

Digitization and Productivity Growth: Where is the Growth?

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December 17th, 2015

Conference Call

Digitization and Productivity Growth

Forty years after the first PCs were commercially sold and twenty-two years after the World Wide Web became available free of charge, it is still an unresolved matter in economics whether electronic inventions as well as the dot.com boom heightened the growth rate of U.S. productivity.

In the new digital era, even more controversial has been the extent to which big data collection and processing and the proliferation of new apps have contributed to productivity growth, since the productivity growth rate over the last five years has slowed significantly to 0.5%.

We find that the recent slowdown in U.S. productivity growth rates has been structural in nature. With that in mind, the questions that remain unresolved are how digital innovations will contribute to the future path of productivity growth and whether U.S. productivity growth can reverse its path and switch into high gear mode in the long run.

Please join us for an informative discussion with Dr. Papanyan



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Monday, December 21, 2015

9:00 am | CDT (GMT -06:00) | 30 min

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Productivity Puzzle

Definition

- Standard definition of productivity is labor productivity measured by output per labor hour

Prior to the mid-1980s

- Productivity was “pro-cyclical” – low during recessions and high during recovery period

Recently It is Not the Case

- During the Great Recession of 2008–2009, productivity rose as GDP growth declined.
- During the last five years of recovery, productivity has slowed to 0.5%

Where is Growth?


- Will electronic inventions, the new digital era of big data collection and processing, and the proliferation of new apps boost productivity?

Productivity Puzzle

U.S. periods of high and low productivity growth

Year-over-Year Growth Rates (%)							
	Productivity	Real Compensation		Real Output	Nominal Compensation	Business Sector Inflation	All Persons Hours
1948 to 1973	2.9	4.3		4.3	6.8	2.6	1.4
1973 to 1995	1.5	3.0		3.1	7.9	4.9	1.7
1996 to 2004	3.1	3.9		3.9	5.3	1.4	0.8
2005 to 2015	1.3	1.4		1.8	3.1	1.7	0.5
2011 to 2015	0.5	2.8		2.6	4.3	1.6	2.1

Economist Divided: The Debate



What's the point, if people don't have jobs?

We are innovating at an insane rate

Gordon's View: The Death of Innovation

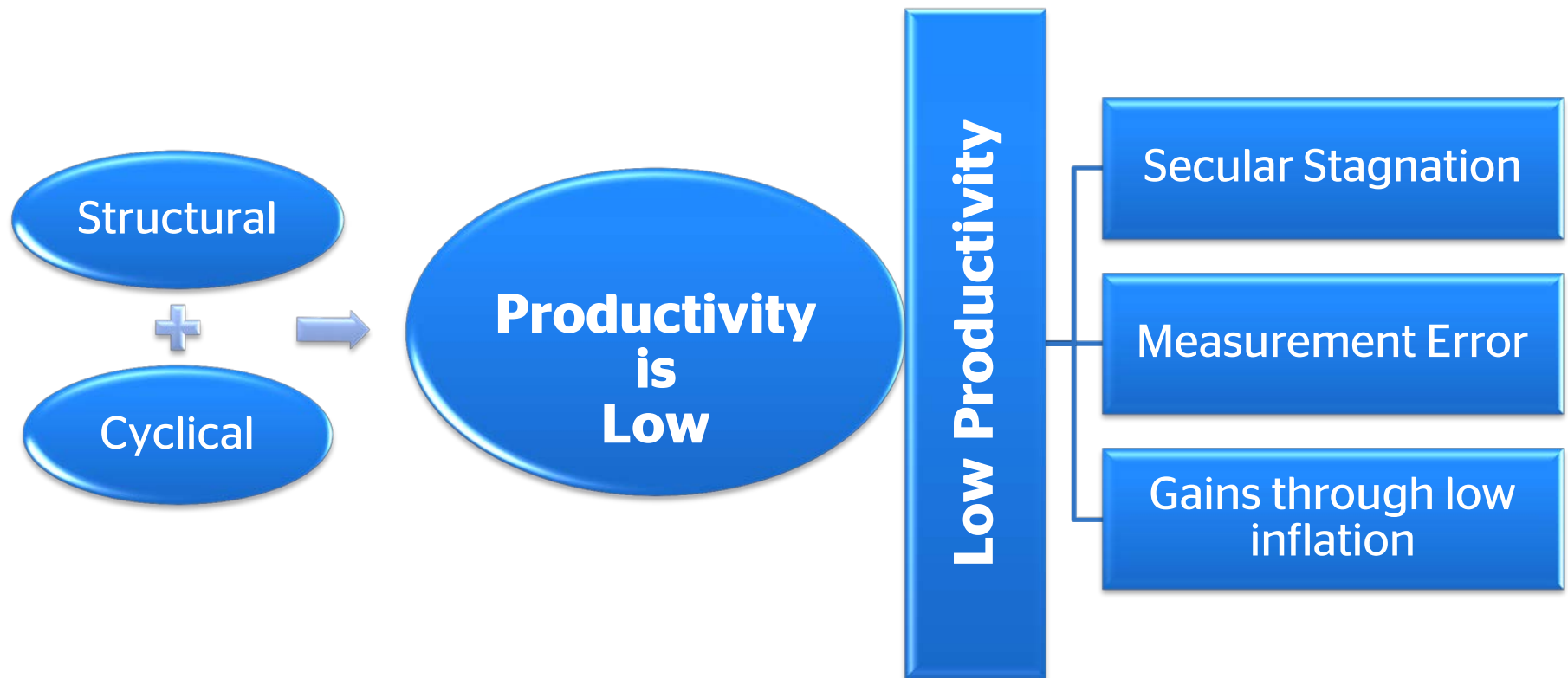
- U.S. Economic Growth is Over
- Headwinds:
 - Demographics
 - Education
 - Debt
 - Inequality
- “The growth rate of the bottom 99 percent of the income distribution ... brings us down to 0.8%”
- Innovations of the past:
 - Electricity and vertical growth
 - Central heating
 - Internal combustion engine
- Need a lot of INNOVATION
- Electronic revolution does not match the past
- “The problem we face is that all these great inventions, we have to match them in the future, and my prediction that we're not going to match them”

Silicon Valley View: Brynjolfsson's Race with the Machines

- Growth is not dead
- Productivity is actually doing all right
- GDP numbers miss over \$300 bn per year in free goods and services on the Internet
- Pains of **“the new machine age”**
 - Productivity is decoupling from employment
 - Wealth is decoupling from work
 - The income of the typical worker is stagnating
- **“the new machine age”** is
 - digital
 - exponential
 - combinatorial
- “Instead of racing against the machine, we need to learn to race **with** the machine. That is our grand challenge.”
- Solutions:
 - management issue rather than innovation
 - need to reinvent our organizations and even our whole economic system, invent new work processes

Measuring Technology and Productivity

The aggregate measure of productivity is volatile and dominated by a strong cyclical component



Measuring Technology: Productivity Trend

Technological progress forms the underlying trend in productivity growth

- sustained productivity growth is a primary source of growth in long-term living standards

Multifactor approach of measuring productivity yields a reliable estimate of the long-term productivity trend measure of technology

Productivity Trend

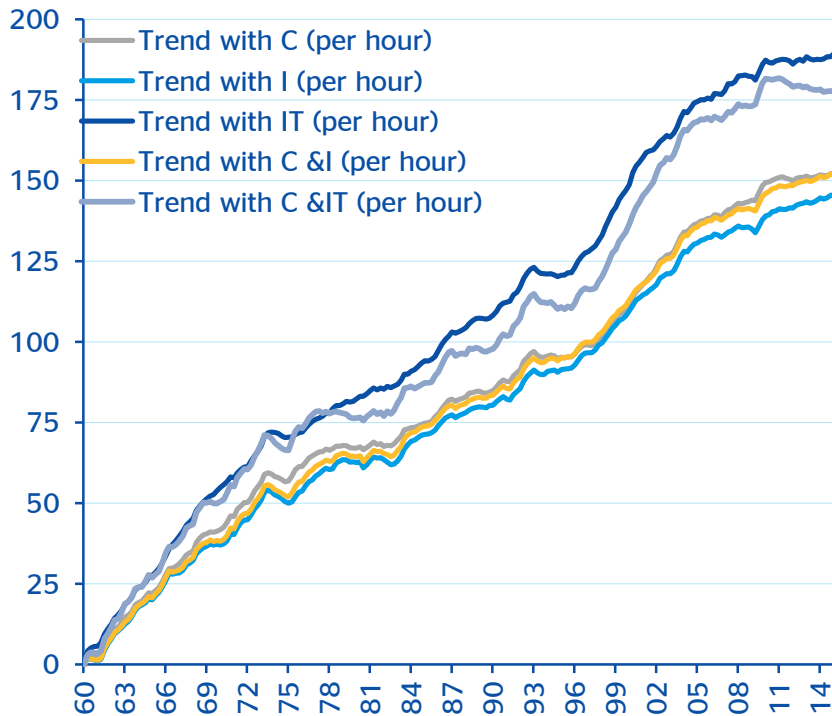
- a measure of technology that encompasses everything that permanently raises output per hour (total factor productivity, capital deepening and growth in human capital)
- estimated as the common trend among labor productivity, labor compensation, and/or consumption (C), investment (I), and IT
- modeled as a process with a two-regime mean growth rate (a probability of switching between the two at any point in time, allows differentiating low-growth and high-growth regimes)

Measuring Technology: Productivity Trend

Technological progress is in a low-growth state

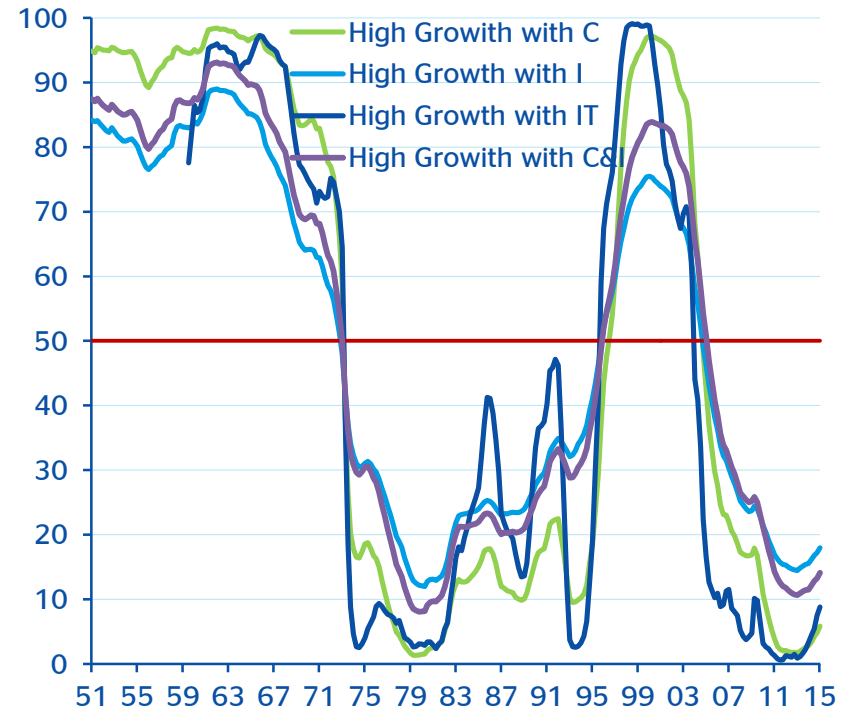
Multifactor Productivity Trend

Per Labor Hour, Logarithmic Scale, 4Q59=0



Probability of High Growth State of Productivity Trend

Per Labor Hour, %



Measuring Technology: IT Expenditures

The IT Expenditures component of investments also has a dominant cyclical component

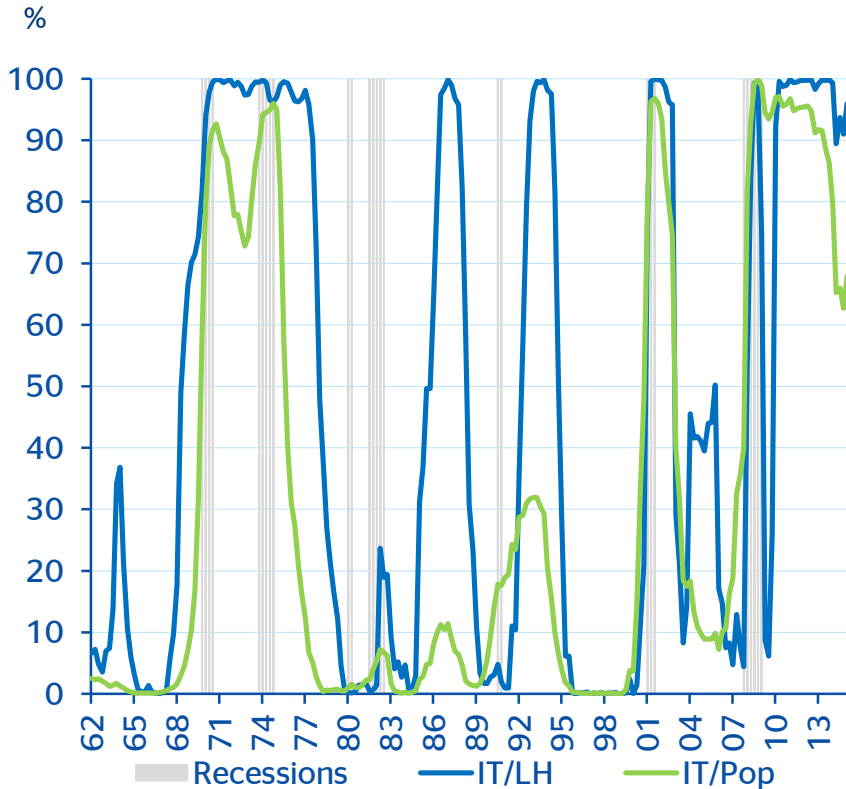
IT Trend

- splitting the long-term trend component of IT from the cyclical component
- modeled as a process with a two-regime mean growth rate - high-growth to low-growth regimes
- estimated per capita and per labor measures of IT trend

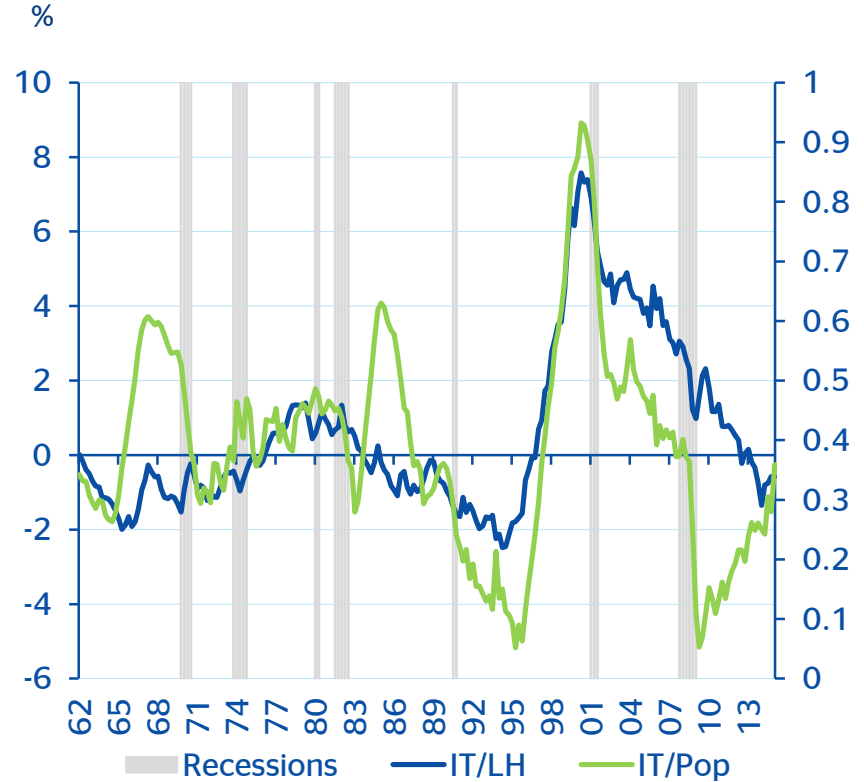
Measuring Technology: IT Expenditures

The IT trend is currently in a high-growth state

Probability of High-Growth State of the IT Trend



Cyclical Component of IT



Digitization Distort Theoretical Measures of Productivity

Digitization distorts theoretical measures of productivity

- the distinction between technology and capital as two separate factors of production fades away

Digitization has an uneven impact across countries and industry sectors

- primarily higher rewards and economic opportunities for the higher skilled and more educated portions of the labor force

Rapid globalization and technological advancements will keep labor compensation growth subdued

Digitization and Labor



Both automation and globalization have heightened competition for jobs

Digitization created an economic system where the mobility of labor has increased

- increasing ability to work globally without the need to relocate

Technological advancement has prompted automation

- intelligent machines are comparatively cost effective and can replace low-skill labor

Digitization will subdue worker compensation growth

“Offshoring is often only a way station on the road to automation”

Brynjolfsson & McAfee

Digitization and Capital

Technological advancements in IT and “gadgetization” have created a new category within capital - digital capital

- The cost of ownership of many types of digital capital is very low
- Digital capital to grow into a resource that is abundant, has low marginal costs, and is fundamental for all industries
- Continuing substitution of physical capital with digital capital will result in permanent reductions of firms' investment expenditures and downward pressure on the price of capital

The dividing line between technology and capital as two separate factors of production is fading

What the Future Holds

Technology today has a more comprehensive role in production than merely integrating resources in the factory

- Technology creates new resources with very low cost of ownership

Additional economic efficiencies in production and resource allocation will soar from digitization

Technology has an uneven impact across countries and industry sectors and can result in deepening income inequality

- higher rewards and economic opportunities for the higher skilled

Outcome

New levels of economic efficiency that can result in both lower wages and lower prices

What the Future Holds

Boost to long-term productivity growth from

- richness in innovation
- a continual increase in the quality of products and services

Restrain to productivity growth from

- Demographics
- Education
- Growing income inequality

Potentially high impact on future living standard from

- policies that yield higher returns from education and workforce training, encourage innovation, deepen inclusive information and communication technologies infrastructure, and promote both private and public capital and telecommunication investment

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