2014

Innovation Indicator

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

Get the App

The Innovation Indicator 2014 is available as an English-language app for tablet PCs. It offers real added value: for example information about the sub-indicators and their impact or video statements. The app also can be used to compare individual countries and topics of the study with each other.

iOS

Android

Introduction

Innovations secure jobs and economic wealth. Companies all over the world know this recipe for success. Policy makers try to create the right framework conditions for innovations. To achieve this, it is important to have a realistic idea of your own position in the global innovation landscape. The Innovation Indicator allows you to do exactly that: it offers a detailed evaluation of the starting situation and derives well founded recommendations for actions.
The Innovation Indicator has been published annually on behalf of the German Telekom Foundation and the Federation of German Industries since 2005. It shows how capable the innovation systems of different countries are. Currently, 35 countries are being evaluated via 38 single indicators.

Basic principles of the Innovation Indicator

1. High timeliness through "Now-Casting": all indicators use statistics from 2013
2. Model-based selection of indicators: only relevant indicators are examined.
3. Sub-division into input/ output and sub-systems (industry, education, science, state, society) allows a detailed analysis of strengths and weaknesses.
4. The combination of soft and hard indicators enables a holistic evaluation of innovation systems.

Changes

Seven new countries were included in the Innovation Indicator 2014: Greece, Indonesia, Israel, Mexico, Portugal, the Czech Republic and Hungary. Additionally, the indicators for the sub-system society were revised. Indicators newly added are the life expectancy of the population, the employment of women and the press publications in research and science.

Structure

- The overall Indicator discusses the current situation of the 35 countries and the developments since 2000.
- The sub-indicators display the five parts of the innovation system – industry, science, education, state and society.
- The focal topic of economic areas is concerned with the developments in Europe, North America and Asia and studies whether a new gravitational centre for an integrated economic area in Asia is developing with China.

Main results

Germany in the international innovation contest

- In the Innovation Indicator 2014 Germany is **placed sixth**. With an indicator score of 56 points it lies clearly behind the leading countries Switzerland (76 points) and Singapore (65 points). The gaps to the countries directly ahead of Germany (Sweden (56), Belgium (58) and Finland (60)) are fairly small

- Compared to the previous year, the **indicator score** for Germany has hardly changed, the placement in the ranking is also the same. Seen in the long run Germany was able to consolidate its catching-up process which began in 2005 but could not continue it. After 2010 Germany's innovation capability did not improve compared with the most important rivals.

- German **industry** lost one point in comparison with last year and fell from third to fifth place. Apart from Switzerland, Korea, Taiwan and Norway were better placed than Germany. Significant causes for the slight decline of the innovation capacity of industry are the relatively low level of venture capital investments, a low dynamic development of internationally registered patents, a slow growth in employment in the knowledge-intensive services, as well as a slower increase in the R&D expenditures of companies.

- German **science** was able to improve its innovation capacity in the Innovation Indicator 2014 compared with the previous year, but still remained under the level reached up to 2009/2010. The ninth place in the international comparison still leaves much room for improvement. Higher inputs through the increase in scientific personnel are to be set against decreases in the number of patent registrations from science and the deterioration of the publishing output as compared to other important scientific nations.

- In the **area of education**, Germany's indicator value improved for the second consecutive year. This was due mostly to better PISA-results, a further internationalisation of university education and more holders of doctorates in scientific and engineering subjects. Still, education with its eleventh place and only 48 points remains Germany's weak point in the Innovation Indicator.

- The contribution of the **state** towards German innovation performance has also improved. With this, the positive trend which started in 2002 continued further. With 55 points Germany managed to reach the eighth place in the international comparison in this area. This result was achieved due to the intensified efforts in education and the increased financing of scientific research, while the German government still mostly refrains from supporting research activities of companies.

- In the area of **society** Germany attained the eleventh place and therefore a middling ranking among the innovation-oriented economies. The societal framework conditions for innovation are thus certainly not special strengths on which the German innovation system can build.

Position of other countries and regions

- **Switzerland** was again able to defend its position as the most innovative economy in the world in 2014 and achieved 76 out of a possible 100 points. The Alpine Republic clearly leads in the area of industry and science and also has no significant weaknesses in education, government and society. The distance to second placed Singapore (65 points) has increased. Compared to last year's report especially the societal framework conditions for innovation in Singapore have been rated more critically. The innovation performance of industry also declined.

- **Finland** is in third position of the innovation ranking. It earned points most of all in the sub-indicators state and science. But education and society are also counted among the strengths of the Finnish innovation system. Industry lately has increased its innovation performance again after the Nokia crisis.

- **Belgium** again did very well with the fourth place. Even if it does not have its emphasis on the easily visible high technology area, it provides many of the "hidden champions" in small industrial supplier markets. Apart from that, the Belgian innovation system is very well balanced. It has no weaknesses in any parts, although it is also not the leader in any area.

- The **USA** has further lost ground and only reached the 13th place in 2014. In 2005 the USA were still among the top three. In absolute numbers the USA still remain the largest innovation location in the world. However, seen in relation to the country's size the resources provided for research and innovation and the achieved results are worse than in many other countries.

- **France,** which like Germany fundamentally changed its innovation policy since the middle of the 2000s in essential areas, can still not achieve an improvement in ranking in the international comparison based on these reform efforts.

- Unchangingly weak is the performance of **Japan**. The high innovation power of Japanese industry is opposed by a scientific community with low performance capacity and hardly any international orientation, a rigid education system and a society which in total is hardly innovation-oriented.

- With **China's** economic development, for the first time there is the chance for Asia that an own economic area forms, which could then ignite a regional dynamic and influence other countries in the region.

- In a comparison of the three great economic regions of **Asia, Europe** and **North America** Europe has slowly but continuously improved its innovation performance since the year 2000. In 2010 the old continent replaced North America which had been leading up until then as the most innovative region. Out of the 20 most innovative countries in the world twelve lie in Europe. A special strength of Europe is science. While Asia has improved significantly, it still clearly lags behind the two other regions. This is however not only due to the big emerging countries China, Indonesia and India, but also due to the in total rather weak performance of Japan and Korea.

What does the Innovation Indicator measure?

It measures the innovation capacity of countries in a future-oriented perspective – therefore the results can significantly differ from the rankings which primarily aim at the economic power of a country.

It compares the position of Germany opposed to the most important competitors in the innovation field. The benchmark are the world's leaders.

It looks at the entire innovation system and allocates importance to the cooperation between the individual elements – industry, science, education, state and society.

Rising stars and setting suns

35 countries in the innovation comparison

No changes at the top of the Innovation Indicator: Switzerland remains the leader in the overall ranking. Germany has established itself in the leading field while the developments in the USA, France and Poland give cause for worry. In contrast, encouraging signals are emanating from Portugal, Spain and the Czech Republic.

Although the Innovation Indicator was methodically revised this year, Switzerland is still able to defend its top position with 76 points. After a first conceptional revision in 2011, the Alpine republic did not show any weaknesses. Regular methodological revisions are necessary in order to reflect the changing framework conditions for innovations and so to ensure the validity of the calculations. Two essential changes have arisen this time: on the one hand, the number of countries surveyed was increased to 35, on the other hand the indicators in the sub-system society were updated (see also introduction on page 10).

Singapore loses eight points in the current Innovation Indicator after a strong result in the previous year, but still remains in second place with 65 points. While this has partially to do with the new indicators used in the societal sector, Singapore would only have achieved not more than 68 points even with the old indicator set. There were interesting changes on the following places: the third place is now occupied by Finland, continuing the positive trend of the past years. This is remarkable since public reporting about the economic situation in Finland has been dominated by the economic problems of Nokia, which at first glance suggests a different result. But the innovation power of the Finnish economy does not only depend on one company, but is based on a multitude of factors. Among them is, for example, the way policy is designed towards innovations. The country tries to bundle centrally the innovation-relevant support via the innovation agency Tekes and thereby ensure a holistic innovation policy. This concept seems to pay off. The results of this year's Innovation Indicator for Finland show that an economy can keep its innovation power or even improve upon it, even if the economic framing conditions are temporarily unfavourable.

Belgium and Sweden follow in the fourth and fifth places. Germany finally reaches the sixth position as in the previous year. The Federal Republic has firmly established itself in the leading field. Great Britain was able to improve its position and is now placed tenth. Great Britain can especially shine with regard to the societal indicators. The dynamic for the USA, however, looks negative. They lose further ground and are currently only in the 13th place. even if they remain the most innovative country in absolute numbers. The development of the former technology leader who was regularly placed first or second in the Innovation Indicators up until the early 2000s must be regarded as very worrying, because these results lead to the conclusion that this is not a temporary decline, but rather a continuing and significant erosion of the earlier good positioning in the ranking is becoming apparent. This trend should also alarm the US American politicians who engage in a mostly passive innovation policy. Austria too falls back slightly and achieves the 14th place this year.

France loses ground

France is also further declining. After an already disappointing 16th place in the previous year, the grande nation slips down one position further. Similar to the USA a continuous decline can be seen here. In the early 2000s France was still placed among the top ten. Ultimately, this development reflects the weaknesses of the economic situation in France. Despite the efforts of politicians to institute reforms for some years, there are no successes. Those politically responsible so far could neither increase the innovation performance nor the competitiveness of the economy. Rather, the fundamentally interventionist orientation of French industrial policy has in hindsight proven more of an obstacle. The promotion of research and development was for many years concentrated on large, established cooperations among the so-called national champions. Seen from the perspective of the innovation policy, this approach has failed. It proved to be unbalanced and ineffective. One reason: when regarded in

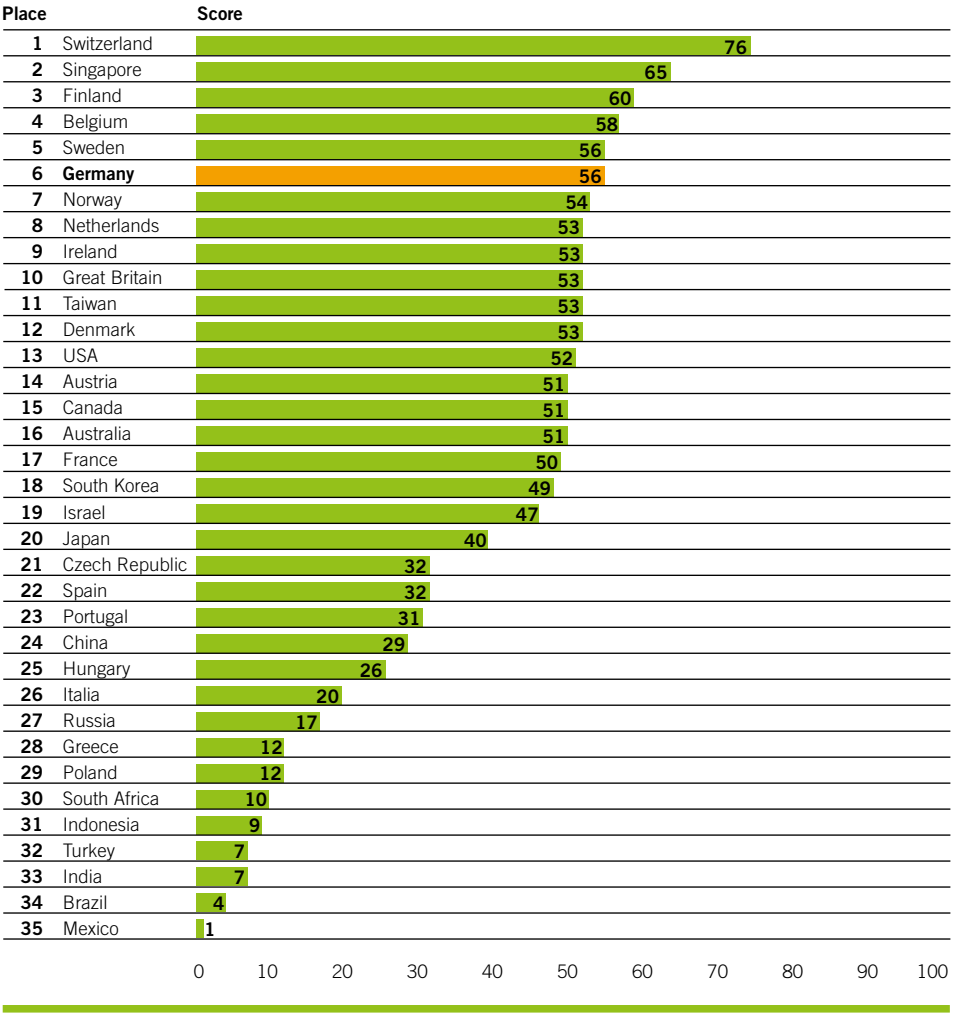
detail these national champions are often large enterprises with best links to the government circles. These are however otherwise seldom sufficiently innovative to fulfil the expectations placed in them. The case of Alstom, in whose sale the government massively intervened, shows in an exemplary manner that a central governmental and interventionist basic attitude still dominates in France. This has a counter-productive effect on the innovation performance: instead of promoting necessary reforms, in the worst case it even obstructs them.

Innovation country Israel

In the 19th place Israel (46 points) is the first of the countries included for the first time in this year's Innovation Indicator. The position is on the one hand a respectable success, since this rank means that Israel has unambiguously joined the group of the world's most successful innovation nations. However, calculating the Innovation Indicator backwards also enables a look at the dynamics. This shows that Israel has clearly lost ground in the past years. It managed to achieve positions in the top ten in the first half of the 2000s. Israel has shifted away from these top positions at the latest in 2005.

Still the country is to be counted among the most research-intensive economies globally. Currently still about four per cent of the gross domestic product is spent on research and development per year. Until a few years ago, the investments however clearly surpassed this mark. A large part of the research investments is devoted to military research. The economic effect is therefore limited. It only arises in the cases in which the military investments can also be used in civilian life at the same time (dual use) or if the military research is transferred to civilian application uses in the course of time (spillover effect). Israel can only generate little output from their massive investments. However, the country does manifest strengths in some civilian areas, such as genetic research or in environmental and energy technologies.

Overall result of the Innovation Indicator



Rankings in the Innovation Indicator, 2000–2013

Rang	2000	2005	2010	2012	2012*	2013
1	Switzerland	Switzerland	Switzerland	Switzerland	Switzerland	Switzerland
2	Sweden	Sweden	Singapore	Singapore	Singapore	Singapore
3	USA	USA	Sweden	Belgium	Finland	Finland
4	Finland	Finland	**Germany**	Netherlands	Belgium	Belgium
5	Belgium	Singapore	Finland	Sweden	Sweden	Sweden
6	Singapore	Netherlands	Netherlands	**Germany**	**Germany**	**Germany**
7	Israel	Canada	Norway	Finland	Taiwan	Norway
8	Canada	Denmark	Austria	Denmark	Norway	Netherlands
9	France	Belgium	USA	Norway	Denmark	Ireland
10	**Germany**	**Germany**	Belgium	USA	Netherlands	Great Britain
11	Netherlands	Norway	Canada	Austria	Great Britain	Taiwan
12	Denmark	Great Britain	Taiwan	Canada	USA	Denmark
13	Great Britain	Austria	Denmark	Great Britain	Austria	USA
14	Norway	Israel	France	Australia	Canada	Austria
15	Japan	France	Great Britain	Taiwan	Ireland	Canada
16	Australia	Australia	Australia	France	Australia	Australia
17	Austria	Ireland	Ireland	South Korea	France	France
18	Ireland	Japan	South Korea	Ireland	South Korea	South Korea
19	South Korea	South Korea	Israel	Japan	Israel	Israel
20	Taiwan	Taiwan	Japan	Israel	Japan	Japan
21	Czech Republic	Czech Republic	Czech Republic	Spain	Spain	Czech Republic
22	Russia	Spain	Hungary	Czech Republic	Czech Republic	Spain
23	Hungary	Hungary	Spain	Hungary	Hungary	Portugal
24	Spain	India	Portugal	Portugal	China	China
25	India	Italia	China	Italia	Portugal	Hungary
26	Italia	China	Italia	China	Italia	Italia
27	Poland	Russia	India	Turkey	Russia	Russia
28	Indonesia	Poland	Russia	Poland	Greece	Greece
29	China	Portugal	Poland	Russia	Poland	Poland
30	Greece	Greece	Greece	India	Indonesia	Südafrika
31	Portugal	Südafrika	Indonesia	Greece	Südafrika	Indonesia
32	Brazil	Indonesia	Südafrika	Indonesia	Turkey	Turkey
33	Mexico	Brazil	Brazil	Südafrika	India	India
34	Turkey	Mexico	Mexico	Brazil	Brazil	Brazil
35	South Africa	Turkey	Turkey	Mexico	Mexico	Mexico

* Results with modified sub-system society

A further newcomer in the Innovation Indicator is the Czech Republic. With 32 points it achieved 22nd place, still better than the southern European countries. If one takes into account that market economy structures have only existed in this country for 25 years, the results must be judged as positive. The Czech Republic seems to have understood that the long-term well-being as well as a continuing high income level can only be reached by technological advances compared to the rivals. Additionally, the country managed better than many other eastern European states to react to the development that internationally active large enterprises which had outsourced simple tasks to eastern Europe in the 1990s are now moving their factories to even cheaper countries (see also excursus on page 21). Spain and Portugal follow in the places 22 and 23. The former was able to confirm its slight upwards trend from the past year and achieves 32 points, as in the previous year. Portugal too, which is observed for the first time in this year's Innovation Indicator, reaches place 23 with 32 points as well. This is even more remarkable if the country's bad results in the 1990s and 2000s are taken into account. Here the indicator value continuously lay below 5 points. The development, which has taken place since and despite the current crisis situation, is therefore both significant and encouraging.

China achieves 24th place just as in the previous year, however it strongly increased its point result. The slow catching-up process which was already implied in the early years seems to be confirmed. Italy - although it was surpassed by China - has also improved slightly and increased its number of points from 19 to 20 after years of stagnation. In place 28 and with 12 points follows newly included Greece, which has a rather weak premiere in this year's Innovation Indicator. Still, a clear upwards trend for the past three years in the area of innovations can be discerned. The indicator value more than doubled up to today. However, Greece especially lost on the input factors in the past years, although the output could be increased. If this imbalance remains, then negative consequences must be expected in the long run.

Directly behind Greece comes Poland, which can be classified as a lot more solid from a purely economic perspective, but in the area of innovation it is still to be seen as a newcomer. Among the three eastern European countries in the Innovation Indicator (Czech Republic, Hungary, Poland) Poland is by far the weakest country. Poland should therefore urgently use the current economic dynamic to establish an innovation-oriented policy which aims at a long-term technological modernisation of the economic structures (see also excursus).

Indonesia follows in place 31; here little dynamic was detectable in the past years. Turkey follows in place 32, which means a marked loss in comparison to the previous year. In the Innovation Indicator 2013 the economic development was already praised, but also warned that the societal development in Turkey must not be neglected. This assessment has not lost its validity. India, Brazil and Mexico are to be found in the last three places. Despite the meanwhile 20 year history of NAFTA – the North American free trade agreement between USA, Canada and Mexico – Mexico is still far from belonging to the group of the modern industrial innovation-oriented countries. Until 2012 Mexico only ever reached zero values. Only in 2013 did the overall index move into the positive area with 0.5 points. Much remains to be done for Mexico.

The euro crisis – A light at the end of the tunnel?

When looking at the effects of the economic crisis in the euro zone it is certainly too early to sound the all-clear – this is underlined by the still difficult credit situation of the companies in southern Europe. However, many of the crisis countries have managed to increase their innovation power again to different intensities. Positive signals come from Spain and Portugal where Portugal in particular follows a long-lasting trend of socio-economic modernisation, which is valid for the entire period surveyed in the Innovation Indicator. With 32 points each the values in both countries are certainly not (yet) in the internationally leading field, but are still cause for mild optimism. The trend is also upwards for Greece, which however can still only be placed on a level very slightly above the emerging countries. Italy was also able to improve its situation slightly. Ireland, which climbed up this year, has never actually been a problem, at least from an innovation policy perspective. Even if economists do not agree on suitable measures to fight the euro crisis, there is agreement that only a competition-oriented policy looking at the long-term effects can be effective in reaching the goals. The current results are certainly encouraging signs that the structural reforms of the past years are bearing fruit. Not only the economic numbers speak for this, but also the political innovation efforts support this development. For example, the European Union made a contribution to this with the 7th Research Framework Programme and a remarkable expansion of the funds for the successor programme Horizon 2020 will certainly deliver further impulses. Supporting this is the fact that the focus of the programme was changed from a pure increase in the R&D ratio to individualised regional development (smart specialisation).

Methodology

How values turn into rankings

To best show the complexity of innovations, the Innovation Indicator is designed as a so-called composite indicator. It compiles 38 single indicators for different parts of the innovation systems and condenses the information into a single measure.

The overall indicator

The 38 single indicators are determined by an empirical model which identifies those indicators which have the highest explanatory power for the innovation ability of economies. Based on fixed reference countries (USA, Japan, Germany, France, Italy, Switzerland, United Kingdom) the individual indicators are normalised on the interval 0-100 to make them comparable. Then the individual values are added, each with equal weight. The detailed account can be found online in the methodology report to the Innovation Indicator.

The sub-indicators

In addition to the overall indicator the results are shown divided between the sub-systems industry, education, science, state and society in order to better show areas of activity for innovation policies. The methodology utilised is the same as for the overall indicator. The individual indicators within the sub-systems are aggregated with equal weight. Note that you can not calculate the total indicator from the sub-system indicators since some indicators are included in several sub-systems.

Forecast until 2013

All data, which the Innovation Indicator uses, refer to the reference year 2013. This way the timeliness of the Innovation Indicator is ensured and the comparability of the values for the different countries guaranteed. For indicators and countries for which data does not yet include 2013, forecasting methods from time series econometrics are used to extrapolate the values up to the present.

Sensitivity analyses

The results of the Innovation Indicator depend, among others, on the weighting of the individual indicators. Sensitivity analyses are performed to check whether any other than the equal weighting lead to the same ranking of the countries. In these the weights are determined by random generators. Every ranking which results from a certain random weighting is noted and the process repeated many times. At the end you receive a simulated fluctuation interval for the ranking of the individual countries.

There are three main groups of countries: top, middle and laggards. Within one of the main groups a country's ranking is not very robust against a change in weighting, the classification within the main group, however, is very robust. For example, one can not say with certainty that Germany in place six is better than Norway in place seven. However, one can say that Germany is placed behind Switzerland. Even in the ideal case of a weighting of the individual indicators most beneficial to Germany, it would not rank better than fourth place, however, it would also never be worse ranked than place eleven.

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