

## Innovation activity in Germany is becoming more concentrated

Paul Hünermund and Christian Rammer, 5 March 2017

*For years investments in research and development (R&D) have shown a rising trend in Germany. In 2015 they have reached a record high of 157.4 billion euro. At the same time, however, R&D expenditures are becoming concentrated within a smaller number of actors. The share of companies that invest in innovation falls steadily. As a result, innovation activities in the economy are more unevenly distributed. This column discusses possible causes for this development.*

Globally investments in the development and commercialization of innovative products, services, and processes are growing. According to the *EU Industrial R&D Scoreboard*, the one hundred companies with the largest R&D budgets worldwide increased their R&D expenditures from 198.4 billion euro in 2003 to 269.4 billion euro in 2015 (+36 percent). In the same period, innovation expenditures in the German economy increased by 59 percent. About a third of all companies in Germany attribute a high importance to the introduction of new or improved products and services for achieving their business goals. At the same time, however, a rising number of firms seem to fall behind this development. In 2003, the innovator rate—i.e. the share of companies that have introduced innovations in their business practices—was 47 percent. By 2015, this number had dropped to 35 percent. Particularly, many small and medium-sized firms have discontinued their investments in innovation. For this reason the inequality of innovation activities has become larger. Since the mid-1990s, the Gini coefficient<sup>1</sup> for the distribution of business sector innovation expenditures has been exhibiting an increasing trend (see Figure 1).

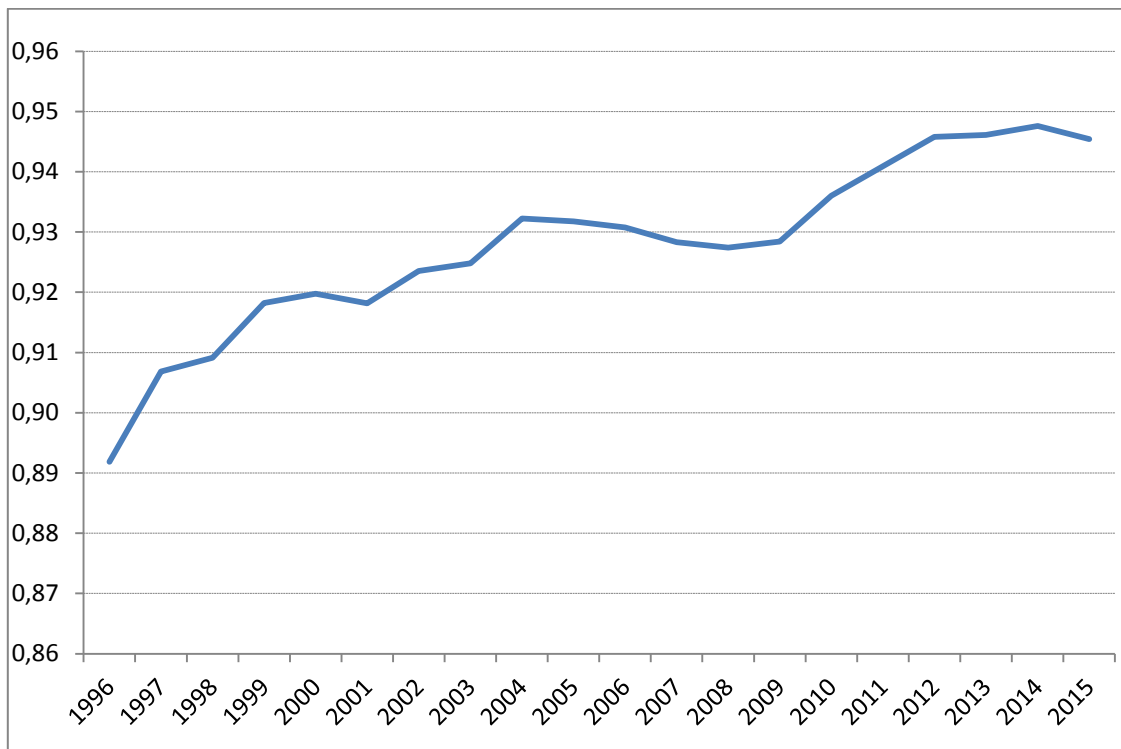
### Possible Explanations

According to Schumpeter (1942), a concentration of innovation expenditures can occur, if markets are characterized by oligopolistic competition. A small number of incumbents use increasing investments in innovation as entry barriers. Their constant, yet mostly incremental, innovation activities significantly raise the costs of rival entrants and thereby secure incumbents' market shares. New entrants would have to match incumbents in terms of their level of investments or even—because of reputation disadvantages—outperform them. This so-called “Schumpeter II” hypothesis stands in contrast to Schumpeter's (1912) original argument, which emphasizes the role of new entrants and creative destruction as the driving force for economic growth.

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<sup>1</sup> The Gini coefficient is a measure for the inequality among values in a frequency distribution. It is normalized to assume values between zero and one. A Gini coefficient of zero would refer to a situation where all firms have the same level of innovation expenditures; a coefficient of one would mean that the total of innovation expenditures in Germany would be incurred by a single entity.

**Figure 1:** Gini coefficient of innovation expenditures in Germany (3-year moving average)



Source: ZEW, Mannheim Innovation Panel. Based on own calculations.

The Gini coefficient was calculated on the basis of data stemming from the German contribution to the Community Innovation Survey, for companies with more than 5 employees that were part of the randomized sample at the time. This results in breaks in the time series in 1998, 2000, 2002, and 2006. Sample values were extrapolated to the population.

The “Schumpeter II” hypothesis is supported by the high stability within the group of firms with the largest R&D budgets in Germany. In the 12 years between 2003 and 2015, nine out of ten companies remained in the top 10 of the largest R&D spenders. Even changes in ranks were only marginal within the top 10 group (see Table 1). Somewhat increased dynamics can be observed for positions 11 to 20. Nevertheless, also newcomers to this cohort were already established companies that came from ranking positions 21 to 36 in 2003. The highest-ranked new entrant in 2015 was ADVA, which was founded in 1994 and was able to secure rank 72. This situation is entirely different in the United States. In 2015, the U.S. top 20 contained three companies that were outside of the top 50 in 2003 (Google, Apple, Celgene), and one company which was founded after 2003 (Facebook).

Increasing competitive pressure from globalization could be another explanation. A study on U.S. manufacturing firms by David Autor and coauthors (2016) finds that Chinese import competition exerts a negative effect on the innovation activities—measured by patent applications—of domestic companies. Comparable studies for Europe show a similar, though more nuanced, picture. Bloom, Draca and Van Reenen (2015) conclude that import pressure from China is indeed able to stimulate the innovation activity of companies if they see a means to preserve their competitiveness in innovation. Simultaneously, however, the paper documents an increased exit probability for domestic firms exposed to Chinese competition, which leads to a concentration of innovation expenditures in the surviving firms.

**Table 1:** Ranking of the 20 German companies with the highest R&D expenditures in 2015 (and 2003).

Company	Ranking 2015	Ranking 2003	Comment
Volkswagen	1	3	Took over MAN, Porsche, and Scania
Daimler	2	1	Included Chrysler in 2003
Bosch	3	4	
BMW	4	5	
Siemens	5	2	
Bayer	6	6	
Boehringer	7	7	
SAP	8	10	
Continental	9	14	
BASF	10	9	
Merck	11	13	
ZF	12	15	
Deutsche Bank	13	19	
Infineon	14	8	
Hella	15	30	
Mahle	16	26	
Schäffler	17	22	
Henkel	18	21	
Zeiss	19	24	
Fresenius	20	36	

**Firms in top 20 in 2003, that dropped out of top 20 in 2015:**

Schering	-	11	Taken over by Bayer
Deutsche Telekom	34	12	
Altana	51	16	Sold pharmaceuticals to Takeda
MAN	-	17	Taken over by Volkswagen
Evonik	21	18	2003: Degussa
Porsche	-	20	Taken over by Volkswagen

Source: European Commission: Industrial R&D Scoreboard. Based on own calculations.

Eventually, the growing inequality in terms of innovative capacity could ultimately be due to changes in the process of doing R&D itself. In a recent discussion paper, Bloom et al. (2017), ask the question whether productivity gains through R&D are today harder to achieve than they were in the past. Although the authors observe rising innovation expenditures across different industries and technology categories, economic growth is stagnating or even slowing down. This trend is visible both at the aggregate, as well as the sectoral level, and for even finer grades of aggregation. It is thus possible that the path-breaking ideas which spur economic growth are harder to find nowadays than it used to be the case several decades ago. If the productivity of R&D decreases though, investments in innovation may no longer be profitable for a large group of firms, especially for small and medium-sized firms. Only a small number of winners will then be able to realize the huge economic potential of innovative products and services offered on globalized markets.

## Literature

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