Lessons learned in Germany

In the past decade, Germany has invested a great deal of money into science funding schemes that have markedly changed its research landscape. Was the money well spent, and how will it be spent in future?

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The collapse of Lehman Brothers in 2008 marked the beginning of a global financial crisis that has since affected the world economy and nations' finances. Even major economies such as the USA or Japan have been struggling with the aftermath of the events that started in 2008 while many European countries still suffer from high unemployment, recession and strained budgets. The crisis has also had a major impact on science as governments are forced to cut down on their investment into research and education. A few countries have escaped this predicament, however, and managed to maintain or even increase their investment into research, notably Germany as a major economy.

In the past 10 years, Germany has invested heavily in its science system—and that was sorely needed. At the turn of the millennium, Germany's research system was not in the best state: Universities were chronically underfunded and brain drain depleted the country of young talent. "Policymakers recognized that something clearly had to be done. A political consensus was found that crossed party lines and was agreed on by the federal and the state governments", said Peter Gruss, former President of the Max Planck Society from 2002 to 2014. The red-green coalition government under Chancellor Gerhard Schröder initiated crucial reforms about financing Germany's research sector, realizing that knowledge and innovation fuel economic growth and are key elements to global competitiveness—especially in a country with few natural resources. The governments under Angela Merkel, who became chancellor after Schröder's defeat in 2005, have largely implemented these reforms. Yet, some of the measures are scheduled to run out and German politicians

and scientists debate on how to continue the success of the past decade.

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The political decision to reform was, however, also driven by larger forces when, in March 2000, the European Commission launched a ten-year strategy, known as the Lisbon Agenda, to transform the EU toward a knowledge-based economy. The strategy attributed high priority to research and set a target of spending 3% of gross domestic product (GDP) for research by 2010. Germany is one of the few European countries that have now reached this goal. “Germany has joined the ranks of countries spending 3% GDP or more, despite having had a global financial crisis”, said Gruss.

The government's investment into research has, since then, increased considerably both in relative and in absolute terms—from around 2.5% GDP between 2000 and 2005 to 2.98% GDP in 2012 (http://www.bmbf.de/pub/bufi_2014.pdf). But the path to reform was not a smooth one. Political decision-making is an intricate process, as the German constitution divides the responsibilities for research and education between the federal government and its 16 states; every decision therefore requires agreement between the federal and state governments. Moreover, whereas

non-university organizations such as the Max Planck or the Fraunhofer Society are funded by both the federal and state governments, the universities are in the hands of the states. According to the German constitution, federal money could only fund “projects of science and research at institutions of higher education”—but not “research facilities”, which prevented the federal government from funding universities directly.

Despite these restrictions, the federal and state governments launched a number of initiatives, sometimes using artful juridical tricks to circumvent the constitutional roadblocks and funnel more money into universities. These reforms gave the German science research a new start—most notably through three initiatives, collectively known as the “three pacts”. One of them, the “Higher education pact”, supports teaching. The other two—the “Pact for Research and Innovation” and the “Excellence Initiative”—directly invest into research.

With the “Pact for Research and Innovation”, the federal and state governments committed to an annual 3% funding increase per year for non-university research institutions from 2006 to 2010, and then again to a rise by 5% a year from 2011 to 2015. For their part, the research organizations have committed to increase their quality, efficiency and performance according to defined goals. “This has provided financial planning security and has enabled me to further develop the portfolio of the Max Planck Society”, Gruss explained. New institutes were founded, others redefined their research focus, and the society has attracted more researchers from abroad. For example, the Max Planck Society founded a number of so-called “Max Planck Centers”—cooperation

projects with international partners—to stimulate exchange and increase international visibility. In addition, new Max Planck Institutes were established, among them are the Max Planck Institute for Biology of Aging in Cologne and the Florida Institute for Neuroscience. “With this increase in basic funding, the government placed a lot of confidence in us”, said Gruss. Whether the money was well spent needs to be assessed in more detail. “An evaluation procedure has not yet been established”, Gruss explained, “and this will not be an easy task. It is quite difficult to compare, for example, the Max Planck Society and the Fraunhofer Society”, which focus on basic and applied research, respectively.

While the Max Planck and Fraunhofer institutes had always been successful research enterprises, German universities were in desperate need.

The first Shanghai ranking in 2003 did not list a single German university among the top 40 and further fueled discussions about the state of the German education system. To address this, the “Excellence Initiative” was launched in 2005. It was run by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG), Germany’s largest funding organization, and the German Council of Science and Humanities (Wissenschaftsrat), Germany’s most important advisory body to the federal and the state governments. The funding scheme was quite different from the Pact of Research and Innovation: It was designed as a competition to find the best universities and make them better. In brief, as the German press often phrased it, Germany was looking for its ivy league.

This was a rather revolutionary approach and away from the prevalent ideal of equality that essentially treated all universities as

equal. Although German universities had been changing since the 1990s, adopting new public management structures and increasingly allocating funds according to performance, the Excellence Initiative took this trend to another level. A report by the DFG and Wissenschaftsrat in November 2008 phrased it clearly: “The Excellence Initiative has—more than any other research funding program before—attracted a great deal of public interest, not least because it is viewed as part of a fundamental paradigm shift in the German science and higher education policy: It contributes to replacing the previous ‘equality paradigm’ by a ‘differentiation paradigm’” (http://www.wissenschaftsrat.de/download/archiv/exini_GWK-Bericht-%5B1%5D.pdf). The Excellence Initiative consists of three funding lines: Graduate Schools, Clusters of Excellence and Institutional Strategies. Currently, there are 11 universities that may call themselves “excellent” based on successful improvements in all three funding lines.

The majority of Graduate Schools and Clusters of Excellence involve partners from non-university institutions, which are traditionally strong in research. Co-operations between universities and non-university institutions have existed before, but the Excellence Initiative has greatly enhanced these bonds, much to the profit of the universities. One prominent example is the Excellence Cluster “Molecular Microscopy for Brain Research” in Göttingen, which profits from the participation of the Max Planck Institute for Biophysical Chemistry, and its two Nobel Prize winners. Another example is the Excellence Cluster CECAD (Cellular Stress Responses in Aging-Associated Diseases) in Cologne. The newly founded Max Planck Institute for the Biology of Aging—along with other non-university institutions—is an integral part of this initiative. Moreover, new structures have formed through the initiative. The Karlsruhe Institute for Technology (KIT), for example, is a merger between the university and a large research center of the Helmholtz Society—a structure that is unprecedented in the German research landscape.

As a whole, the Excellence Initiative has been viewed as a success story and set off an avalanche: More than 800 proposals were drafted in two concurrent program phases, and a large number of universities participated. “The Excellence

Initiative has achieved a lot. The self-organization of the whole science system has gained momentum. The universities have worked on their profile and have set priorities in graduate education, research and governance", said Antje Boetius, professor of marine biology at the University of Bremen and Chairwoman of the Scientific Commission of the German Council of Science and Humanities. But she also has some criticism. "The competitiveness and short-term project financing has increased in Germany to an extent where I would say, there is a danger of competition overkill. Competition can be counterproductive when scientists do not find time for research and are discouraged from projects that will not produce immediate results", she said.

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Although the Excellence Initiative brings extra money and reputation to the universities, it has often been criticized that this funding is only short term. Within the framework of Excellence Clusters and Graduate Schools, universities make commitments that go far beyond the time of these funding schemes, for example, by appointing researchers on permanent positions. These commitments may be at the cost of other research areas within that university. Criticism has also been raised that funding periods are too short to prove excellence or implement the planned changes before the next round of proposals. This may have been the pitfall of the universities of Karlsruhe, Göttingen and Freiburg, who had gained excellence status in 2006 and 2007, but were not able to maintain it in 2012—too short a time, one could argue, to judge their performance. Gaining a title raises reputation, but having the title withdrawn damages reputation to an even larger extent. This general principle also applied to the universities of the Excellence Initiative, according to a study by Berthold Wigger, professor for economics at the KIT, and his colleagues [1]. They took the enrollment numbers of first year students in Baden-Württemberg as a measure for reputation. Gaining elite status had no measurable effect on student numbers, but its withdrawal had significant negative impact.

According to the Federal State agreement on the Excellence Initiative in 2005, the objectives of the Excellence Initiative were to "strengthen Germany as a research location in the long term", "improve its international competitiveness" and "increase international visibility". Did it live up to these expectations? The DFG thinks so. "[The Excellence Initiative] has triggered lasting changes in the German university system and strengthened our research considerably within the international arena, and it will continue to do so [...]", Matthias Kleiner, then president of the DFG, was cited in a press release announcing the second program phase in 2012 (http://www.dfg.de/en/service/press/press_releases/2012/press_release_no_26/index.html). "The success has been evident in significantly more productive research [...] and much more scientific knowledge transferred to business and society" (http://www.dfg.de/en/service/press/press_releases/2014/press_release_no_42/index.html).

According to Stefan Hornbostel, professor for science studies at the Humboldt University in Berlin and head of the iFQ—Institute for Research Information and Quality Assurance, there are as yet not sufficient data to support all of these claims. "I do not want to deny that the Excellence Initiative has provoked something, but there is relatively little systematic accompanying research to actually measure its effect", he said. An international review committee is currently evaluating the situation, and their results are scheduled to be published in 2016. "There are a number of soft factors that are difficult to measure—I think there is little doubt that a lot has happened in terms of research climate, activities and cooperation structures", said Hornbostel. "But when you ask for the hard facts, a slightly different picture emerges".

Take, for example, publications as an indicator for scientific productivity. According to a recent bibliometric study [2], the proportion of German publications in Reuter's "Science Citation Index Expanded" are decreasing slightly, as is that of the USA and other European countries, while the proportion of emerging economies, such as China, Brazil or India, are increasing. The number of publications per researcher in Germany has been relatively constant over the years as well as the citation rates

of German publications. There is one increase though of the proportion of German publications among the 10% most cited ones. But this trend can hardly be attributed to the Excellence Initiative, as it has started well before 2005. "We are, as a matter of fact, running a large field experiment in Germany, with a strongly excellence-oriented funding, the Excellence Initiative, and the counterpart, the Pact for Research and Innovation, where there is essentially an unconditioned funding increase", Hornbostel explained. As it seems, a difference in outcome can as yet not be detected. The numbers of publications from universities and non-university institutions, for example, have increased approximately to the same extent [2]. "This raises questions", said Hornbostel. "Would it make sense to continue pursuing the model we have followed during the Excellence Initiative—the idea that a strong institutional differentiation, a few top universities, would get the whole system going?"

Germany is under some pressure to find these answers: All the three pacts are ending soon. The current program phases of the Pact for Research and Innovation and the Excellence Initiative will run until 2015 and 2017. In 2013, key players, among them DFG and Wissenschaftsrat, have urged politicians to develop new instruments to secure funding beyond these dates, as time is getting short.

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A central theme of their recommendations is to increase "basic funding" for universities—that is, for human resources, research costs and infrastructure that is not linked to specific research projects. The idea is to add more sustainability and room for strategic growth as in the "Pact for Research and Innovation". "The Pact for Research and Innovation provides an increase in basic funding for the non-university institutions. For universities, it is not really clear how the future pacts could provide such a stable funding", Boetius explained. "The universities need a well-tailored funding package for the future".

There is, however, a good reason why the Excellence Initiative did not provide basic funding for universities: It would have been against the constitution, which rules that funding universities is the responsibility of the states. If the federal government wants to finance universities directly, the constitution needs to be changed. Such a change is on its way. The federal cabinet had already drafted a resolution to change the constitution, to which the German Parliament agreed. At the time of writing, the approval of the German Federal Council was still pending.

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Meanwhile, other measures have been taken. The Joint Science Conference (Gemeinsame Wissenschaftskonferenz) of the German federal and state governments and the heads of the governments decided to extend the three pacts. Now, the governments need to devise concrete plans as to the exact format the Excellence Initiative or its successor should take after 2017. “The Council of Science and Humanities has made concrete suggestions about specific actions to take, and now we are all eagerly waiting to see how the federal and state governments will pick up on these ideas and put them into practice”, Boetius said. “As scientists, we are of course extremely impatient and would like to know what to expect as soon as possible”, Boetius said. “But the political decisions are complex, as it is a multi-actor—multi-dimension problem how to shape a better research ecosystem”.

So far, the Excellence Initiative has largely been seen as dividing German universities into “excellent” ones and others, while capturing media attention with talk establishing a German Harvard or Stanford university. “This comparison with the ivy league is not particularly fortunate”, acknowledged Hornbostel. “The rhetoric has really gone wild here and there”. Indeed,

there is more to it than just a search for “Germany’s next top university”. In fact, the different funding lines—Graduate Schools, Clusters of Excellence and Institutional Strategies—have stimulated all participating universities to set priorities and develop their individual profile. It has led to “functional differentiation”, as DFG and Wissenschaftsrat call it.

“We have a qualitatively very homogeneous university landscape. Thus, it makes sense to develop specific profiles through specialization so that some division of labor emerges in the system”, Hornbostel explained. World-class research does not necessarily need to take place in large, world-class institutions; instead, small universities can excel in specific areas. “We have a few universities that have shown that they are competitive at an international level and they should be supported and maintained. But that does not mean that we need a competition system to artificially increase the distance between these universities and the next best”, Hornbostel remarked. “With all the interest in the top universities, it is important not to forget that small universities that are excellent in specific areas should also be valued and deserve funding”, Gruss commented. “The spectrum of the elite universities is broader, but that does not mean that other universities cannot catch up, if they pursue good research politics”.

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Boetius also sees a lot of potential in Germany’s non-elite universities. “Germany has universities that are very strong in engineering, others are very strong in natural sciences or in the humanities”, she said. “To me, this plurality is a strength of the German system. Do we really need one university to cover everything?” One argument that has been put forward in favor of a Harvard-like university is that it would attract world-class

researchers. However, Boetius thinks this is already happening, especially when taking the non-university institutions into account. “We have hot-spot areas, with excellent networks between universities, and research institutions of Max Planck, Helmholtz, Leibniz and Fraunhofer, all covering different dimensions of the science system. Most researchers look out for other scientists or for infrastructure in their own field, and they could find that in very different places in Germany. I don’t think it is particularly important to them whether or not that place is regarded as the German Harvard. We do not even know yet if there is a market of students who would take that as a criterion.” she said.

Germany has achieved a lot during the past decade in strengthening and improving its research base, and it is now about to lay down the tracks for the coming decade. “I personally don’t think it is all that important to define five leading universities”, Boetius concluded. “To me, it makes more sense to work on different cooperation formats, on better career paths for talents in the science system and, at the same time, on sharpening profiles and strategic infrastructures. But this needs to be done with a more comprehensive view on the entire system”. There is no question though that the country cannot just rest on its laurels but has to continue the path of more funding and reforms. “It is important to build on what we have achieved and continue the work. Otherwise the small plant that is now just beginning to grow will wither and will not be brought to blossom”, Gruss warned.

References

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