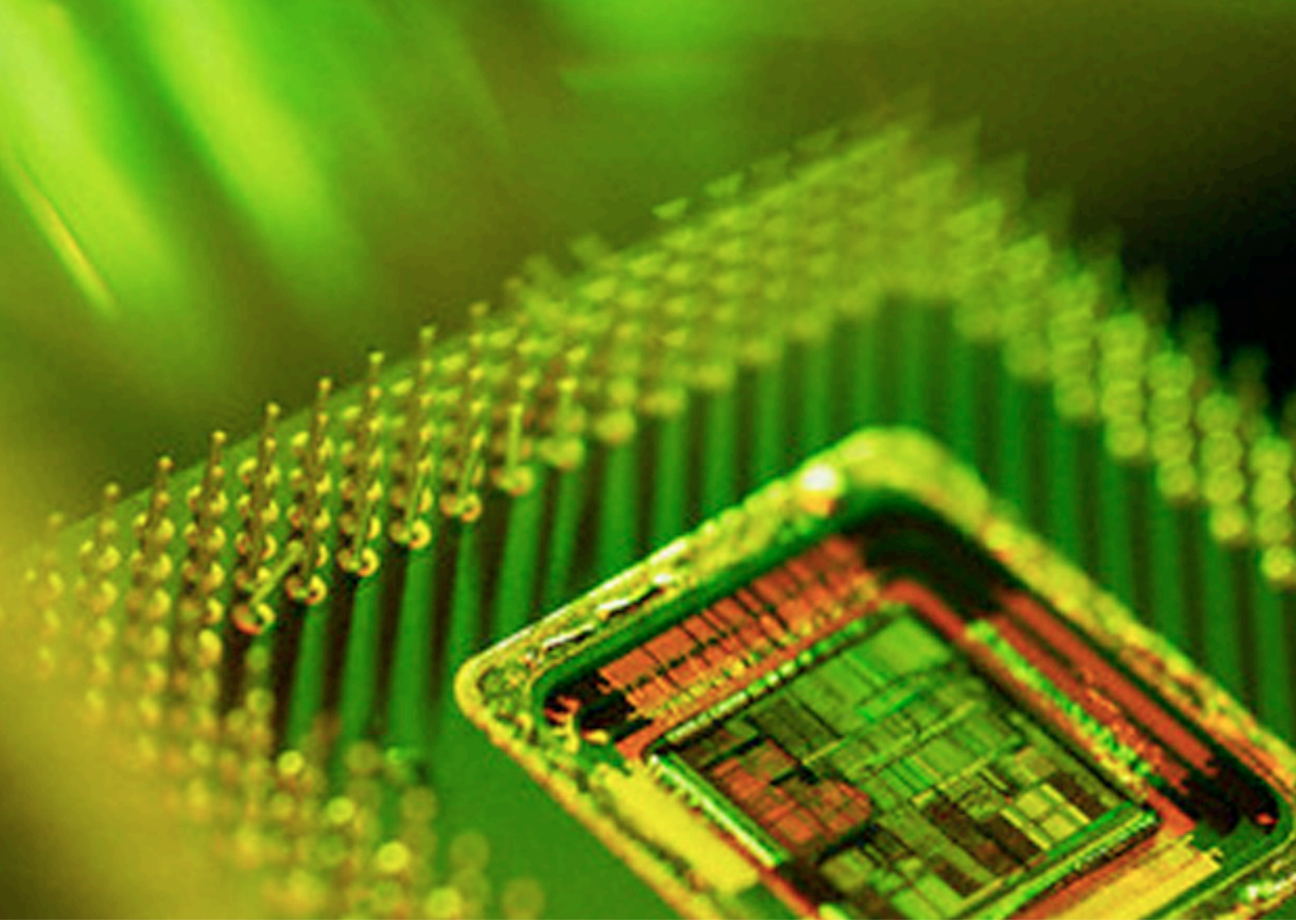


Innovation Indicator 2011

English Extract

Deutsche Telekom Stiftung

BDI
Bundesverband der Deutschen Industrie e.V.

Fraunhofer ISI

United Nations University
UNU-MERIT

ZEW
Zentrum für Europäische Wirtschaftsforschung GmbH

Main Results

- Germany has clearly improved its innovative performance in the past five years and is now in 4th place in an international comparison. Public investments in science and public research have contributed significantly to this improvement in position.

- In the crisis, industry maintained the high level of research funding, which also strengthened the position of the German innovation system in an international comparison. Germany also survived the economic crisis in research and innovation much better than many other countries.

- The strengths of the German innovation system are the networking of the individual actors of the innovation system as well as its industry that is very actively involved in innovation.

- The greatest deficits are in the area of education. Too few young people obtain a tertiary education qualification. This cannot be compensated by the vocational education system, which makes a significant contribution to the success of German innovation.

- The state-regulated framework conditions for research and innovation in Germany are anything but exemplary. The state provides little support for the R&D activities of the enterprises.

- The entry of the „new industrial countries“ in the innovation competition has brought Germany more advantages than disadvantages so far. The great demand for technology goods in China and other countries spurred German exports, while direct competition from these countries in world markets is still low. This will however not remain so.

- At the top of the innovation ranking is Switzerland, followed by Singapore. Both countries are among the leaders in all subsystems – industry, science, education, state, society.

- The USA is one of the losers in the innovation competition of the past years. The economic situation and too low investments in science and research are showing their effect.

- Japan can also not hold its own. Main reasons are the lack of internationalization and weak scientific performance. In addition, Japan feels the effect of the new competitors from East Asia more than other countries. The events in Fukushima are also a huge challenge.

- In the past ten years, China invested massively in education, research and science. It takes nine to twelve years before these investments are reflected in a higher output of publications, patents and high-tech exports. It is expected that China will increase its innovation performance in the coming years.

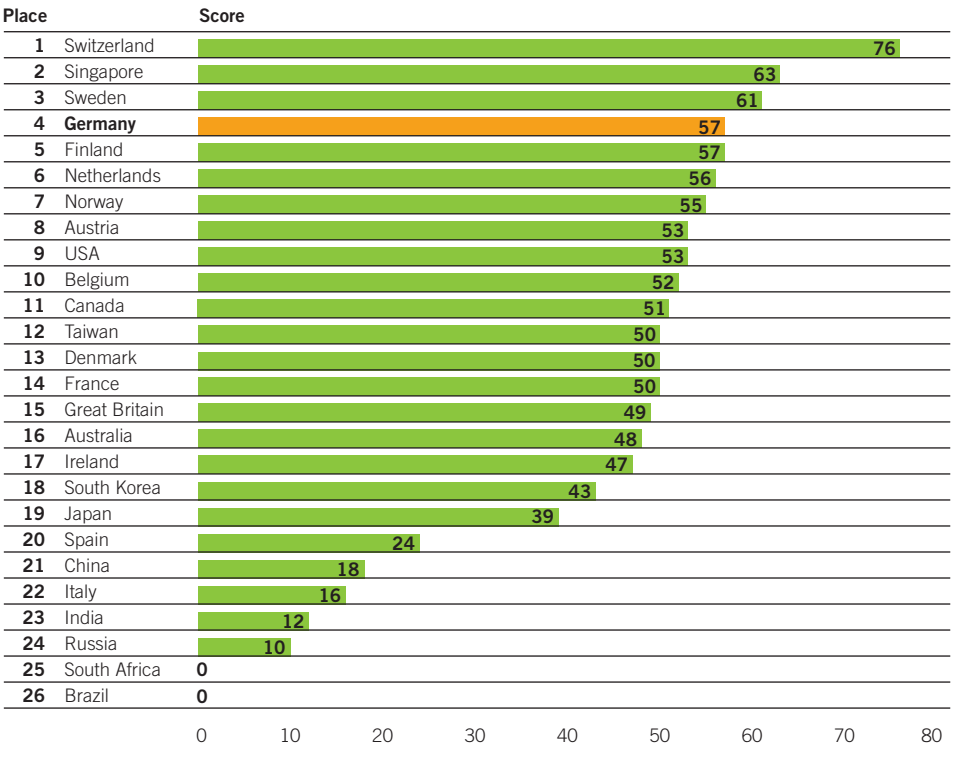
Germany in Contact with the Leading Group

The results of the Innovation Indicator

The latest edition of the Innovation Indicator for Germany was published two years ago in 2009. Since then, the world economic structure has changed significantly. The world economic crisis of 2008 and 2009 has left its mark, just like the rapid development of emerging countries like China, in particular. These changes in the economic realities are also reflected in the innovation potential of the economies. In this respect, the altered ranking in the Innovation Indicator 2011 is primarily due to updating the data stocks. The fundamental methodological revision in the course of the re-organization and reduction of the number of indicators applied plays a subordinate role, on the other hand.

The country set of the new Innovation Indicator was greatly expanded. 26 economies are taken into account, which are evaluated by summarizing the most important single indices in an overall statistical parameter – the Innovation Indicator. Which indices are to be used for this purpose were identified by an economic model prior to the analyses. The scores of the countries vary between 0 (worst result in comparison) and 100 (best result in comparison), although none of the countries investigated obtained the ideal number of 100 points, as this would mean taking first place for all single indicators. Not even the best countries managed this feat.

Overall result of the Innovation Indicator



Germany and the Embattled Midfield

In the Innovation Indicator 2011 Germany occupies a good fourth place. With an indicator rating of 57 it was overtaken only by Switzerland, which was always very good (rating 76), Sweden (61) and the new arrival in the leading group which was analyzed for the first time, Singapore (63). This means that Germany has risen several places in the past years, which is due on the one hand to the increased innovation efforts of industry and policy-makers and in particular to the increased public expenditures on research and development. On the other hand, several countries suffered more from the world economic crisis, so Germany was able to improve its position.
The ranking in the midfield from place 4 to place 17, which is led by Germany, is very close, so that even small changes in the indicator ratings can affect the overall ranking. The figure on these pages illustrates how close together the indicator ratings of the countries are.

The Innovation Indicator determines the position of a country always in relation to the comparison group of all countries investigated. Thus a country can only continuously stay ahead if it permanently works at maintaining its own position. In this case, stagnation in the innovation competition always means a step backwards.

Like no other country, Switzerland has succeeded for many years in keeping the other emerging and innovation-oriented countries at a distance. Switzerland has had a consistently high rating on the Innovation Indicator for almost the complete evaluation period. Only few nations have succeeded in achieving similarly good positions. This leading group (Switzerland, Singapore, and Sweden) is followed by a broad midfield of countries. This ranges from Germany with an indicator rating of 57 to South Korea with 43 points. Germany lies neck and neck with Finland, just ahead of the Netherlands (56) and Norway (55). These four countries thus differ only marginally in their overall innovation capacity.

Austria promoted, USA relegated

Behind this group of countries in this year's ranking are Austria and the USA (rating 53). Austria especially has advanced several places in the past years. After hovering around the 14th place since the beginning of the new millennium, it now lies in 8th place, according to the forecasts for 2010. Austria has as perhaps no other country in the EU taken the so-called Barcelona Target seriously, namely to increase the overall expenditures for research and development to three percent of GDP. Through continuously raising spending while also introducing aggressive innovation policy measures like e.g. a generous tax rebate for R&D promotion, the R&D rate of 1.8 percent in 1998 was increased to 2.8 percent in the year 2010. At the same time, Austrian industry was able to clearly increase its innovation output.

This year's analysis clearly revealed that the USA no longer belongs in the leading group and that with the ranking 9th place (rating 53) in 2010 they belong only in midfield – behind Germany. Due to the banking and economic crisis which began in the USA and had its worst impacts there, the country has dropped down several places in the past two years. An erosion of the US-American position, however, was clearly recognizable even before 2009. For a long time they were able to defend second place behind Switzerland, but in the wake of the New Economy crisis at the millennium they were overtaken already by Sweden and Finland as well as finally Singapore and the Netherlands. Now the USA have slid down even further and have fallen behind – even if only just – Germany, Finland, the Netherlands, Norway and Austria.

As this development results from structural problems, the USA threatens to remain permanently in the midfield, if not to slide down even further. It is still the largest R&D nation and its science system is also the largest worldwide, in absolute terms. However, more could be expected of the USA because of the size of the country. In addition, greater dynamics are presently found in other countries. A particular challenge for the USA is the enormous balance of trade deficit, especially for high-technology products. The USA imports around 40 percent more high technology than it exports. All things considered, the massive investments in R&D and science no longer bring advantages for the USA on the international scene to the former extent. This is partly because other countries have also recognized the significance of research and innovation and competition has increased.

The American economic system

Ultimately, the American slide down the Innovation Indicator is also a symptom of more fundamental problems in the entire economic system. A currently sharply rising budget deficit, and in particular a notoriously negative balance of trade exert pressure on the system, whereby the high budget deficit is already almost a tradition in the USA since the days of the Reagan administration in the 1980s. At that time, significant tax cuts and state investments were intended to boost the economy. These debt levels exploded as a result of the massive military expenditures since 2001. This was accompanied by the challenges to the welfare systems caused by the current banking and economic crisis. The budget deficit of the Obama administration has more than tripled from 2008 to 2009. Despite the ideal of lean government that all political parties claim to represent, which the Americans have associated for decades with dynamic growth, it is questionable in the meantime whether a paradigm shift towards a

Keyword
The Indicators

The new Innovation Indicator comprises 38 single indicators which in an economic model proved to be significant and thus relevant to describe the innovative capability of a country. In this context, innovation is not an end in itself, but is the most important chance for developed and modern economies to safeguard economic growth, prosperity and employment. Innovation is defined in the Innovation Indicator as the implementation of new ideas that means that innovation processes are considered holistically from the initial idea, via research, development and systematization up to market development, market introduction and to market success. Innovations are not exclusively of a technical nature: services, organizational methods or processes can be innovative and have as their goal to create something new or to do something better. For this reason it is not only important to consider indicators for research and development processes in industrial enterprises, but also indicators of implementation, demand or of the political and legal framework conditions. The individual indicators of the Innovation Indicator reflect all these aspects.

debt-financed government activity has not taken place. Experiences from the 1970s as well as from the 1990s in Japan indicate that such politics are not sustainable in the long term. Rather, the state expenditures financed by excessive borrowing increase the money supply and, under certain circumstances, discourage private investment. Possible consequences are inflation and a lower medium-term economic growth.

Budget deficits in the USA

In addition to the federal deficit, the USA also has an enormous current account deficit, which increases the need for capital inflows and thus exerts pressure on the US dollar, which again increases inflation. The problem of American indebtedness to foreign countries is in many respects more problematical than Germany's. Firstly, the German budget deficit is lower – not only in absolute terms, but also measured in terms of economic power. Secondly, in Germany the budget deficit is countered by a high surplus from the private sector, so that in net terms the state is indebted to its own citizens, while in the USA the private sector is becoming increasingly indebted to foreign countries, i.e. the nation as such is also becoming ever more dependent in the medium term.

The problem is also how the debt-financed resources are utilized. The US trade deficit is primarily due to consumer goods. Many consumer goods such as, for instance, electronic articles are subject to stronger price competition today than was the case several years ago, so that producing these goods cheaply is absolutely imperative. However, the western industrialized nations – also including the USA – have not been able to offer cheap production sites for some time now. For this reason, the significance of innovations and new technologies at a qualitatively high level are a basic pre-requisite for the success of western industrialized countries, at least for those that have no raw materials to offer, like Norway or Russia. It can be assumed that the incurred debts will not be utilized in such a way that economic returns in the form of strengthening the US-American competitive position are to be expected.

The USA is losing importance

According to the analyses in the new Innovation Indicator, the USA will no longer be among the leaders in the coming years, not only in relation to its size and expenditures. In the medium term, it will no longer occupy a leading place in absolute terms, neither for R&D expenditures nor in scientific publications or patents. In a far distant future it will also no longer be the largest economy in the world. This is already foreseeable today, because the USA's population is too small. It is to be expected that at least China and possibly even India, if they continue to increase the productivity of labor and capital inputs at the present pace, will catch up with the USA in terms of economic power and ultimately overtake it. This must, however, not be a fundamental problem for the USA or for other countries.

With an indicator rating of 52, just behind the USA, Belgium is in tenth place. This is followed by a group consisting of Canada (51), Taiwan (50), Denmark (50) and the two large European industrial nations France (50) and Great Britain (49), with Australia (48) and then Ireland (47), which is unlikely to maintain even this place in future in view of the austerity policies resulting from the economic crisis.

France: New innovation efforts

While France has steadily lost ground since the beginning of the 1990s, and has slid down from a former leading position to place 14 in the lower midfield, Great Britain was always to be found in midfield and, apart from slight fluctuations, has previously also occupied its current position 15. Several factors within the innovation system are responsible for the erosion of the French innovation capabilities. Marked deteriorations took place, not only in the science but also in the education system, in the state framework conditions and in the economy. Only recently has the French government increasingly addressed innovation policy and thereby changed the old concept of almost exclusively promoting national champions in favor of a widespread innovation funding and the discovery of small and medium-sized enterprises

as a target group for innovation policy-making. France partly looked to Germany and other countries, for example, for cluster promotion, or more recently, the role of the Fraunhofer Gesellschaft in Germany's research landscape as in the case of the Carnot Institutes. Unlike Germany, where there are no such concepts, the reform of tax incentives for research and development expenditures in companies could just have medium-term positive effects for France. Reforms of the state innovation landscape and new innovation instruments like the Pôles de Compétitivité – similar to the German Leading-Edge Cluster Competition – have brought a new motivation into the system and somewhat opened up the central government interventionism. So there is still hope for France, although there is currently little dynamics to report in many places – above all in public and private investment. But France has at least not fallen further behind in these aspects.

Denmark falls back, Japan disappointing

The Innovation Indicator 2009 showed Denmark in a much better position. Until a few years ago, Denmark was to be found in the upper midfield, even according to the new calculation method used in the Innovation Indicator, although it could never occupy a really top position on account of the 38 indicators applied. More recently, however, its performance in some of the indices, especially in the areas of education and society, is no longer sufficient.

Japan received a remarkably bad place in the ranking. It is behind South Korea, although in absolute figures it still belongs to the group of most significant innovative countries. Japan finally achieved third place in total spending on research and development, behind the USA and China. In the past years, the Japanese innovation system has not succeeded in adapting its structures sufficiently to the new global framework conditions. Admittedly, large Japanese enterprises like Toyota, Matsushita or Sony are still among the giants in their respective branches. The new emerging industrialized countries South Korea, Taiwan and China as well as several other countries, however, have undermined the strengths of Japanese in-

Rankings in the Innovation Indicator, 1995–2010

Place	1995	2000	2005	2010
1	Switzerland	Switzerland	Switzerland	Switzerland
2	USA	Sweden	Sweden	Sweden
3	Netherlands	USA	USA	Sweden
4	Sweden	Finland	Finland	Germany
5	Belgium	Belgium	Singapore	Finland
6	Canada	Singapore	Netherlands	Netherlands
7	Germany	Canada	Canada	Norway
8	Finland	France	Denmark	Austria
9	France	Germany	Belgium	USA
10	Denmark	Netherlands	Germany	Belgium
11	Singapore	Denmark	Norway	Canada
12	Great Britain	Great Britain	Great Britain	Taiwan
13	Japan	Norway	Austria	Denmark
14	Norway	Japan	France	France
15	Australia	Australia	Australia	Great Britain
16	Austria	Austria	Ireland	Australia
17	Ireland	Ireland	Japan	Ireland
18	South Korea	South Korea	South Korea	South Korea
19	Taiwan	Taiwan	Taiwan	Japan
20	Russia	Russia	Spain	Spain
21	India	Spain	India	China
22	Spain	India	Italy	Italy
23	Italy	Italy	China	India
24	China	China	Russia	Russia
25	Brazil	Brazil	South Africa	South Africa
26	South Africa	South Africa	Brazil	Brazil

dustry in electronics and have proved tough competition for Japan in its traditional principal market of eastern Asia. The Japanese economy has rather to contend with competition from neighbors in the west than, for instance, the USA which has come under pressure for other reasons.
In addition, the Japanese innovation system did not focus sufficiently on the globalization of science and research. Japanese companies and research institutions are not nearly as well networked internationally as other industrialized nations in the process of knowledge generation and diffusion. This is proved by the individual indicators based on scientific publications, but also the very low number of international co-patents, that means patents which were produced in cooperations between Japanese and foreign researchers, as well as the relatively low number of foreign students. The Japanese system has not opened up enough. In times of complex technologies and rapid alterations in science and research, a strongly nationally oriented innovation system, especially in an export-oriented economy, does not appear promising for the long term.

Internally, Japan is not open enough

In addition, the Japanese system does not appear to be sufficiently open. The largest share of research expenditures is spent in companies, while the shares of the public research institutions and the universities are rather small. One current political goal is to raise the contribution of public financing to research to one percent of GDP. In view of the catastrophic earthquake and its consequences, this will hardly be feasible, as the resources are required elsewhere. It is true that a high R&D participation of industry is a significant driving force and guarantee of success for many systems. There is however no rule of thumb as to how high this quota should be. In the case of Japan, it appears to emphasize that the interaction between science and industry and the science connection of private research is too low. If one looks deeper into the system, additionally, a strong pillarization of the research system becomes evident, in which individual institutes are very closely linked to single ministries. In addition, some institutes are not able to collaborate with industry, as there is no possibility of funding on the part of industry. The problem continues even further, as the scientists cannot respond to the questions and needs of industry.

The negative consequences of this system are unexploited exchange potentials and a too low orientation towards the current technological challenges facing industry. The analyses and experiences from the successful innovation systems worldwide prove that an exchange between science and industry favors technological development in any case. For this reason, the innovation policy of the German federal government in the past years and decades was directed towards improving and broadening the cooperation and exchange between science and industry. Now this function need not automatically have the same significance or same effect in other innovation systems. With reference to Japan, however, development can be assumed, not only on the basis of the indicators, but also based on the scientific literature as a whole.

Japan‘s strengths

Even if Japan has some weaknesses in the education system, the good performance in primary and secondary education are among Japan‘s strengths. Japan does extremely well in the OECD PISA comparison. Employment of highly qualified personnel and ultimately the research based thereon in the companies are further Japanese strengths. If only the economy were considered, Japan would attain a markedly better ranking. However, the Japanese position has also clearly deteriorated in the past years. What stands the Japanese system in good stead now and has done in the past is the high system productivity, that means the favorable relationship between output and input as it is calculated in the Innovation Indicator. Japan‘s output and input are not among the best. The results which it achieves with relatively low investments were however very good over the years. This means that the Japanese system displays a high productivity which is only bested by the Swiss and finally by the – as we now know - overheated Irish innovation system. The Japanese innovation system functions (still) extremely

efficiently compared with the other innovation systems which are investigated in the Innovation Indicator.

The bad 19th place out of the 26 countries in our ranking was already apparent before the atomic disaster at Fukushima. Due to the massive investments and the production losses in 2011, this position will not improve in the short term either. On the contrary: Japan will have to fight harder to retain even the present 19th place.

In final place: The BRICS states

At the bottom end of the ranking we find - at a clear distance from Japan and South Korea - Spain (index rating 24) and Italy (16) as well as the emerging BRICS states Brazil (0), Russia (10), India (12), China (18) and South Africa (0) (on South Korea and BRICS, see also the chapter „Asia“). Italy must be classified as Europe‘s „problem child“ in the innovation areas. It is even behind China in the overall evaluation and is ahead only of India, Russia, South Africa and Brazil. It should be emphasized that this position was never really better compared to the established industrialized countries. It is, however, significant that a country of immense land area like China, which has been actively developing its innovation system only for the past decade, has already overtaken Italy.

Italy must be classified as Europe‘s „problem child“ in the innovation areas.

Innovation hotspot Asia

Dynamic countries around China are increasing their global significance

The group of countries backing innovation in international competition has been growing continuously over the past years and decades. In the 1990s, this group of innovation backers was joined by the Scandinavian countries and later South Korea. New countries are now pushing ahead and are putting more and more pressure on the established economies. The USA and Japan, in particular, are feeling the pressure, but also west Europe. At present, many of the most dynamic countries are from Asia. The strengths and potentials of this region are explained in the following.

China belongs to the group of the most important newcomers among the innovative nations, not only due to its size, but also on account of its very marked ambitions to speed up its modernization via imitations and innovations. The opening-up policy of Deng Xiaoping in the late 1970s and especially the economic reforms introduced since China joined the WTO in 2001 had the objective, among other things, to allow the broad masses to participate in the economic upswing.

Asian countries in the ranking of the Innovation Indicator, 1995-2010

Place	1995	2000	2005	2010
1	Switzerland	Switzerland	Switzerland	Switzerland
2	USA	Sweden	Sweden	**Singapore**
3	Netherlands	USA	USA	Sweden
4	Sweden	Finland	Finland	Germany
5	Belgium	Belgium	**Singapore**	Finland
6	Canada	**Singapore**	Netherlands	Netherlands
7	Germany	Canada	Canada	Norway
8	Finland	France	Denmark	Austria
9	France	Germany	Belgium	USA
10	Denmark	Netherlands	Germany	Belgium
11	**Singapore**	Denmark	Norway	Canada
12	Great Britain	Great Britain	Great Britain	**Taiwan**
13	**Japan**	Norway	Austria	Denmark
14	Norway	**Japan**	France	France
15	Australia	Australia	Australia	Great Britain
16	Austria	Austria	Ireland	Australia
17	Ireland	Ireland	**Japan**	Ireland
18	**South Korea**	**South Korea**	**South Korea**	**South Korea**
19	**Taiwan**	**Taiwan**	**Taiwan**	**Japan**
20	Russia	Russia	Spain	Spain
21	**India**	Spain	**India**	**China**
22	Spain	**India**	Italy	Italy
23	Italy	Italy	**China**	**India**
24	**China**	**China**	Russia	Russia
25	Brazil	Brazil	South Africa	South Africa
26	South Africa	South Africa	Brazil	Brazil

The Chinese Way

The (re-)introduction of private enterprise and the 2007 law protecting private property were intended to contribute decisively to this goal. In doing so, the government consciously accepted an increasing inequality in the distribution of wealth. And yet the political framework conditions were still retained with the undisputed leadership of the Communist Party and socialism as the economic and social ideology: instead the "Chinese way" to economic growth and prosperity is being followed. The objective is to establish a socialist market economy. So there are private enterprises and private property on the one hand and a centrally planned economy and set targets on the other. These plans provide the framework for both the private and the state-controlled economy.

Investments in Science and Technology

The medium- to long-term plan for Science and Technology adopted in 2006, which covers the period up to 2020, provides for a stronger focus of the Chinese economy on research and development. Up to now, China's competitiveness has been powered by its low wages and the related price advantage. The medium-term plan, however, aims at bolstering home-grown technologies and a much lower dependency of the Chinese economy on technology imports from industrialized economies. This requires high investments in educating and training the population and in research and science infrastructure.

The Chinese government has achieved impressive results here over the past ten years – as shown by the differentiated analyses of the innovation indicator for input and output. For investments in research and development in absolute terms China

has recently moved ahead of Japan to take second place behind the USA – taking into account the purchasing power of the Chinese currency Renmimbi. Based on the size of the country, China will need to make further investments, however. These are also expected. Further investments are unavoidable, if in China as a whole or in other districts besides the already existing hotspots like Beijing, Shanghai, Hong Kong or Guangzhou more people are to be allowed to participate in prosperity. The investments which have already been made will soon make their mark on national and international markets. According to the results of the new Innovation Indicator, China is expected to clearly improve its performance in the important output indicators of innovation activity within the next two to five years (for example, patent registrations, high-tech exports or citations of scientific articles).

Five-Year Plan: Increasing domestic consumption

The Chinese government published its Twelfth Five-Year Plan in March 2011, which intends to achieve broader domestic consumption and thereby increase the purchasing power of the Chinese population – in short: to bring about greater prosperity and consumption for all. The government is well aware that they have to expect increased inflation, above all if they actually manage to significantly raise wages especially in the mega-cities, as designated in the current Five-Year Plan. Bolstering domestic consumption is also a reaction to the worldwide economic crisis of the past few years, which affected China's exports almost as strongly as those of Germany and slightly slowed down the overall growth. The Chinese government also expects global economic crises in the future and wants to make the country more independent of them in this way. However, it is clear that exports will continue to provide an important contribution to economic performance in the future.

Key industries in the future

In addition, the current Five-Year Plan sets the annual growth rate of the gross domestic product (GDP) to an average of 7.5 percent – which is a marked slowdown compared to the real average growth of more than 11 percent achieved over the past few years. Seven strategic industries are to drive growth. These include energy saving and environmental technologies, the next generation of information technologies, biotechnology, manufacture of air and spacecraft and modern machine construction, renewable energies and nuclear technology, new materials as well as alternative vehicle propulsion technologies. In the period leading up to the Twelfth Five-Year Plan these were nominated as particularly relevant for future economic growth. At the same time, these are also the fields which should help China to tackle global challenges and the problems concerning energy supply, climate change and environmental protection arising from the changing economic structure. The current three percent contribution of these fields to the GDP is to be increased to eight percent by 2015 and to 15 percent by 2020. The choice of topics makes it clear that China is continuing to focus strongly on innovations in science and technology, which the government believes promise fast and internationally visible success. The Twelfth Five-Year plan, however, also refers explicitly to services and service innovations as important factors for the development of the domestic market.

Singapore and Taiwan

Two other players in Asia which are worth looking at are the relatively small but very dynamic countries of Taiwan and Singapore. The city state of Singapore actually manages one of the top positions in the current ranking. From eleventh place in 1995 it has consistently moved upwards. With its disciplined and well educated population, as well as a skillful economic policy, in the past years Singapore has developed into an attractive location for multinational corporations. The city state has on the one hand good research and development conditions to offer and on the other hand with its good infrastructure also serves as gateway and key location for the entire Asian market. Taiwan, which for the Chinese government still has the status of a province and not an independent country, profits greatly from the geographical and particularly the cultural proximity to China. Paired with its out-

The choice of topics makes it clear that China is continuing to focus strongly on innovations in science and technology.

standing competence in information and communication technologies, Taiwan achieved twelfth place in the ranking. Several well known large firms from the IT branch have their headquarters here, for example, ACER, ASUS, GIGABYTE or HTC. In addition, China handles a part of its worldwide activities via Taiwan with its more liberal economic system, which means further impulses for the island to the south east of the Chinese mainland.

South Korea has a heterogeneous profile

The Innovation Indicator shows South Korea has consistently held 18th place for several years, which seems surprising at first against the background of the dynamic developments in individual indicators such as patent applications, for example, or also the relatively high research and development ratio (R&D ratio) in the gross domestic product of more than 3.3 percent. Overall, however, the South Korean profile is very heterogeneous for the individual indicators examined. It does hold pole positions in education, the R&D ratio or the number of researchers, but, at the same time, it only has very poor values for the employment of the highly qualified and the science system. The gross domestic product per capita in South Korea is also at the lower end of the spectrum compared to the other countries regarded. This reflects the inability of the South Korean economy to transfer the investments in education, research and development into value added.

Singapore has turned itself into an attractive location for multinational corporations with a skillful economic policy.

South Korean Education System

South Korea is the PISA winner and has a large share of university graduates, but on the other hand, the country struggles with a large number of unemployed but highly qualified natural and technical scientists. The South Korean education system is obviously dedicated to teaching core competences in primary education, and that very well. Teaching at the universities is of widely differing quality, so that a large number of young people are entering the labor market, whose qualifications are neither adequate nor applicable to market requirements. Although there are many universities in South Korea, the share of good universities is small. What is true for university education also applies for university research. The quality and quantity of the scientific publications are rather low. Even if the disadvantages of language barriers and low international visibility are taken into consideration, more could be expected from the Korean system due to the investments and the goals.

Too few cooperations

The South Korean innovation system is, similar to the Japanese one, scarcely oriented towards (international) cooperation, which is documented in the low shares of international co-publications or co-patents and confirmed by South Korea's relatively low R&D investments abroad. A modern innovation system however requires openness and transparency to be successful internationally. This is especially true when the focus of the activities is based on complex technologies which require a great bandwidth of interdisciplinary knowledge. As in the case of South Korea, the input indicators already reflect a much higher level than the output indicators (see following figure), an improvement of the overall position can be expected for the future.

Russia below average

Russia lives off its natural resources and so far is not in a position to sustainably shape and further expand the investments in research and development made in the 1990s as well as a broad economic dynamic. Also the investments have declined, according to the relative consideration applied in the Innovation Indicator. The place in the Innovation Indicator remains correspondingly below-average and the differentiated consideration according to inputs und outputs proves that the investments, viewed in an international comparison, are really not sufficient to be successful in international technology markets.

India: Too few dynamic centers

India, like China a populous country with a huge land mass, has also not developed dynamically up

to now. There are isolated centers which evolved around science parks and special economic zones. This is especially the case for some hotspots which play an important role in the areas of software development or in pharmaceuticals and chemistry in international value-added chains. The spark, however, has not yet ignited the whole country.

Further investments in developing new science parks have not so far sparked off a broad focus on innovation in the country. In addition: extending R&D spending, which would have led to a greater R&D intensity, scarcely took place in the past years. As before, the share of spending on research and development amounted to less than one percent of GDP. Most of the funds were invested in the past in military and space research, both of which do not promise success in the short term and, in the long term, will probably not direct India on the pathway to innovation. In addition, a strong concentration - and thus a dependency - on the North-American market exists. If India does not emancipate itself from this dependence, then the desired dynamic will not be attained in the years to come. The most recent announcement of a significant increase in the share of GDP to be spent on research and development funding must first be realized and could (with a clear time lag) produce effects.

Asian Economic Area

In the past, approaches to build an Asian Economic Area which however cannot be compared with the NAFTA or the EU/EFTA either in terms of size or institutionalization have emerged – ASEAN is merely an association of economically smaller south-east Asian states. The Asian Economic Area could however establish itself as the third major market in the world. Evidence suggests that economic interconnections among neighboring countries – if the economic, technological and political conditions fit – can develop faster and more easily due to cultural and geographical proximity than with far distant partners. Already today Japan and South Korea are active in the whole of Asia and in particular in China. China itself is also increasingly active in the rest of Asia. A close cooperation with its southern neighbors Vietnam or Laos, as well as the connections with Taiwan, are only two examples. In this context, China has a gravitational effect on the development of an Asian Economic Area. Thus the single indicators of cooperation in the Innovation Indicator display on the whole an increasing significance of international collaboration in science and industry. The Asian countries considered here have strong cooperative relationships with their neighbors, which often extend beyond the average overall growth of external relations. The interests of Japan and South Korea in China are still primarily in utilizing the benefits of cost advantages. As the new Innovation Indicator shows, China will become a new major player which in the mid term not only functions as an extended workbench with cost advantages, but independently produces innovations and forms a separate market with strong internal demand and rising purchasing power. This will be of great advantage to the entire Asian continent.

China has a gravitational effect on the development of an Asian Economic Area

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