Digital Innovation and the Distribution of Income

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The findings expressed in this paper are those of the authors and do not necessarily represent the views of the OECD or its member countries.
Inequalities have risen

- In the United States, the top 1% income share:
  - has risen from 27 times in 1980s to 81 times more than the bottom 1% in 2014
  - is almost twice as large as the bottom 50% share

- Close to zero growth for working-age adults in the bottom 50% since 1980 (Piketty et al., 2016).

- Similar trends across OECD countries over the past three decades
Digital innovation has also risen

Top 1% income share and PCT patent applications for selected OECD countries, 1987-2009


Note: The statistics are based on a GDP-weighted average for the following 13 OECD countries: Australia, Canada, Denmark, France, Germany, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States. The selection is based on data availability over the 1987-2009 data period. The data annex provides further information.
Digitalisation and Inequalities may be connected

Digital Innovation: “non rivalry”

- Economies of scale & Reputation and network effects
- Creative destruction
- Concentration on winner-take-all markets

Market Structure

- Market rents

Risk

- Risk premium

Distribution of Income & Social Mobility

↑ Return on top executives and key employees

↑ Return to capital but ↓ return to labor

Social mobility
The explanation in short

- The increasing importance of digital innovation magnifies innovation-based market rents

- These rents contribute to increasing the income share of top income groups

This explanation complements others: globalization, the financialisation of the economy, unskilled-labor-displacing technologies, the weakening of trade unions
Winner-take-all markets: Market concentration

- Digital Innovation
  - Economies of scale & Reputation and network effects
  - Concentration on winner-take-all markets
  - Market rents
  - Creative destruction
  - Risk
  - Risk premium

Distribution of Income & Social Mobility

- ↑ Return on top executives and key employees
- ↑ Return to capital but return to labor
- Social mobility
Market concentration and digital innovation

- Digital innovation => New products and processes based on software code and data

- Non-rivalry of knowledge makes the market production different from the tangible goods
  ⇒ knowledge production is subject to massive economies of scale: the more products sold, the lower the average cost

  ⇒ “winner-take-all” markets
  (e.g. evidence in Autor et al., 2017)
Characteristics of winner-take-all markets

- Superstar economy akin to top sports stars and entertainers (Rosen, 1981)
  - The winner of the tournament gets most if not all of the market ...
  - but the runner-up gets hardly anything (even if the idea was only marginally better)

- Scale without mass; network effects; reduction in barriers across markets (Internet).

- Dynamics of knowledge magnified by globalisation that allows for global – hence bigger – markets
Market shares of the top global R&D investors

Share of the top 1 and 5 companies in total sales of leading R&D firms in 2015

Source: EU (2016), EU R&D Scoreboard 2016. The shares are computed as the sales share of the top 5 firms within the total number of firms of the 2,500 R&D most intensive firms of the EU R&D Scoreboard. The number of firms included in the total for each sector is included in brackets.
Winner-take-all markets: Creative destruction

- Digital Innovation
  - Economies of scale & Reputation and network effects
  - Concentration on winner-take-all markets
  - Market rents

  Creative destruction
    - Risk
      - Risk premium

  Distribution of Income & Social Mobility
    - ↑ Return on top executives and key employees
    - ↑ Return to capital but return to labor
    - Social mobility
More opportunities for creative destruction

- Entry barriers have been reduced with lower costs of producing, managing and communicating knowledge
  - “scale without mass” / “cloud computing” / platforms

- Radical innovations can challenge incumbents bringing disruptive change => Schumpeter’ creative destruction
Risk in the digital economy

Estimates of selected sectors’ betas relative to the entire financial market for US firms over 2008-12

Source: Based on data by Aswath Damodaran (2015), computed from data from Bloomberg, Morningstar, Capital IQ and Compustat.
Creative destruction and market concentration

- Creative destruction does not necessarily mitigate the impact of market concentration on rents: competition is not about prices but about radical product innovations (competition FOR the market)

- Conditions may have changed for entry compared to opportunities Google and Facebook faced, making the position of incumbents less contestable:
  - Acquisition of start-ups of highest potential
  - Positive feedback loops from exploiting large data
  - Advantages from consumer networks and capital
Impacts on the distribution of income

Digital Innovation

- Economies of scale & Reputation and network effects
- Concentration on winner-take-all markets
- Market rents
- Creative destruction
- Risk
- Risk premium
- Return on top executives and key employees
- Return to capital but return to labor
- Social mobility

Market Structure
Higher returns from digital innovation accrue to residual claimants: investors, managers, top employees

Rents are not necessarily “excessive”: they provide rewards to those taking risks (as betting on the only marginally worse idea is very costly)

Consistent with macro-level evidence on innovation & growth on top 1% (Aghion et al., 2015, Forbes, 2000)
The evolution of profits and the top 1%

Correlation of annual growth rates of profits and the top 1% and middle 40% of the US pre-tax income distribution, 1992-2013: Average

Source: Paunov and Bas (2017) based on data from the Compustat database on profits and Piketty et al. (2016) for pre-tax income of the top 1% and middle 40%.
Rewards for top executives

Managerial decisions in winner-take-all markets have magnified impact on firm’s profit: marginally better or worse decision decide for total success or large losses

Executives in IT-related services:
- had the highest exit rates over 2000-2013 (of 20%)
- are over-represented in top 1% of executives relative to their sectors’ size (24.7% relative to 9.6%)
- had the highest share in compensation relative to net sales (16.4% for the 90th percentile)

=> Similarly for IT- and innovation-related manufacturing as well as finance (=> confirming the role of financialisation)
## Winner-take-all markets and executive pay

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Executive pay</th>
<th>90th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average effects</td>
<td>Volatility of pay</td>
</tr>
<tr>
<td>Herfindahl index $t_{-1}$</td>
<td>0.593***</td>
<td>1.484***</td>
</tr>
<tr>
<td></td>
<td>(0.170)</td>
<td>(0.333)</td>
</tr>
<tr>
<td>Creative destruction $t_{-1}$</td>
<td>0.967*</td>
<td>4.085***</td>
</tr>
<tr>
<td></td>
<td>(0.569)</td>
<td>(1.030)</td>
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<tr>
<td>Herfindahl index $t_{-1}$ * CEO</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Herfindahl index $t_{-1}$ * Other</td>
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<td>Creative destruction $t_{-1}$ * CEO</td>
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<tr>
<td>Observations</td>
<td>55,582</td>
<td>45,555</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.20</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Note: All regressions include executive-firm fixed effects, year fixed effects, industry, executive and firm controls.

Source: Paunov and Bas (2017), Winner-take-all markets and executive pay.
Labour compensation

- Micro evidence on workers sharing rents in winning firms
  - Dispersion in earnings inequality across firms, within industries and US states points to rent sharing possibilities (Song et al., 2015), also other evidence (e.g. Card et al., 2013)
  - Wage differentials of high-skilled relative to other workers increase with firm size: points to rent sharing for some, not all (Mueller et al., 2015)

+ International trade & investment; skills-biased technical change; and weakening of trade unions.
### Opportunities for investors and workers

Note: All regressions include executive-firm fixed effects, year fixed effects, industry, executive and firm controls.

<table>
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<tr>
<th>Dependent variables:</th>
<th>Profits</th>
<th>Wages</th>
<th>Profit to wage ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herfindahl index ( t_{-1} )</td>
<td>( 0.333^{***} )</td>
<td>(-0.026)</td>
<td>(0.477^{**})</td>
</tr>
<tr>
<td>Creative destruction ( t_{-1} )</td>
<td>0.345</td>
<td>0.453</td>
<td>0.152</td>
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<tr>
<td>Observations</td>
<td>11,962</td>
<td>3,993</td>
<td>3,049</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.72</td>
<td>0.45</td>
<td>0.31</td>
</tr>
<tr>
<td>Number of firms</td>
<td>1,404</td>
<td>435</td>
<td>381</td>
</tr>
</tbody>
</table>

Source: Paunov and Bas (2017), Winner-take-all markets and executive pay.
The decreasing labor share

Labor share of industry value added in the United States by sectoral R&D intensity in percentages, 1971-2011

Source: OECD STAN Database.
Declining labour share

- Corollary of higher return to capital is decreasing labour share (Karabarbounis and Neiman, 2014)
- Econometric evidence on industry data for 1995-2011 across 27 OECD countries points to the role of innovation as captured in patent data (Table 1, p. 19)
- “Winner-take-all” market dynamics (Autor et al., 2017) ... rents and efficiency as explanations => profit share increases (Barkai, 2017)
Policy implications

• **Two core principles:**

1. Rents are needed for innovation and innovation is necessary to growth, innovation-based rents should not be pushed down, but “excess” rents only

2. Many policies are designed for economy in which tangible activities were dominant & innovation-based rents lower => reassessment is needed!
Policy implications

- **Fiscal policy is needed but has its limits**
  - In many countries taxes are not very redistributive
  - Intangibles can relocate across borders
  - Taxation of innovation-based rents may deter investment

- **Innovation and framework policies**
  IPR, standards, competition policies as well as education and skills policies
Policy implications

- IPR & data
  - Scope & duration of patents
  - Data ownership
  - Data markets

- Competition policies
  
  Data-based competition is different, competition policy must evolve.
THANK YOU

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