

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

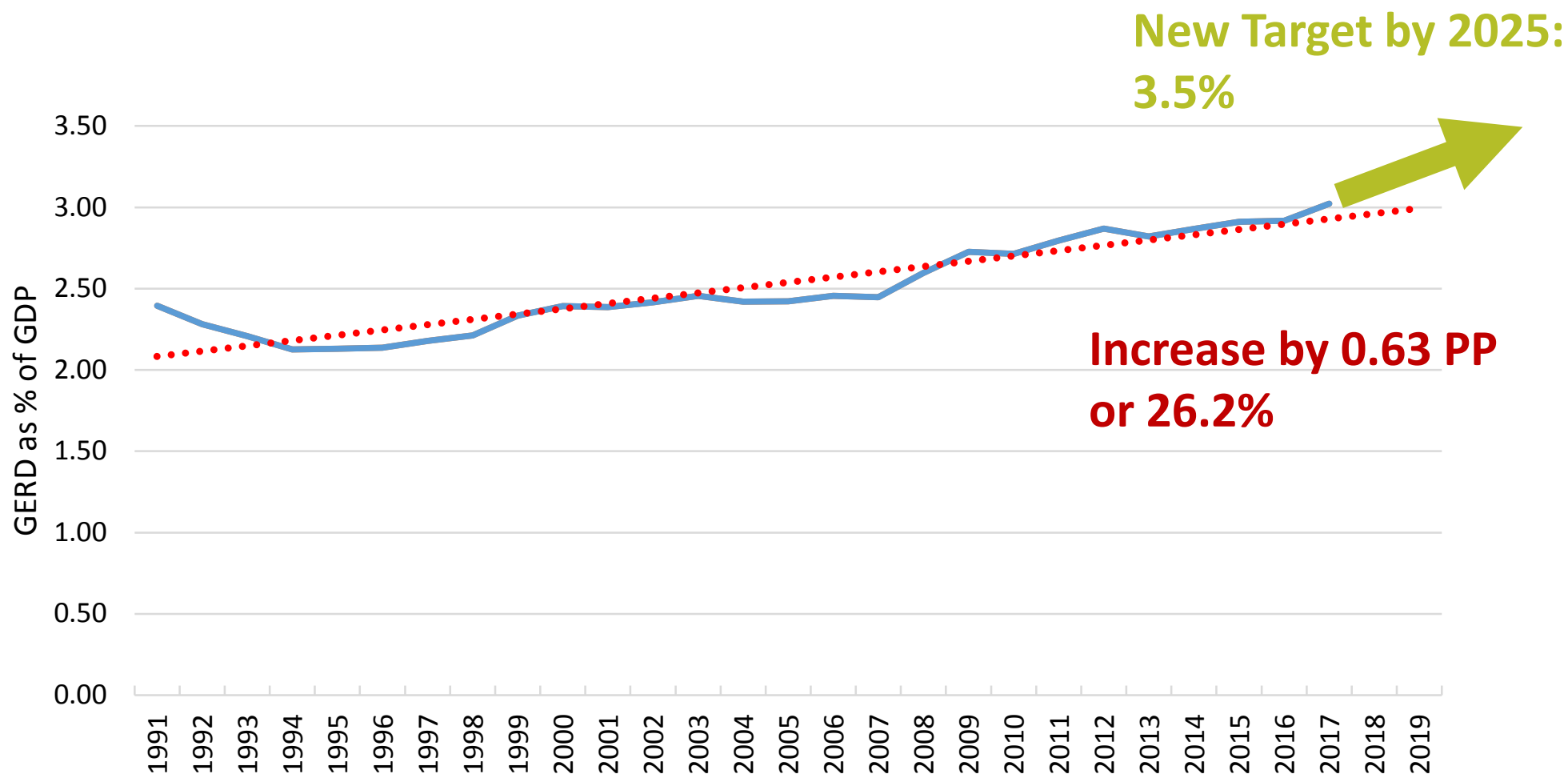
Bettina Peters

(ZEW Mannheim, MaCCI, University of Luxembourg)

OECD Workshop “R&D Intensity”
London, April 11, 2019



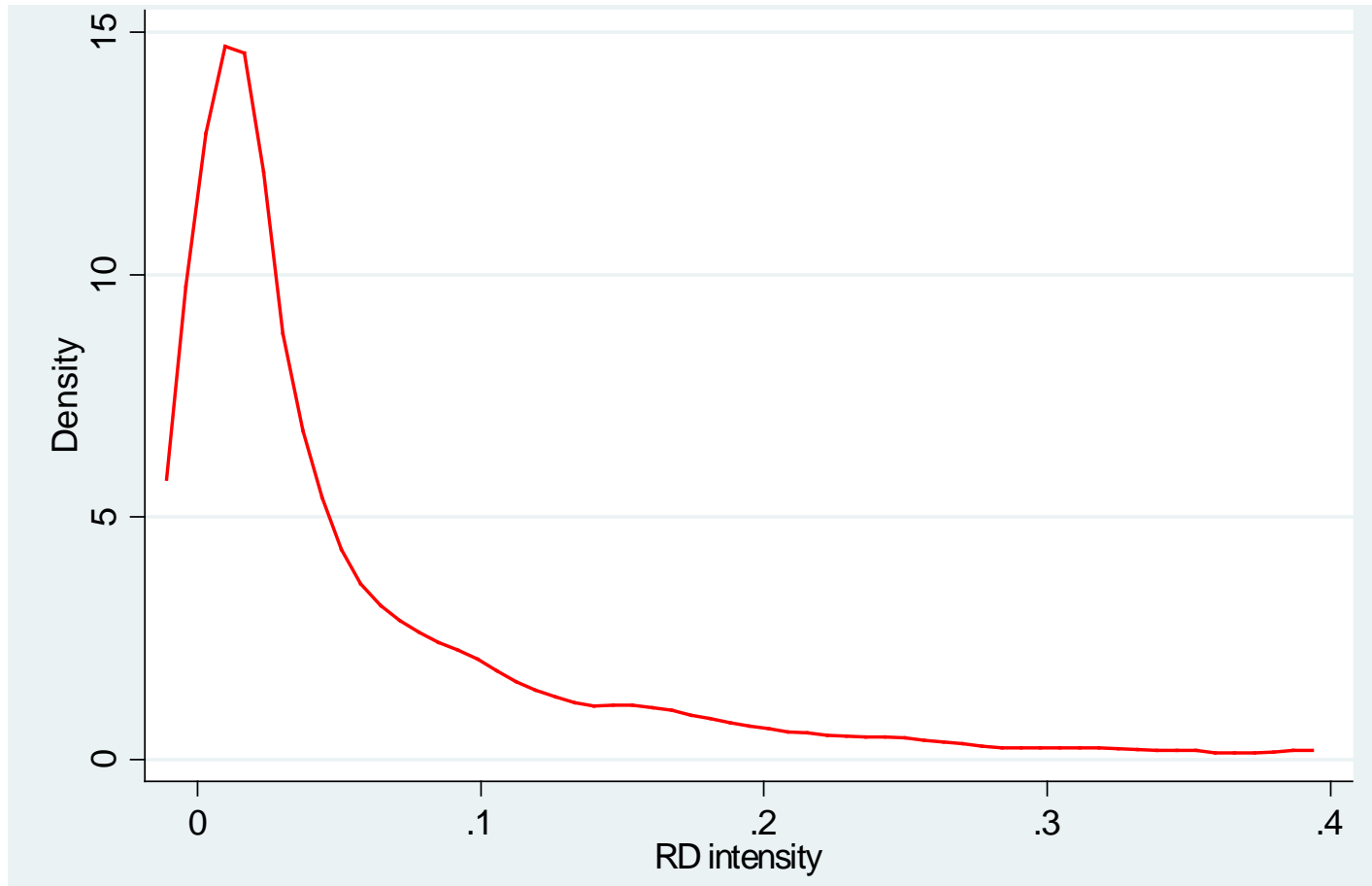
R&D INTENSITY, GERMANY 1991-2017



❖ **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...**

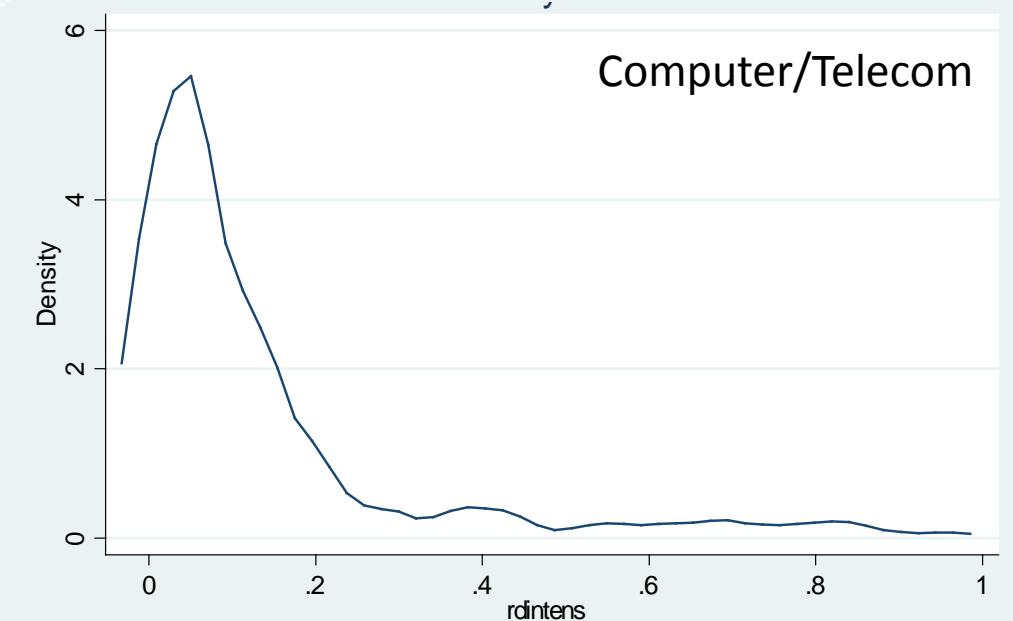
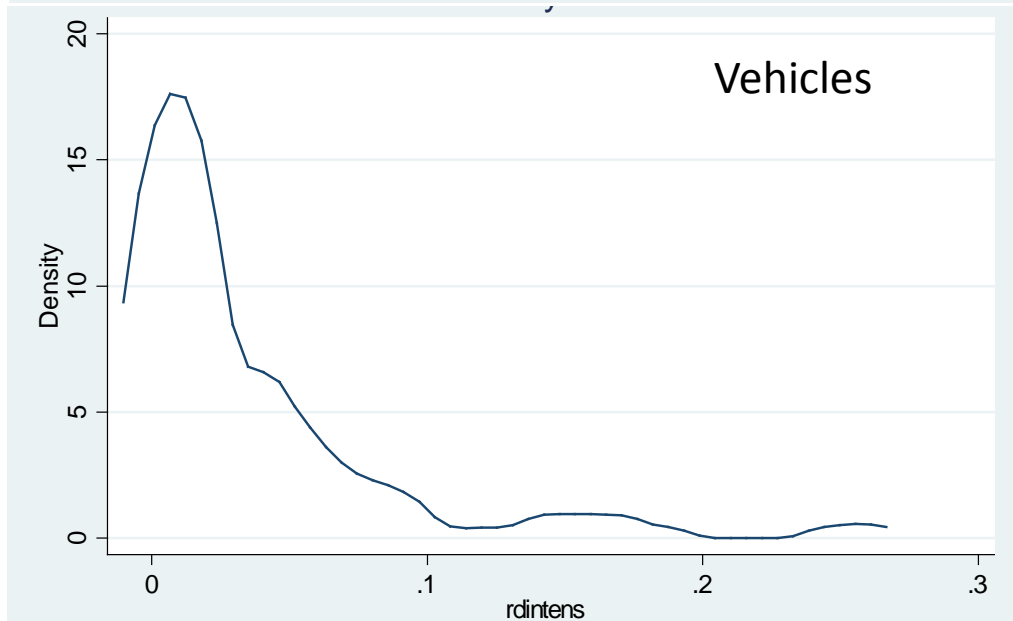
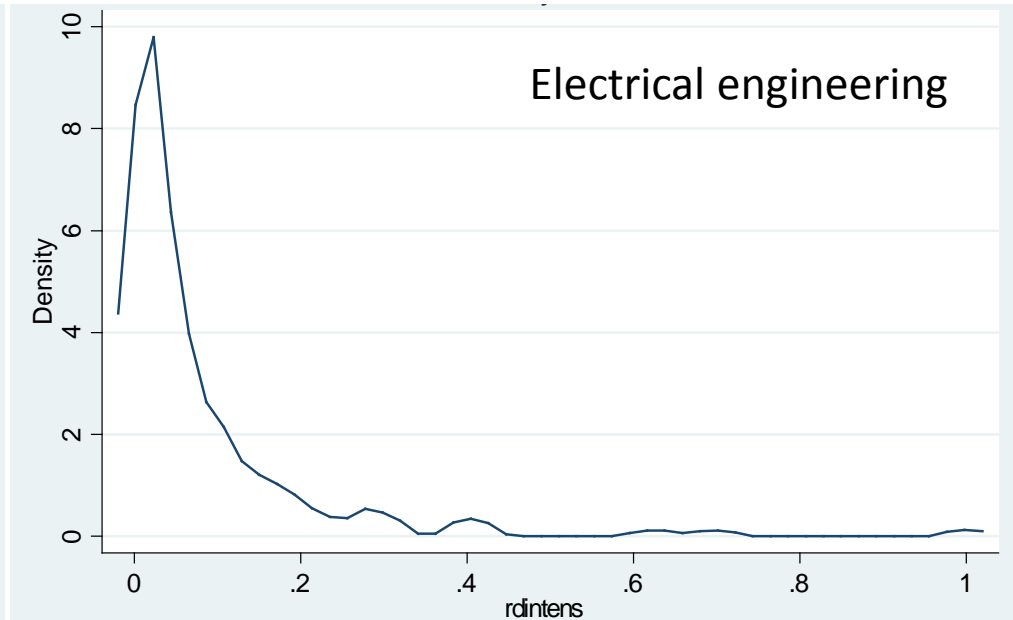
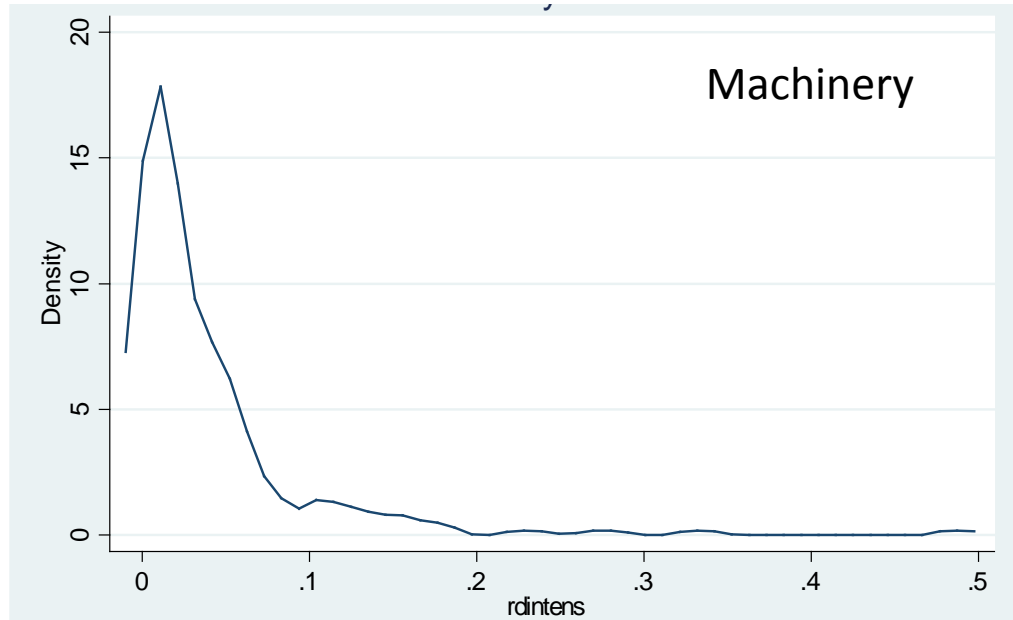
DISTRIBUTION OF R&D INTENSITY, GERMANY 2017



Note: R&D intensities larger
0.4 not shown
Source: ZEW- Mannheim
Innovation Panel

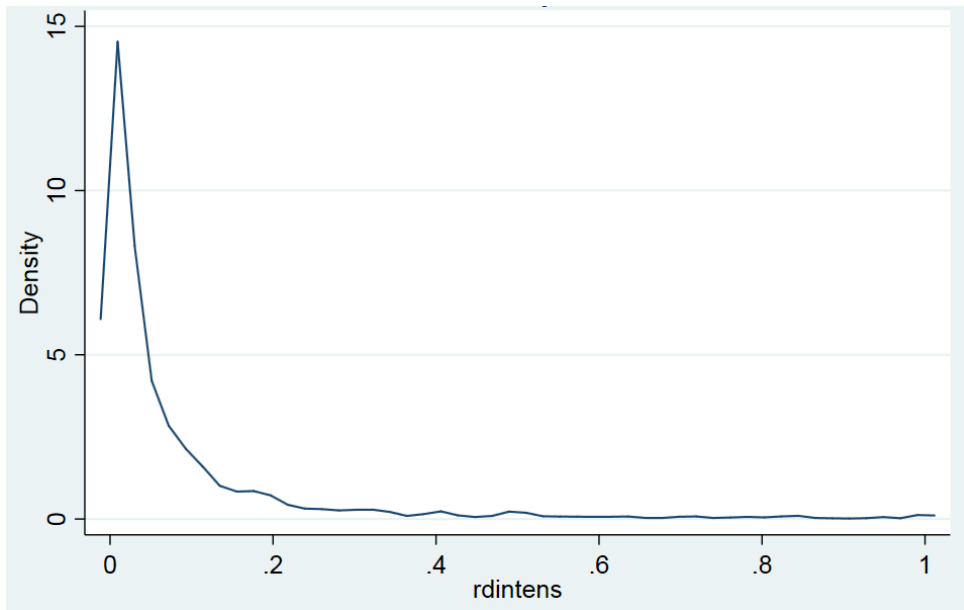
- ❖ Large dispersion in R&D intensity among firms (even within R&D performers)
- ❖ Highly right-skewed distribution

ZEW ... NOT ONLY ACROSS INDUSTRIES BUT EVEN WITHIN NARROWLY DEFINED INDUSTRIES



... NOT ONLY ACROSS FIRM SIZE BUT ALSO WITHIN SIZE CLASSES

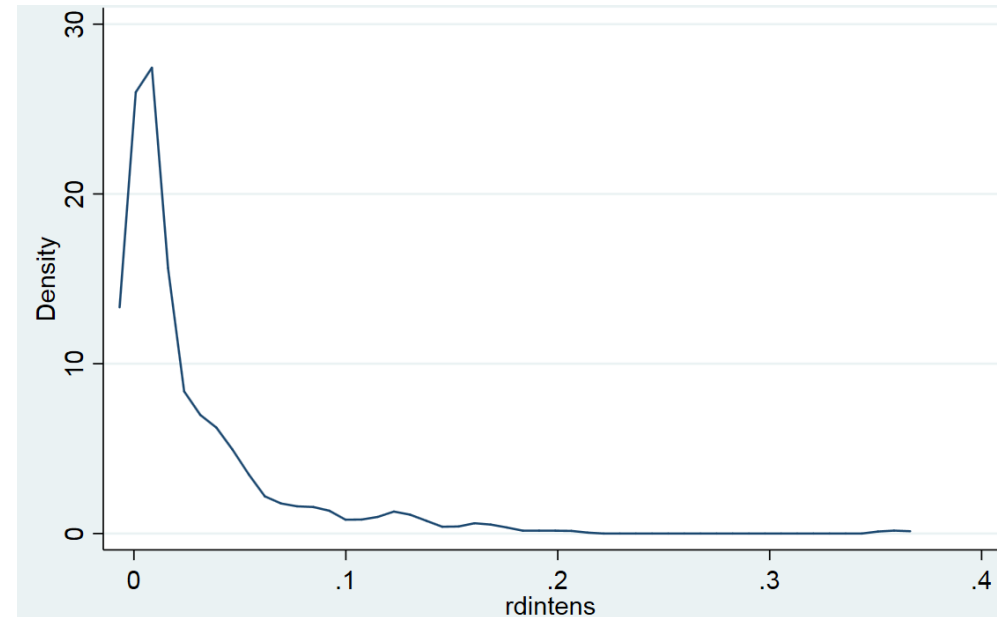
SME (<250)



Average R&D intensity among

- All firms: 2.0%
- R&D performers: 7.4%

Large firms (>250)



Average R&D intensity among

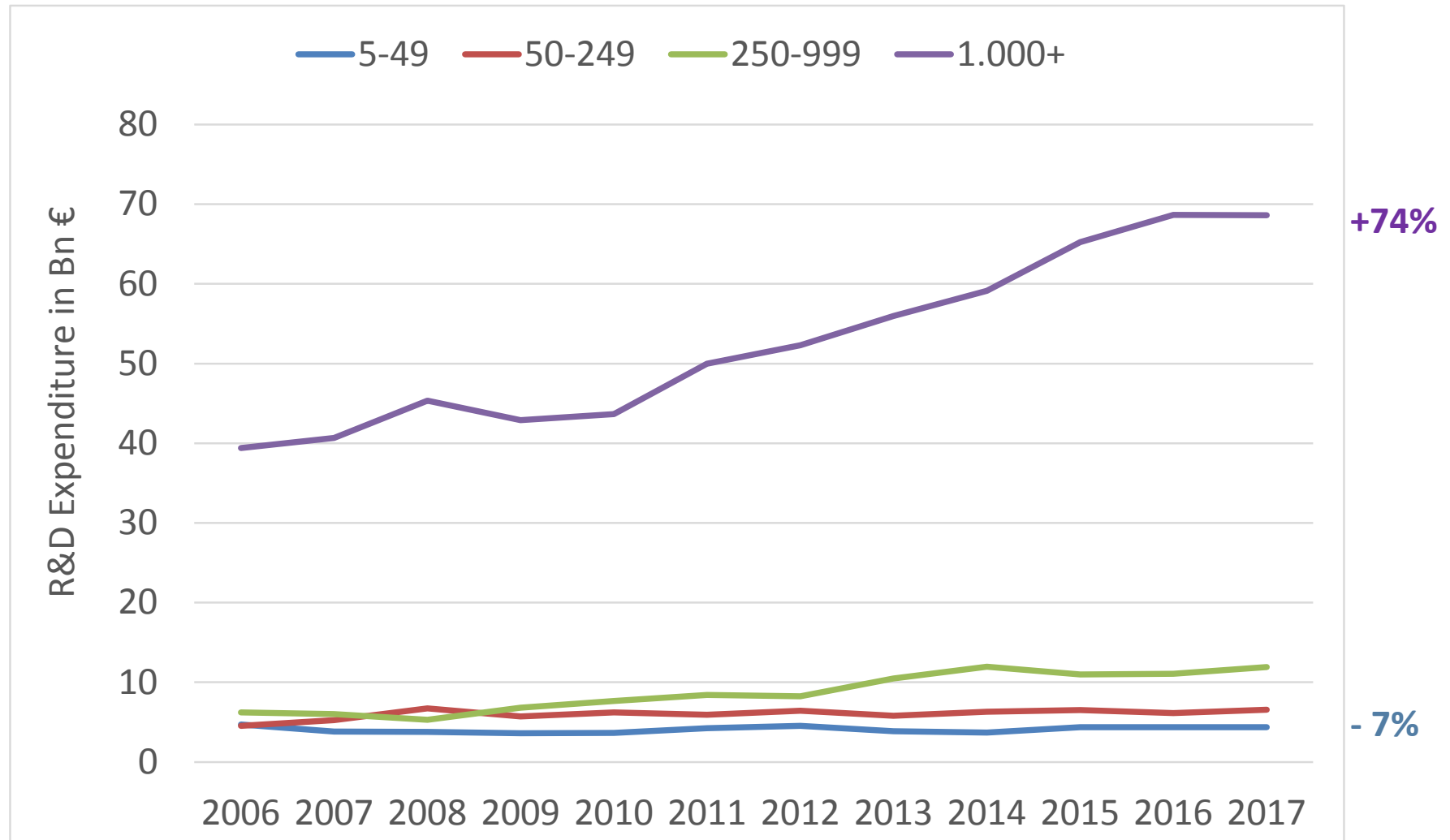
- All firms: 1.6%
- R&D performers: 3.1%

**BIG QUESTION:
DO WE OBSERVE ANY CHANGES IN THESE
PATTERNS OVER TIME?**

SOME RECENT DEVELOPMENTS...

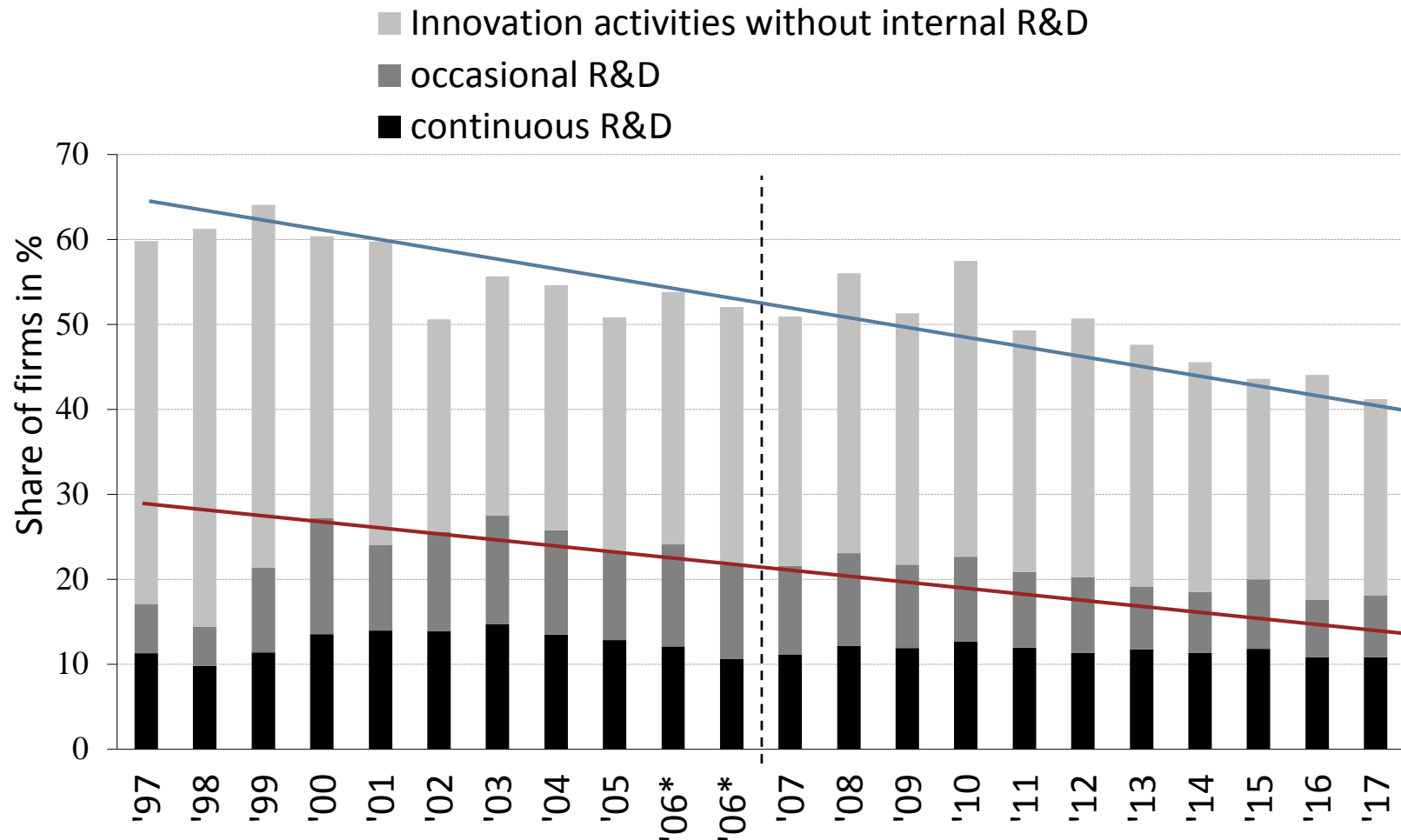
DEVELOPMENT OF R&D EXPENDITURE BY SIZE CLASS

GERMANY, 2006-2017



SHARE OF R&D PERFORMERS AND INNOVATION ACTIVE FIRMS

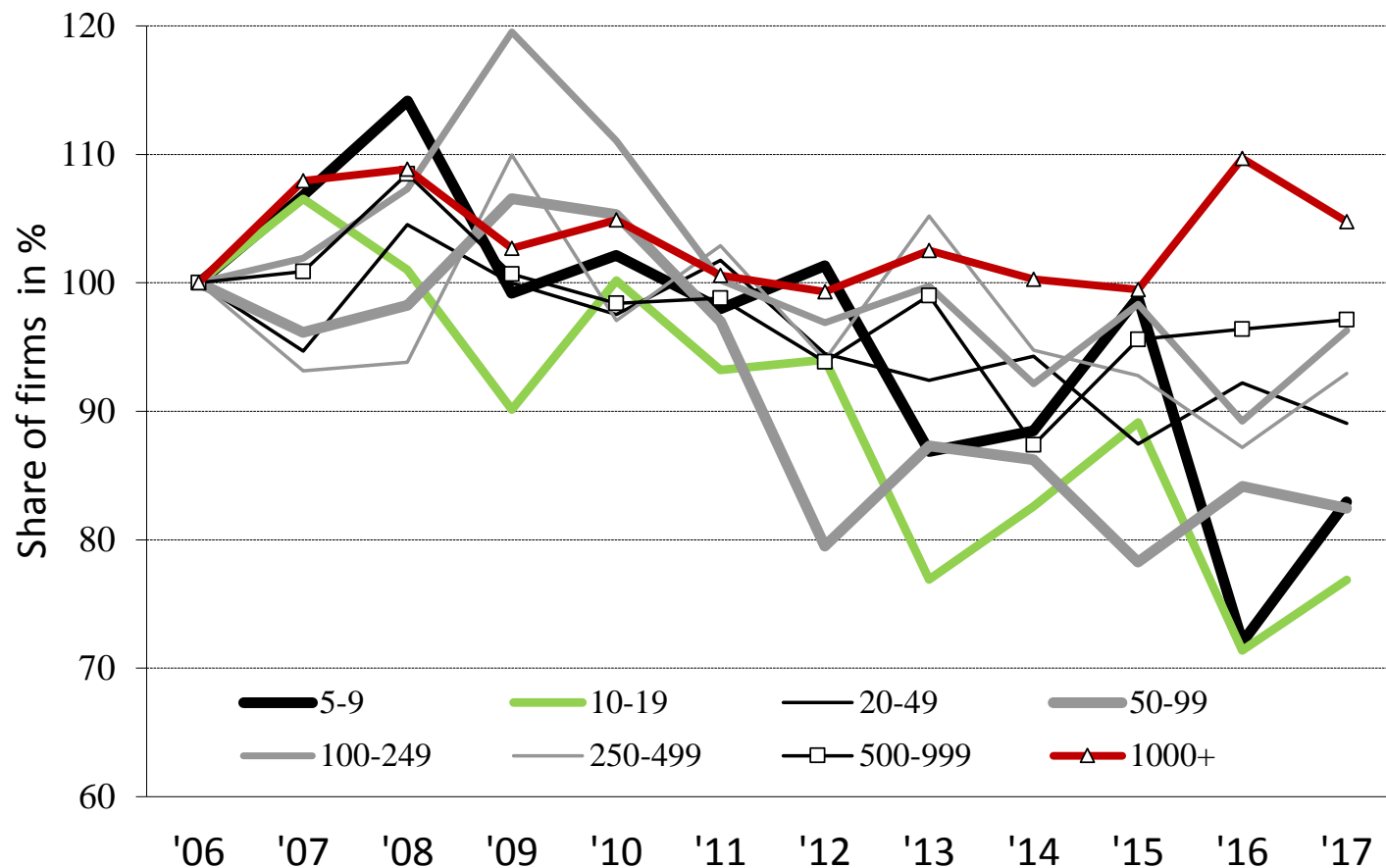
GERMANY, 1996-2017



❖ Share of innovative active firms overall is falling, particularly share of (occasional) R&D performers

SHARE OF R&D PERFORMERS BY SIZE CLASS

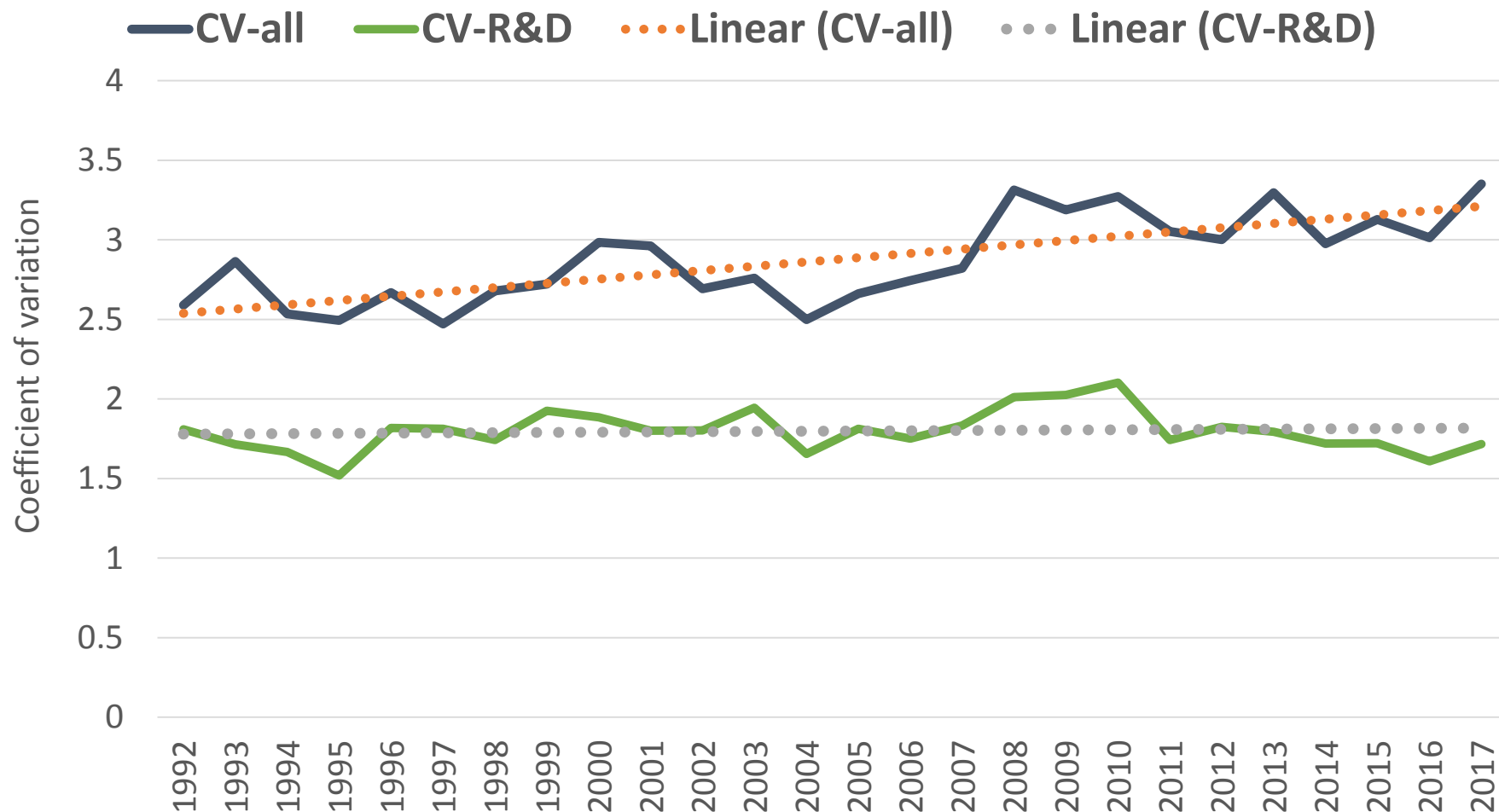
GERMANY, 1996-2017



❖ **Share of R&D performers is falling across all size classes, except for very large firms (1000+)**

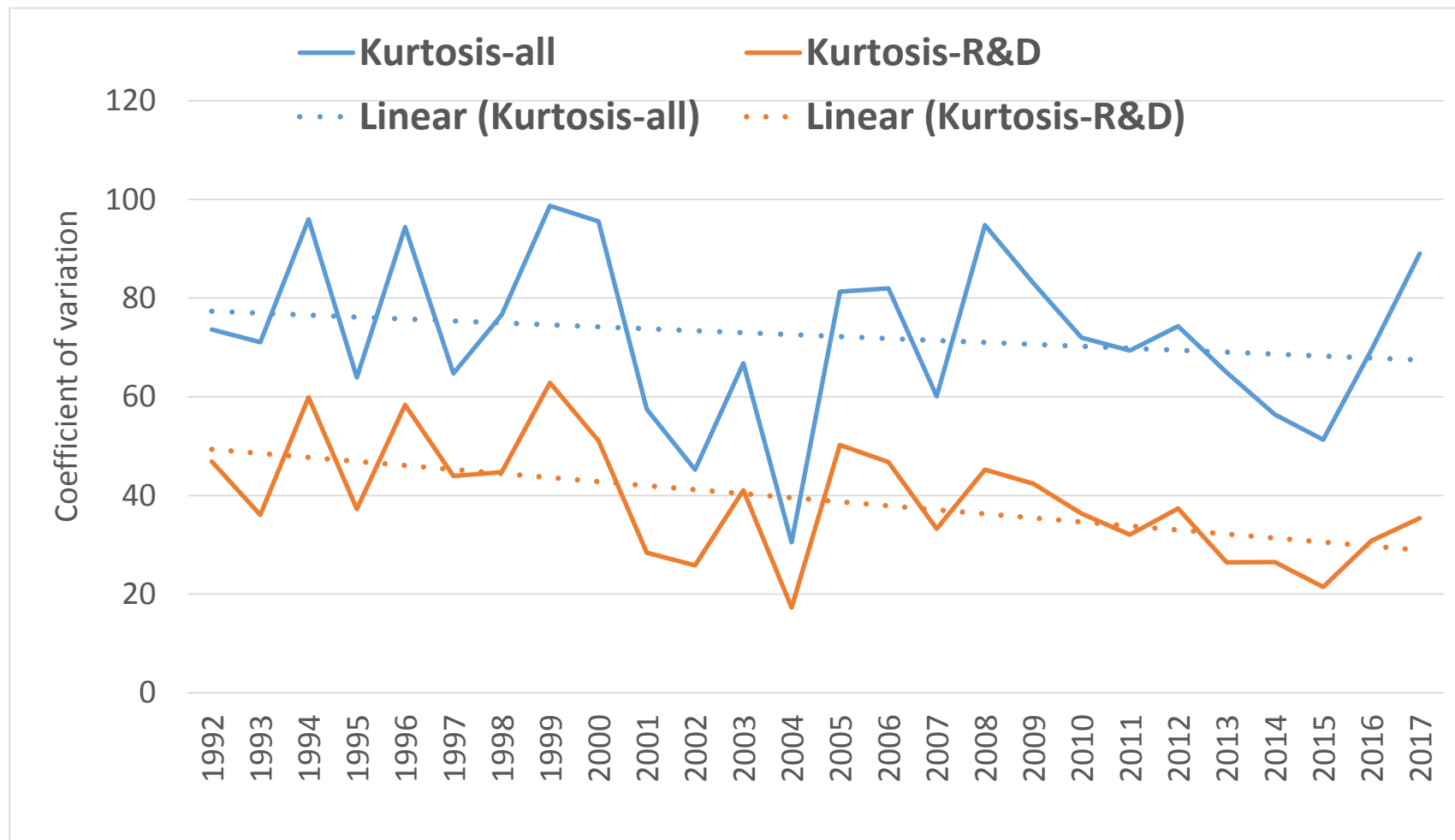
INCREASING DISPERSION OF R&D INTENSITY

GERMAN MANUFACTURING, 1992-2017



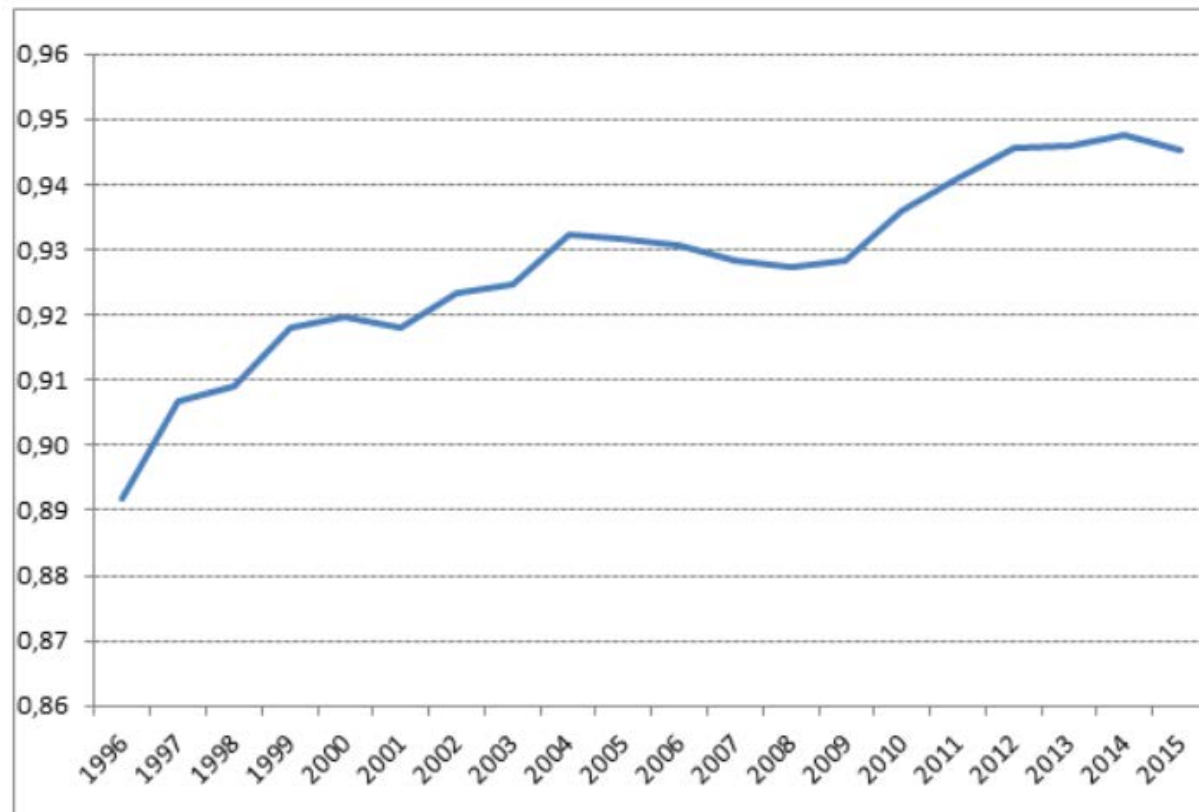
DECLINING KURTOSIS OF R&D INTENSITY (HEAVY TAILS WHICH BECOME THINNER)

GERMAN MANUFACTURING, 1992-2017



INCREASING CONCENTRATION OF INNOVATION INTENSITY

GINI COEFFICIENT OF INNOVATION EXPENDITURE, 1996-2015



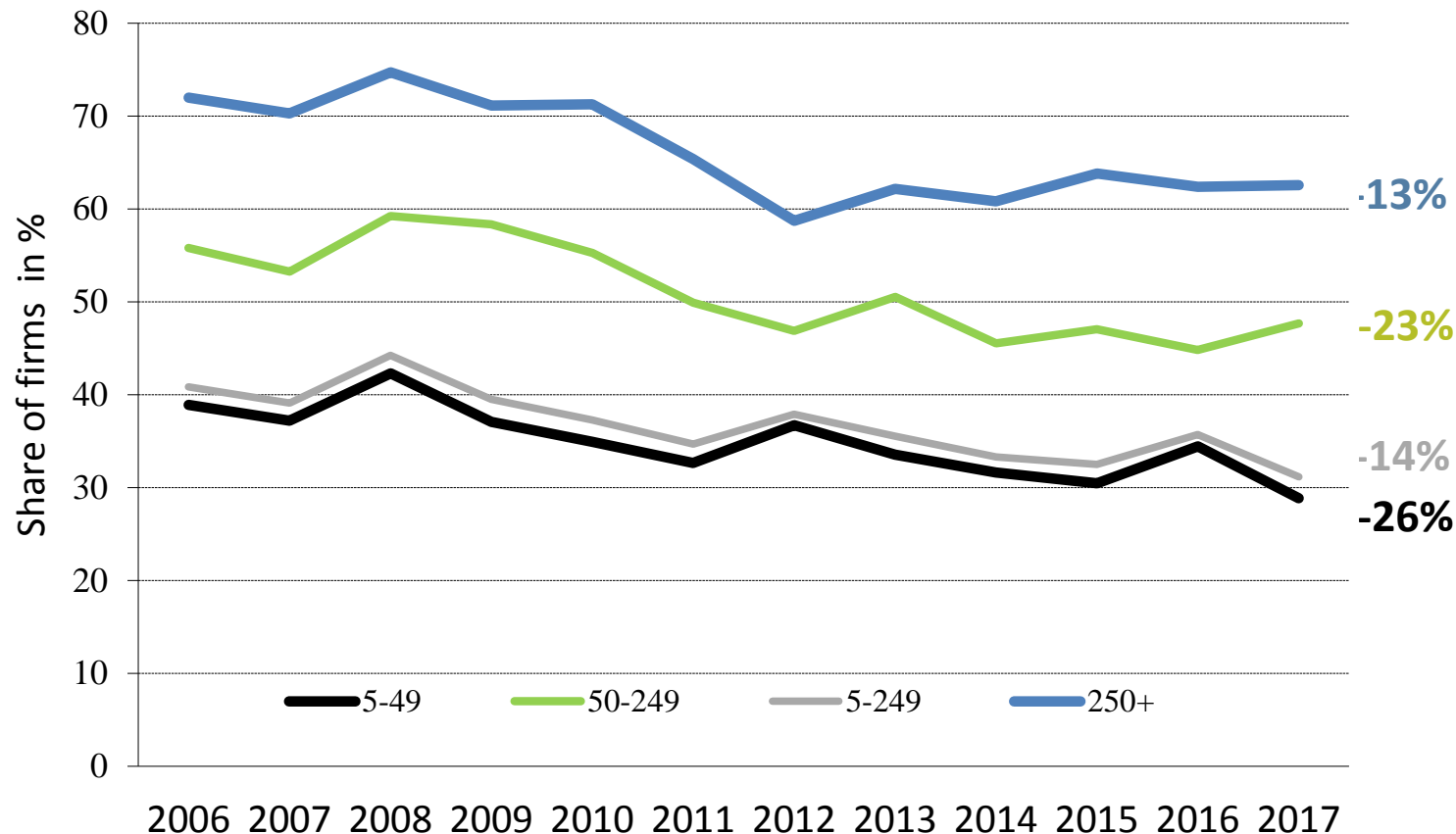
Source: Hünermund and Rammer (2018), ZEW-Mannheim Innovation Panel

- ❖ Innovation 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?

SHARE OF INNOVATORS

GERMANY 1997-2015



- ❖ 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

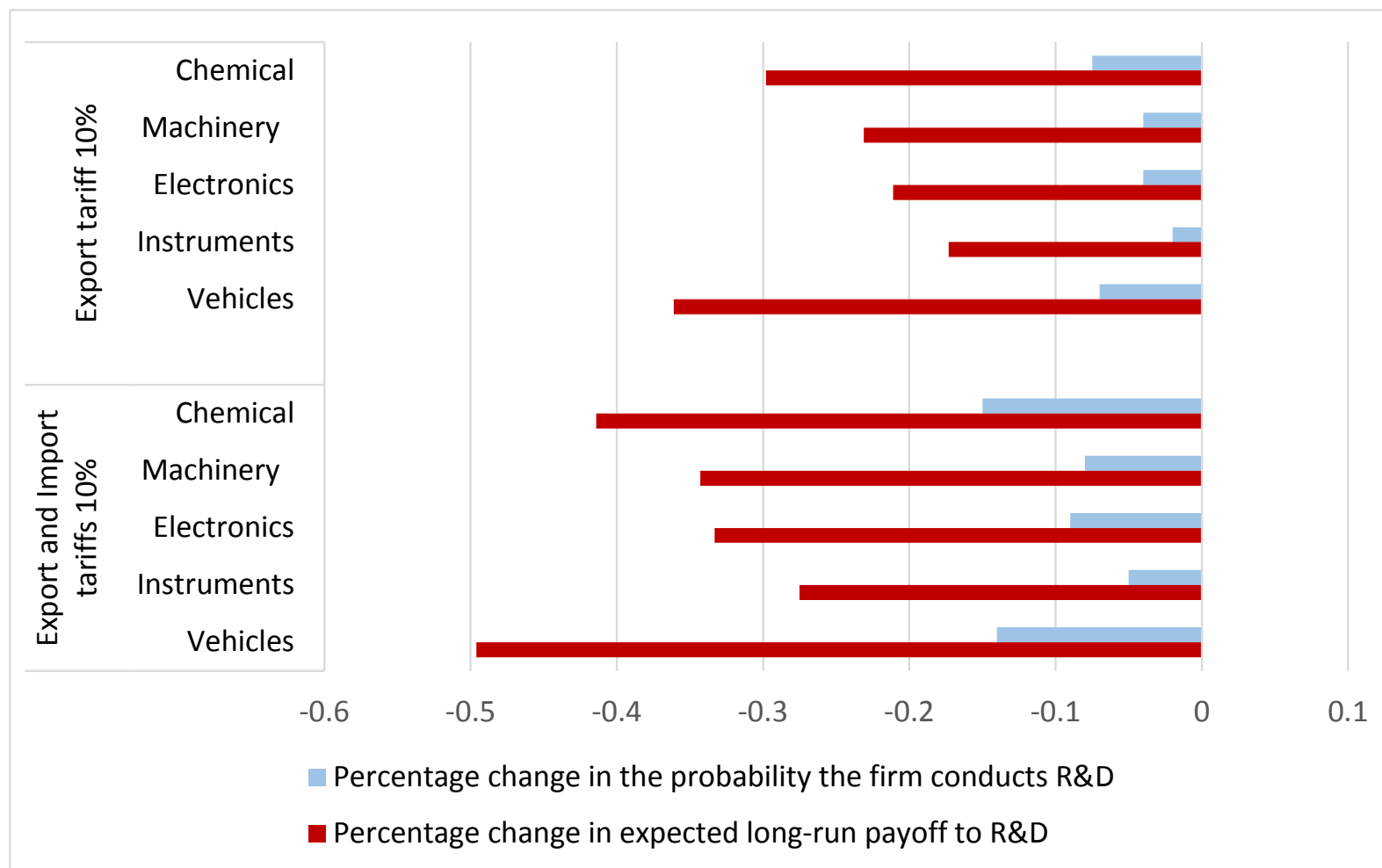
SOME POSSIBLE EXPLANATIONS

- ❖ **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 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



Source: Peters, Roberts & Vuong (2018)