The drivers of productivity growth over the last 15 years

Diego Comin
Dartmouth College
Pre-2000s

- Failure to converge in some countries
- Tied to difficulties to adopt new technologies
- However, TFP growth in Germany, UK and US similar
Why is there a slowdown in productivity post-2000s?

• Two hypotheses:
  
  • Bad luck: Slowdown in productivity for reasons others than the financial crisis
  
  • Endogenous response to business cycle conditions:
    
    • Reduction in innovation activity and in investments to bring in new technologies
Evidence

• R&D cyclicality

• Cyclicality of speed of diffusion

• Particularly during the GR
Figure 2: R&D Expenditures by US Corporations, 1983-2013
Share of sales from new or improved products

Year


Weighted by yearly share of sales
Table 1: Cyclicality of the Speed of Technology Diffusion

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \hat{y}_t )</td>
<td>3.73</td>
<td>3.7</td>
<td>3.64</td>
<td>4.12</td>
</tr>
<tr>
<td></td>
<td>(3.59)</td>
<td>(2.81)</td>
<td>(3.94)</td>
<td>(3.17)</td>
</tr>
<tr>
<td>( \hat{y}_t \times \text{US} )</td>
<td>0.07</td>
<td>-0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{lag}_{it} )</td>
<td>-0.057</td>
<td>-0.057</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.22)</td>
<td>(4.76)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{lag}_{it}^2 )</td>
<td>0.001</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.52)</td>
<td>(2.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \ln(\text{lag}_{it}) )</td>
<td></td>
<td>-0.29</td>
<td>-0.29</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.68)</td>
<td>(6.65)</td>
<td></td>
</tr>
<tr>
<td>\text{R2 (within)}</td>
<td>0.11</td>
<td>0.11</td>
<td>0.13</td>
<td>0.13</td>
</tr>
<tr>
<td>\text{N technologies}</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>\text{N observations}</td>
<td>327</td>
<td>327</td>
<td>327</td>
<td>327</td>
</tr>
</tbody>
</table>

Notes: (1) dependent variable is the speed of diffusion of 26 technologies, (2) all regressions include technology specific fixed effects. (3) t-statistics in parenthesis, (4) \( \hat{y}_t \) denotes the cycle of GDP per capita in the country and represents the high and medium term components of output fluctuations, (5) \( \hat{y}_t \times \text{US} \) is the medium term cycle of GDP per capita times a US dummy, (6) lag represents the years since the technology first started to diffuse.
Figure 3: Speed of Diffusion

![Graph showing the speed of diffusion with data points for the years 1980 to 2005. The graph includes two lines: one for average diffusion and another for average diffusion with a 3-year moving average. The x-axis represents the years from 1980 to 2005, and the y-axis represents the diffusion rate from -0.3 to 0.]
Figure 4: Diffusion of Technologies on Business use of Internet in UK, 2004-2013
TFP decomposition

• Decompose TFP between exogenous and endogenous components
• How? Combine:
  • A DSGE model with endogenous technology
  • observations on cyclicality of adoption
  • actual R&D series
Figure 8: Endogenous TFP, TFP and Labor Productivity
Figure 9: Endogenous TFP Decomposition

Endogenous Component of TFP
Liq. Demand Shock Contribution
R&D Shock Contribution
Figure 12: R&D efficiency in data versus model

Linearly detrended level of R&D production, 
\[ R^\text{prod}_{t-1} \], and average of the estimated levels of \( \chi_t \) between years \( t-1 \) and \( t \) (\( \bar{\chi}_{t-1:t} \)).
Conclusions

• The decline in productivity during and after the GR is due to an endogenous response of companies to financial and business cycle conditions.

• The pre-GR decline in TFP growth is surely a reflection of the lower productivity in R&D