DEVELOPMENT OF R&D INTENSITY IN GERMANY – A SUCCESS STORY?

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R&D INTENSITY, GERMANY 1991-2017

- New Target by 2025: 3.5%
- Increase by 0.63 PP or 26.2%

Absolute real RD expenditures increases between 1991-2017 by 81%, between 2008-2017 by 30%
OFTEN OVERLOOKED IN POLITICAL DISCUSSIONS BUT SOME WELL-KNOWN STYLIZED FACTS...
Large dispersion in R&D intensity among firms (even within R&D performers)

Highly right-skewed distribution
... NOT ONLY ACROSS INDUSTRIES BUT EVEN WITHIN NARROWLY DEFINED INDUSTRIES

Source: ZEW- Mannheim Innovation Panel
... NOT ONLY ACROSS FIRM SIZE BUT ALSO WITHIN SIZE CLASSES

Average R&D intensity among
• All firms: 2.0%
• R&D performers: 7.4%

Average R&D intensity among
• All firms: 1.6%
• R&D performers: 3.1%

Source: ZEW- Mannheim Innovation Panel
BIG QUESTION:
DO WE OBSERVE ANY CHANGES IN THESE PATTERNS OVER TIME?

SOME RECENT DEVELOPMENTS...
DEVELOPMENT OF R&D EXPENDITURE BY SIZE CLASS
GERMANY, 2006-2017

Source: ZEW- Mannheim Innovation Panel
SHARE OF R&D PERFORMERS AND INNOVATION ACTIVE FIRMS
GERMANY, 1996-2017

- Innovation activities without internal R&D
- Occasional R&D
- Continuous R&D

Share of innovative active firms overall is falling, particularly share of (occasional) R&D performers.
Share of R&D performers is falling across all size classes, except for very large firms (1000+).

Source: ZEW- Mannheim Innovation Panel
INCREASING DISPERSION OF R&D INTENSITY
GERMAN MANUFACTURING, 1992-2017

Coefficient of variation

CV-all  CV-R&D  Linear (CV-all)  Linear (CV-R&D)

Source: ZEW- Mannheim Innovation Panel
DECLINING KURTOSIS OF R&D INTENSITY (HEAVY TAILS WHICH BECOME THINNER)
GERMAN MANUFACTURING, 1992-2017

Source: ZEW- Mannheim Innovation Panel
Investment expenditure (R&D expenditure plus investment in machinery, external knowledge, product development and testing, training, market launch for innovation) is increasingly concentrated among fewer firms.

Inequality in innovation expenditure is rising.

SHOULD WE CARE?
Declining share of innovative firms among all size classes, in particular among small firms

Observed for both product and process innovation, though somewhat stronger for product innovation
SOME POSSIBLE EXPLANATIONS

- Firms compare long-run benefits and innovation costs when determining about whether to invest in R&D and on the amount of R&D expenditure

- Lower long-run returns to R&D due to exhausting tech opportunities?
  - Techno pessimists (e.g. Gordon 2012, Bloom et al 2017) vs tech optimists (Brynjolfsson and McAfee 201)
  - Argument: exhausting technological opportunities
    - First more obvious and easier ideas arise and are further developed into new technologies, products, processes or business models (*low-hanging fruits*)
    - With technology progress moving forward, less and less low-hanging fruits are available and it becomes much harder to get new ideas and translate them into inventions, new products, processes or business models.
    - Innovating becomes more and more costly
  - Literature review do not suggest a (dramatic) decline in the returns to R&D (Peters, Mohnen et al. 2018)
SOME POSSIBLE EXPLANATIONS

- Increasing entry barriers to innovation due to incumbents?
- Stronger competition due to globalization?
- More winner-takes-it-all competition?
- Stronger financial constraints?
- ...

...
OUTLOOK: EFFECT OF INCREASING TRADE BARRIERS ON R&D ENGAGEMENT

Export tariff 10%
- Chemical
- Machinery
- Electronics
- Instruments
- Vehicles

Export and Import tariffs 10%
- Chemical
- Machinery
- Electronics
- Instruments
- Vehicles

Source: Peters, Roberts & Vuong (2018)