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Explaining Germany's Exceptional Recovery

Edited by Dalia Marin

A VoxEU.org Book

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Centre for Economic Policy Research
33 Great Sutton Street
London, EC1V 0DX
UK

Tel: +44 (0)20 7183 8801
Email: cepr@cepr.org
Web: www.cepr.org

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Foreword

Germany's transformation from the 'sick man of Europe' in the 1990s to its world leadership of global exports today is an astounding phenomenon. Intrinsically linked to the trade liberalisation of Eastern Europe after the fall of communism, Germany's newly decentralised firm structures and labour markets flourished in building production networks that have proven remarkably resilient to international competition.

This eBook explains Germany's extraordinary recovery. The authors' central focus is the transformation of the country's industrial relations, which decentralised wage bargaining and in turn decreased labour costs while increasing competitiveness. Decentralised firm hierarchies improved product quality, which is why wage moderation alone is not a good explanation for Germany's quickly rebounding exports after the Global Crisis.

The eBook also looks at the roles of international production networks (via Eastern Europe's trade liberalisation), the current account surplus, and technology – all of which affected firms' access to and demand for labour. In turn, this has had a lasting effect on Germany's ability to withstand the China shock far better than some other Western economies. Meanwhile, voting patterns and the country's international relations remain affected by the country's historical politics. Finally, the authors draw some policy lessons for economies in which institutions prevent or restrict the decentralisation of wage bargaining, and discuss how the evolution of firm management styles in Germany may not be easily replicable elsewhere.

CEPR is grateful to Dalia Marin for her excellent editorship of this eBook, and to Anil Shamdasani and Sophie Roughton for its production. CEPR, which takes no institutional positions on economic policy matters, is delighted to provide a platform for an exchange of views on this topic.

Tessa Ogden
Chief Executive Officer, CEPR
April 2018

5 Science, research, and innovation in Germany: 2000 to 2017

Dietmar Harhoff and **Monika Schnitzer**
Max Planck Institute for Innovation and Competition and CEPR; Ludwig-Maximilians-Universität München and CEPR

Germany was portrayed in the 3 July 1999 edition of *The Economist* as "the sick man of the Euro" – a country with low GDP growth rates, high unemployment, and stagnant export activity. The 2017 version of Germany leads European countries in GDP growth and displays persistently low unemployment rates, especially for individuals entering the labour market. The outstanding export performance and high trade surplus have by now led to heated discussions about imbalances in international trade. The prognosis for 2018 indicates a continuation of these trends. German exports are driven by strong demand – mostly in the BRIC countries and helped by favourable exchange rates – for technologically advanced German investment and consumer goods, allowing the country to maintain a high share of output in manufacturing, by now with strong service components.[1]

What contributions did science, research, and innovation (SRI) in Germany make to this amazing turn-around and to the country's new position as an economic leader? Starting around 2005, major SRI reforms took place, and while their full impact will play out only in the long run, they are indicative of a change of priorities in German SRI policy.

Economic models of growth suggest that the production of scientific knowledge (for example, at universities and in public research organisations) and research and development activities in the private and public sectors should be considered major

1 The manufacturing share of total value added is 23%, about twice the share in the US and the UK (see https://data.oecd.org/natincome/value-added-by-activity.htm).

determinants of productivity growth (Romer 1990, Aghion et al. 1998). Moreover, activities by young firms contributing to Schumpeterian 'creative destruction' are deemed important (Schumpeter 1912). To structure the following narrative, we discuss the evolution of German SRI policies and their likely impact by looking at three areas: academic science, innovation in established firms, and entrepreneurial innovation.[2] We conclude with a summary and an outlook.

Academic science in Germany

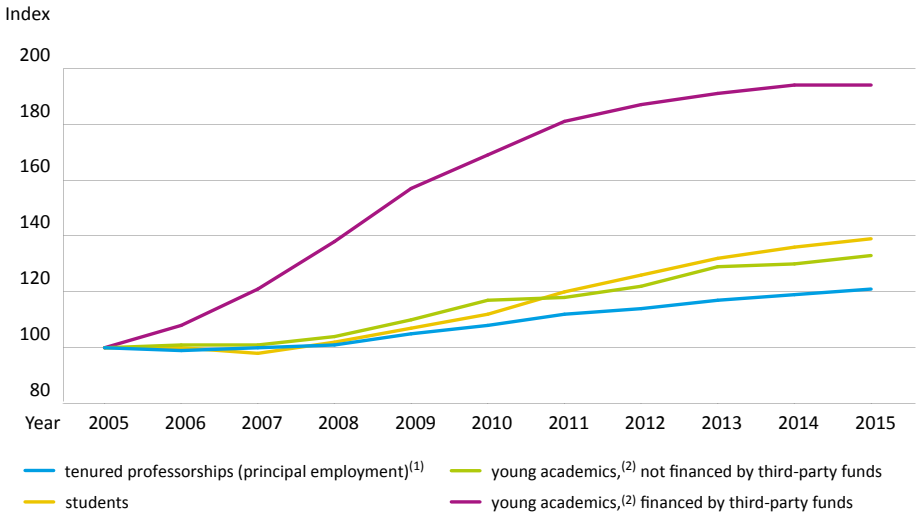
Most of scientific research in Germany is performed in universities and in non-university public research organisations (PROs).[3] While post-WWII recovery in the late 1950s and 1960s brought funding levels for universities and public research organisations close to pre-war levels, Germany had lost the scientific excellence of the pre-WWII years in many, if not most fields (e.g. Waldinger 2010, 2012). Student protests in the late 1960s questioned university traditions and led to a weakening of meritocratic structures and processes. Competition between universities for students and faculty was relatively low, reducing incentives for vertical and horizontal differentiation. Plans for a competitive framework in which leading universities could claim a status of excellence and obtain additional funding were being discussed in the early 2000s, and finally introduced in 2005/06 with the Excellence Initiative. In this framework, universities could compete for funding of doctoral schools, collaborative research centres and supplementary institutional funding. In policy terms, these measures were remarkable as the Federalism Reform of 2006 had transferred all policy and financial authority regarding education, and in particular universities, to the Laender.

2 A more detailed look at the evolution of German SRI policies for the time period 2005-2017 is provided in the 2017 report published by the Commission of Experts for Research and Innovation (EFI 2017). Both authors are members of the Commission. When undertaking its 2005-2017 review of SRI policies in Germany, the Commission studied the three mentioned areas and in addition technology and knowledge transfer as well as governance issues. For the sake of brevity, these topics are not being discussed here.

3 The latter typically belong to one of the four large research organisations: the Fraunhofer Society, the Max Planck Society, the Leibniz Association, and the Helmholtz Association.

Public funding for civil research and development (R&D) in Germany grew by more than 60% between 2005 and 2015. This increase was only superseded by Switzerland and Sweden where funding was roughly doubled, and approximately matched by South Korea. Much of the additional funding went into universities and PROs – between 2006 and 2017, funding for young academics (but not for tenured faculty) at universities rose considerably (Figure 1). A separate measure strengthened the PROs with annual budget increases of 5% (EFI 2017: Chapter B1-4). Increases in subsidies for R&D in the private sector were considerably more modest than the ramp-up of funding for academia.

Figure 1 Development of the number of professorships, the number of scientific and artistic staff who can be classified as young scientists, and the number of students at German tertiary education institutions, 2005 to 2015



Notes: Index: 2005 = 100. (1) Tenured (principal employment) professorships do not include temporary professorships paid according to the C2 scale (or equivalent remuneration grades) or junior professorships. (2) Young academics include the following personnel categories: temporary professorships paid according to the C2 scale (or equivalent remuneration grades), junior professorships, lecturers, academic and artistic staff.

Source: Own calculations based on Statistisches Bundesamt (Federal Statistical Office), Fachserie 11, Reihe 4.4 and 4.1.

In the course of these reform measures, Germany has become significantly more attractive as a location for mobile scientific talent (EFI 2017: 47). The Federal Government has substantially increased resources for publicly funded research and has thus made a significant contribution towards achieving the 3-percent target for R&D

relative to GDP. Most observers agree that the Excellence Initiative has strengthened Germany as a location for science.[4]

While the non-university research organisations achieved the budget increases of the last few years via institutional promotion with the Pact for Research and Innovation, a problem in the case of tertiary education institutions (universities and universities of applied sciences) is that a high proportion of the increase in funding has been realised via temporary and earmarked funds. A key challenge in the coming years will be to overcome the structural underfunding of Germany's tertiary education institutions and to further boost their international competitiveness. Given Germany's federal constitutional setup, it is the Laender that have an obligation to invest more in their universities.

Innovation in established firms

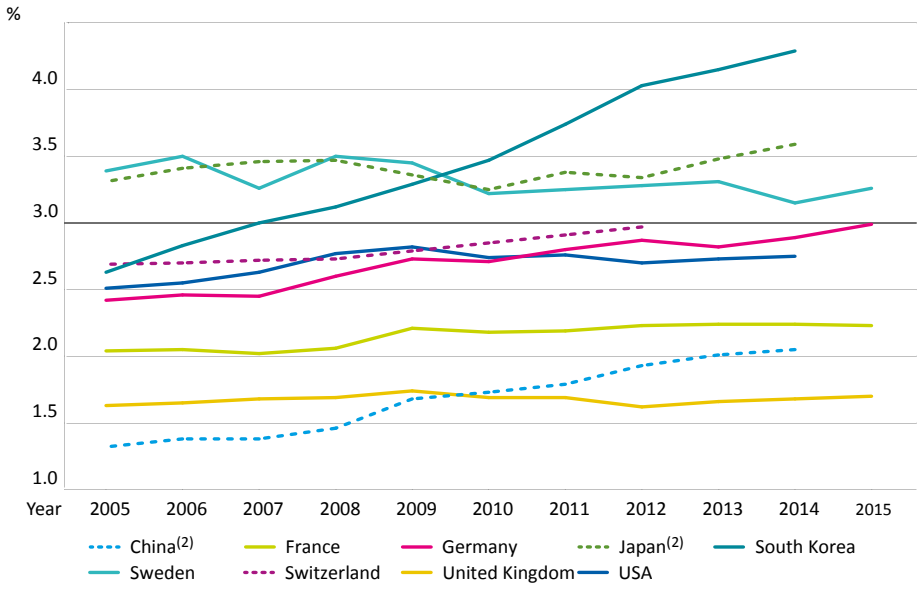
Despite some weaknesses, national R&D intensity (defined as R&D expenditures relative to GDP) is an important indicator of the research and innovation orientation of an economy. R&D in Germany takes place in established (mostly large) firms and in dedicated research institutions and universities. Consistently over the past three decades, about two thirds of all R&D has been performed in the private sector, and mostly in large firms.

German R&D intensity started to decline in the late 1980s and was in a slump after reunification. It increased moderately in the mid-1990s. As shown in Figure 2, between 2005 and 2015, national R&D spending in Germany rose from below 2.5% of GDP to almost 3.0%.[5] Only a few other countries (Sweden, South Korea, Switzerland) experienced similar growth in R&D spending. It is remarkable that private R&D spending rose in parallel with public spending, although firms are rarely the recipient of state subsidies.

4 See EFI (2017: Chapter B 1-2) for a detailed discussion and further references.

5 See EFI (2017: Chapters B3-2 and C2) for an overview and international comparison.

Figure 2 R&D intensity in selected OECD countries and China, 2000 to 2015 (as percentage)[(1)]



Notes: (1) Gross domestic product based on the methodology of the European System of National and Regional Accounts (ESA 2010). (2) Gross domestic product based on the methodology of the ESA 2005. Some of the data for Switzerland were estimated. Japan 2008, France 2010, South Korea 2007, break in the series in China 2009.

Source: OECD, EUROSTAT. Calculations and estimates by CWS in Schasse (2017). © EFI - Commission of Experts for Research and Innovation 2017.

The impressive growth in R&D spending masks the fact that there is a strong sectoral concentration on the automotive sector, with 36% of all private R&D. The geographical distribution of R&D is concentrated in the southern Laender. The former Eastern states are still struggling to catch up in terms of their R&D and productivity statistics, and convergence has been painstakingly slow.

Entrepreneurial innovation

In most countries, business start-ups contribute significantly to raising productivity and to economic growth. If one were to point to a possible Achilles heel of the German innovation system, it is presumably the weakness in providing supportive framework conditions for start-ups. That has contributed to the sectoral stability of Germany and – as a flipside – to its failure in either adopting or generating new sources of value

creation. As a general rule, innovative products, processes, and business models are often developed and implemented in new companies in particular. Start-ups are often the source of more radical innovation, as young firms are not impeded by cannibalisation problems. But the beneficial effect of start-ups does not stop there. As new competitors, start-ups force established companies to improve their products, services, and processes. Designing a founder-friendly framework must therefore be a key objective of political decision-makers. For a long time, political processes in Germany were more tuned towards supporting established firms and sectors.

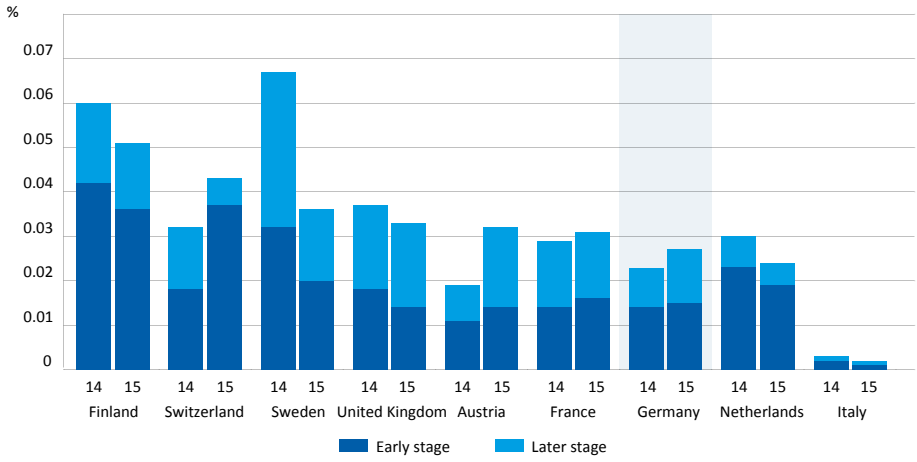
This has not always been the case. After WWII, Germany experienced a start-up boom, but a declining taste for entrepreneurship thereafter. Almost all comparative studies show low entrepreneurial activity. A paucity of equity capital, experienced founders, and exit channels have been named as reasons. Moreover, there have been very few globally successful German start-ups. Contrary to the US stock market where there is considerable churning among top firms, the German DAX30 composition has been astonishingly stable. A flare-up of start-up activity in the late 1990s came to an end in the dot-com crash. The stock market segment then designed for young firms (Neuer Markt) was abandoned. Policies to address institutional and capital market deficiencies were then initiated in the mid-2000s.

The start-up rate – the number of start-up businesses as a percentage of the total number of companies in Germany – is still low by international comparison. In the past five years, the availability of venture capital (VC) as a source of finance for start-ups has been improving, but it is still trailing VC availability in Scandinavian countries, not to speak of the UK or the US (Figure 3). The German tax code (for example, provisions limiting the utilisation of loss-carry forwards in the case of major ownership changes) is still limiting the attractiveness of investing in German start-ups for investors. While cultural propensities at universities and among the public have been tilting towards a positive view of entrepreneurship, policymakers were slow to modify regulation and taxation rules in favour of young firms. But the strong start-up performance of cities such as Berlin has finally impacted the political agenda as well: a reform allowing

investors to profit from loss-carry-forwards was implemented in late 2016. Other measures favouring VC as a source of finance have also been implemented.[6]

Figure 3 Venture capital investment as a percentage of national GDP in 2014 and 2015

Venture capital is defined here as temporary equity investments in young, innovative, non-listed companies



Notes: Investments according to registered office of the portfolio companies. Early stage comprises the seed phase and the start-up phase.

Source: EVCA (2016), Eurostat. Own calculations. © EFI - Commission of Experts for Research and Innovation 2017.

Summary and outlook

To summarise, the period from 2005 to 2017 saw the introduction of a number of successful policies, such as better governance and coordination among major players in the innovation system, vastly improved public funding of universities and public research organisations, quality competition among universities, and new initiatives for public-private R&D partnerships. Strategic programmes in important industrial areas, such as electric cars and digitalisation, fared less well and are still awaiting stronger impact.

6 See EFI (2017: Chapter B4) for a detailed discussion and further references.

This brief summary has neglected advances in the governance structures of German R&I policies. These include a shift to mission-oriented R&I policies and improved coordination between ministries which were held – due to coalition governments – by different parties. Whether these collaborative approaches can be maintained in strong political competition is debatable. The positive developments in the German science sector and the continuing strength of its established firms are being tested right now. The automotive industry is under attack from (at least) three directions: the substitution of combustion engines by electric drives, the advent of new ownership and service models requiring a smaller fleet size, and digitalisation which shifts margins and political power to data-oriented actors. Similarly, the remainder of the core of German industry – based very much on the art of mechanical engineering – is seeing changes due to the introduction of machine learning, artificial intelligence, and cloud computing. Digital services are becoming important aspects of firms' offerings, and German Mittelstand firms in particular have a hard time adapting the new approaches. That being said, these firms are also beneficiaries of a highly versatile institution – namely, vocational training – that has allowed German firms in the 1980s to thrive after the first wave of digitalisation and automation as it allowed for relatively rapid updating of skills and human capital.

The remaining bottlenecks are weaknesses in entrepreneurial culture, VC finance, and in digital government services (e-government). In the latter domain, Germany has fared particularly badly and invested little, depriving its IT and software sector of an important source of demand.

The biggest advantage that Germany may be able to utilise in the coming years is the widespread consensus among political parties and the public that science, research, and innovation are essential for growth and for maintaining the country's standard of living. These objectives are starting to compete with other policy goals, but currently they remain at the top of the political agenda.

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About the authors

Dietmar Harhoff is Director at the Max Planck Institute for Innovation and Competition. His research focuses on innovation, entrepreneurship, intellectual property, and industrial economics.

Since 2004, he has been a member of the Scientific Advisory Boards of the Federal Ministry of Economics. From 2008 to 2013, he was a member of the Economic Advisory Group on Competition Policy (EAGCP). From 2012 to 2015, he chaired the Economic and Scientific Advisory Board (ESAB) at the European Patent Office. Since 2007, he has been the Chairman of the Commission of Experts for Research and Innovation (EFI) of the German Federal Government.

He is an elected member of the German Academy of Science and Engineering (acatech), the German National Academy of Sciences Leopoldina, and the Bavarian Academy of Sciences. From 2009 to 2012 he had the Vice Chair of the Verein für Socialpolitik (German Economic Association).

Monika Schnitzer holds a Chair in Comparative Economics at LMU Munich. Her research interests are in the areas of innovation, competition policy, industrial organization, multinational firms, and international trade. Her work has been published in journals such as *American Economic Review, Rand Journal of Economics, Journal of the European Economic Association, European Economic Review, Economic Journal, Review of Economics and Statistics*, and *Journal of International Economics*.

Monika Schnitzer received her Ph.D. in Economics from the University of Bonn in 1991. She has been a Visiting Professor at Boston University, MIT, Stanford University, Yale University, University of California, Berkeley, and Harvard University.

Monika Schnitzer is a Fellow of the European Economic Association. She is a member of the Council of Economic Advisors of the Federal Ministry of Economic Affairs and Energy in Germany, and deputy head of the Commission of Experts for Research and Innovation for the German Federal Government. In 2008 she was elected a member of the Bavarian Academy of Science. From 2015 to 2016, she served as the President of the Verein für Socialpolitik (German Economic Association).