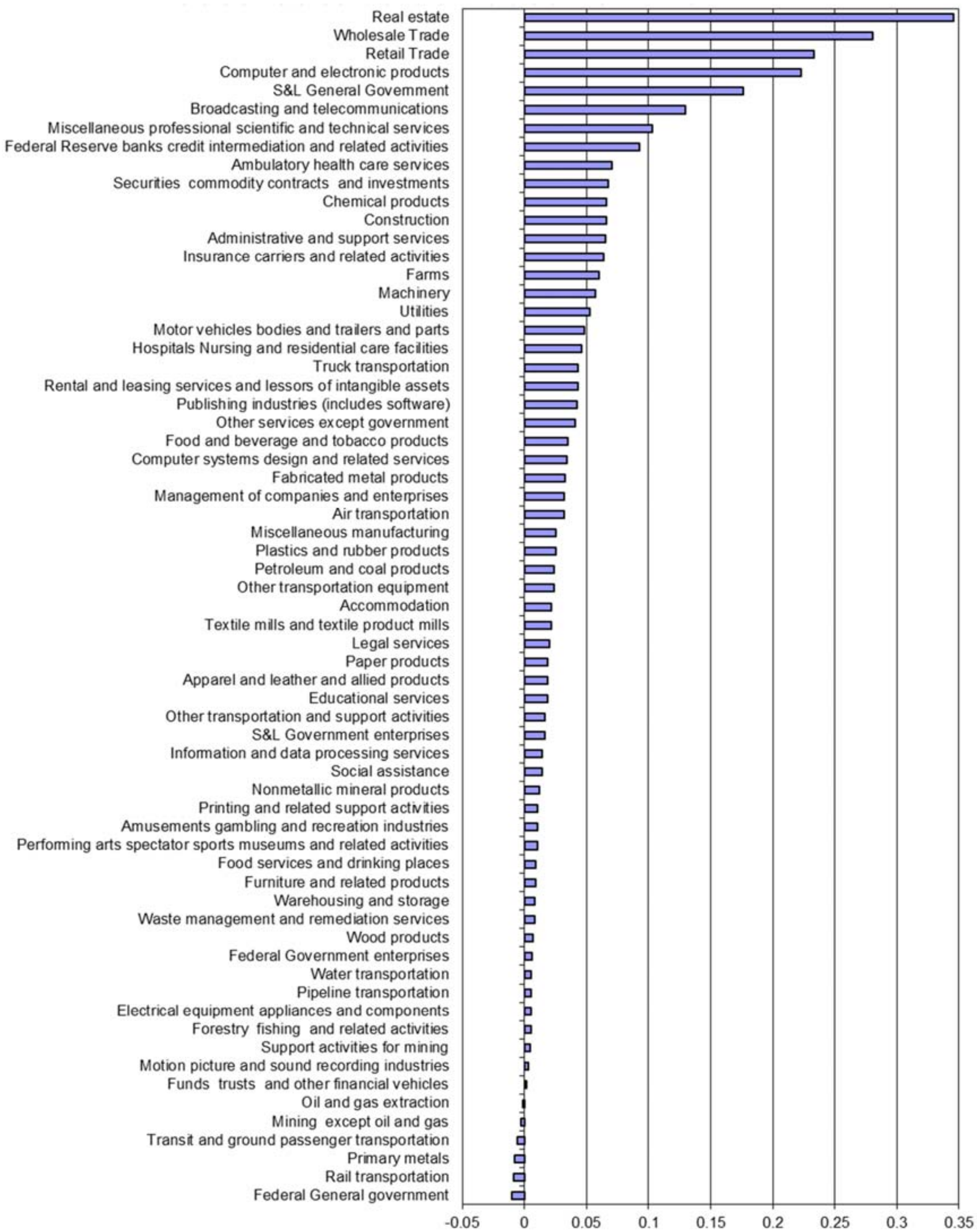

Figure 1.4: Contributions of Industry Groups to Productivity Growth, 1947-2012

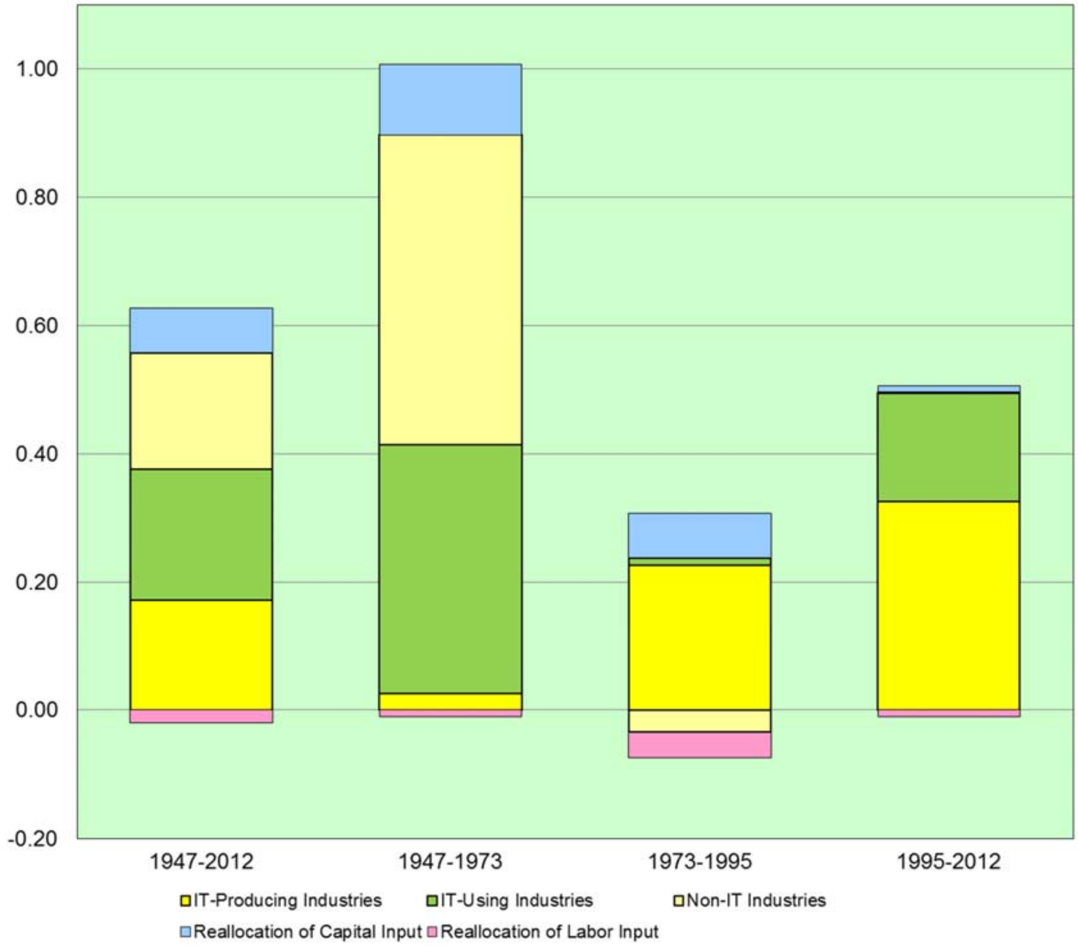

Figure 1.5: Contributions of Industry Groups to Productivity Growth, 1995-2012

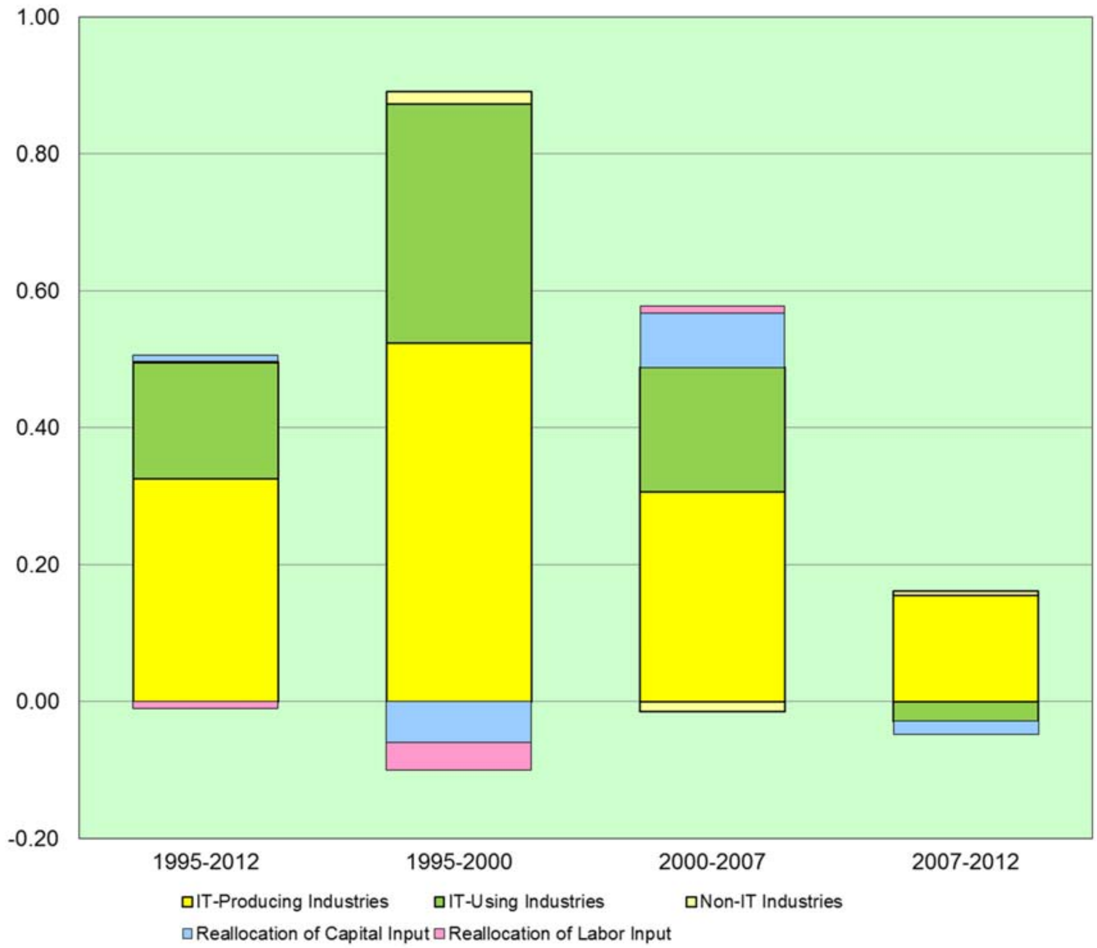

Figure 1.6: Contributions of Individual Industries to Productivity Growth 1947-2012

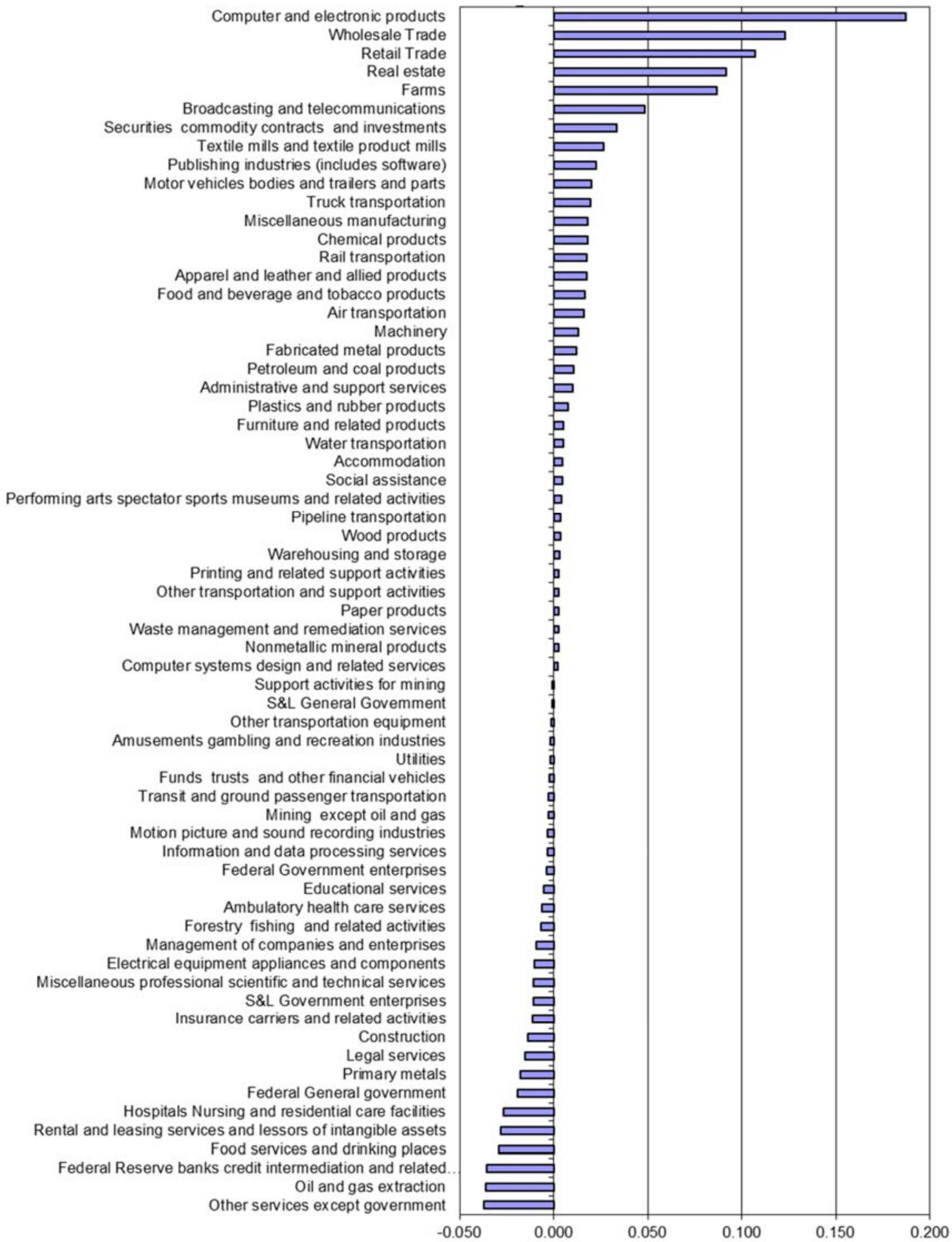

Figure 1.7: Sources of U.S. Economic Growth, 1947-2012

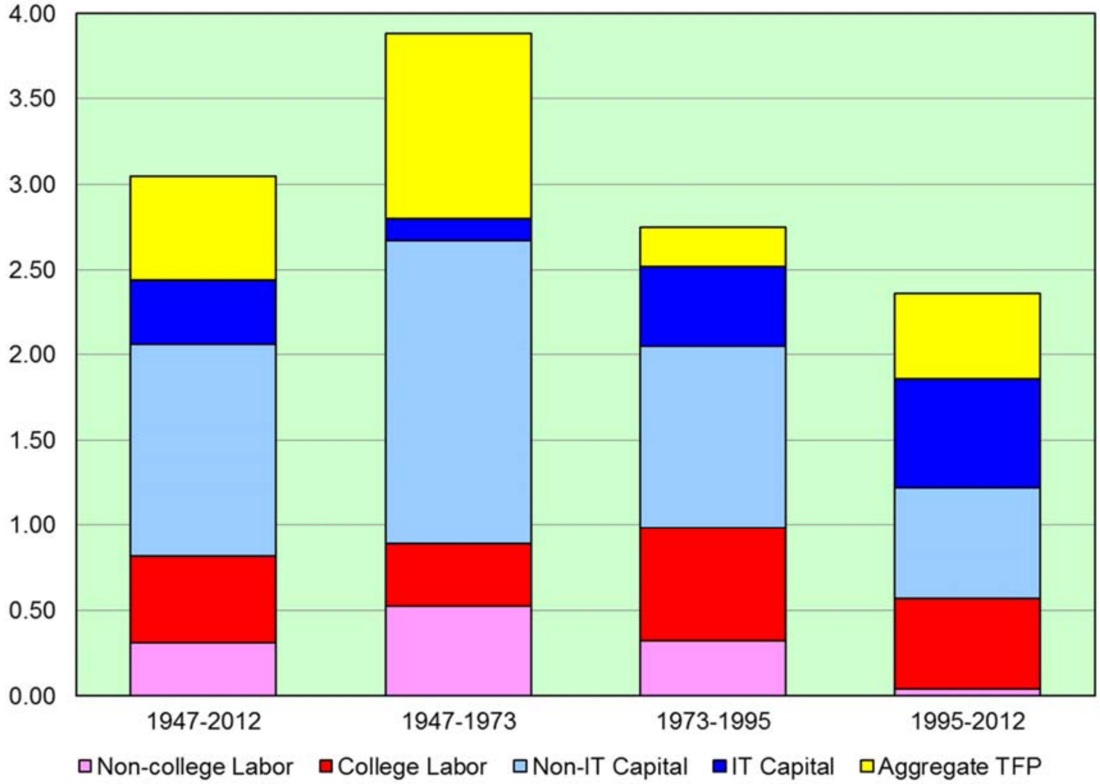

Figure 1.8: Sources of U.S. Economic Growth, 1995-2012