Productivity Growth

Technology, the productivity puzzle, and where to find "progress"

- Why think about productivity growth?
- The "productivity puzzle", or the missing productivity gains
- Where to find technological progress, and how to promote productivity growth

Why think about productivity growth?

TFP Definition

- Total Factor Productivity = outputs / inputs
- Exact measurement of "inputs" varies: often weighted average of capital investment & hours worked
- "Output" is value created: measured in a similar way to GDP
- If technology is doing more with less, TFP is a measure of pure technology.

How do we grow GDP?

- Output = Human Capital x Hours Worked x Investment Capital x Productivity
- Can get GDP growth by increasing any of these factors
- We can get some GDP growth through capital deepening or education
- But in the long-run, productivity is the main driver

The last 40+ years



TFP is different from "productivity"

UK trends in hourly earnings and labour productivity, 1970-2010



Notes: All data is controlled for the GDP deflator. "Workers" includes employees and self employed. Source: Analysis from Pessoa and Van Beenen, Decoupling of Wage Growth and Productivity Crowth?: ONS, General Household Survey (CHS), Labour Force Survey (LFS) and Annual Survey of Hours and carrings (ASHE)

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What happened?

- Much debate over whether there is a productivity slowdown, or not
- Are we mis-measuring productivity?
- Did capital deepening give us productivity without technology?
- How can we get back to pre-1973 levels of tech progress?

The "productivity puzzle"

Has there *really* been a technological slowdown?

- Productivity slowdown starting 1973 implies - no technology since 1973 has not been able to move the needle on economic growth, apart from a short bump in the 1990s-2000s
- Actually quite a startling claim, given how much has happened since then







"You can see the computer age everywhere but in the productivity statistics."

-Robert Solow

That can't be true!

- "Productivity mismeasurement" thesis has been tested over and over again - has not really held up.
- There are some good reasons to believe that computers actually haven't moved the needle on productivity ... yet.

Some firms are extremely productive

Labour productivity growth of global frontier firms and non-frontier firms

Index 2002 = 1



Sources: OECD (2014) and CompNet sample based on firms with 20 employees or more. Notes: OECD global frontier firms are defined as the 100 most productive firms within an industry (defined at the 2 digit level according to NACE rev.2) and year. OECD non-frontier firms refer to the (weighted) average productivity growth of non-frontier firms in each of the 2-digit manufacturing industries, considering all OECD countries. Euro area countries covered are: Austria, Belgium, Finland, France, Germany, Italy, Portugal and Spain.

... and those are mostly high-tech firms



Why are high-tech firms more productive?

- Total Factor Productivity = outputs / inputs
- High-tech firms have greater outputs than firms with comparable inputs (educated workers, large capital investment)
- If technology is "doing more with less", then what exactly are they doing?

Technology = Inventions + Processes

- Super-productive high-tech firms do not have very special "capital equipment", just a computer
- Most people with a desk job sit at work at a computer, but that doesn't necessarily mean they are doing things "smarter"



The last 10 years in software: new processes

- Agile Development: shorten product development cycles & release new software over the web
- Product Management: collect relevant information, devise strategy, encourage collaboration between different specialists
- A flexible organisational style, quite different from 20th century international corporation

"Intangible capital"

- Intangible capital = specialised intellectual knowledge, organisational processes
- "Intangible capital" used to be below 30 percent of the S&P 500 in the 70s, now it is about 84 percent
- One specific form of intangible capital: internal software tools.
- All forms of raising people's productivity

Where to find technological "progress"

Divergence between sectors

- Productivity stagnation is generally confined to to services
- Within services, tech and finance have relatively high productivity, and education, healthcare & construction have relatively low productivity



Divergence between metros

- Advanced firms have to draw on a range of expertise and specialised skills (e.g. software, management, design)
- "Frontier firms" are geographically concentrated in big cities due to these network effects
- More complex to make a movie than to make an airplane ... and even more complex to build software

Why won't frontier firms expand?

- In an interview with Eric Schmidt, he gives three reasons for Google not investing more in doing new things: talent, rents and regulation.
 - Hard to find people with the skills they need
 - Too expensive to hire people nearby
 - Expanding into sectors like healthcare and education is too difficult

Technological Solutions

- Bringing software to the "deskless workforce" using technologies such as AR
- Bringing software and new management techniques into sectors like healthcare and education
- Improving communication technology to make more work remote

Policy Solutions

- Find ways to work with high-tech new entrants in the education & healthcare spaces
- Building more affordable housing in highproductivity metros
- Creating research universities in stagnating regions to develop skills and know-how